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Synergies between urban agriculture and urban household food security in Gweru City, Zimbabwe

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It is estimated that 25% of Zimbabwe's population lives in urban areas (CSO, 2002), 70% below the poverty line, and a million in the city of Gweru. The worsening macroeconomic situation in 2008 resulted in urban food insecurity. Households adopted different survival strategies, including the intensification of urban agriculture. In an effort to assess the extent to which urban household food insecurity is mitigated by UA activities, a comparative analysis between households practicing and not practicing UA was done in Gweru in 2009. Household size as well as household head sex, age and employment status were found to affect household UA practice. Results indicated that UA practicing households were food-secure than non-practicing households. Household size, UA participation, household income, household head sex, maize meal price affected household food expenditure. Household head sex, UA participation, household head age and informal activities carried out by household members significantly affected urban household food security. The study concluded that there are synergies that exist between UA and urban household food security.

Key words: Urban agriculture, household food security, Gweru.

INTRODUCTION

Urban food insecurity is a growing challenge emanating from rapid urbanization and rising poverty heightened by the HIV/AIDS epidemic. Rapid urbanization, declining rural productivity and poor marketing systems results in increased urban poverty and food insecurity. Urbanization increases resource competition, costs of supplying, distributing and accessing food, thus negatively impacting on urban household food security. The challenge of feeding cities lies in enhancing consumer access to food by ensuring increased local food production, processing and distribution as well as reversing dependence on distant production sites, thus enabling cities to become more autonomous in food

production (Rabinowicz, 2002).

Macro-economic policies since the late 1990s have had a deleterious effect on wage-dependent workers, creating vulnerable urban people. Hovorka et al. (2009) highlighted that economic or political crisis drives UA, which provides safety net for the poor and for households seeking to augment dwindling incomes. It is estimated that one-fourth of Zimbabwe's population lives in urban centers, 70% living below the poverty line (STERP, 2009). The Zimbabwean annual real GDP has been declining an average of -5.9% since 2000 (STERP, 2009). Recession has culminated in non-wage unemployment rate soaring from 80% in 1995 to an

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estimated 94% in 2008. Food shortages in 2007 and 2008 resulted in inflation reaching 231 million percent (CSO, 2008).

UA is defined as mostly crop and livestock rearing on private, leased, or rented land in peri-urban areas, in backyards, on vacant public lands and in semi-public areas. The drivers of UA include: High food prices and rampant inflation; food shortages; growing joblessness; erosion of purchasing power of wages and pensions, and cultural attachment or hobby. UA, is a major coping strategy for poverty and food insecurity alleviation, has been increasing in the SADC region (Harare Declaration, 2003). UA is not a relic of the past, and will not fade away nor brought to the city by rural immigrants who will lose their rural habits over time as the city grows (Hovorka et al., 2009).

Urban agriculturalists are composed mostly of disadvantaged groups such as orphans, women, rural immigrants without jobs, and the elderly. However, there has been an influx of the lower and middle-income earners, as well as richer people seeking a good investment for their capital by undertaking UA for physical and or psychological relaxation (Hovorka et al., 2009). In 2007, it was estimated that 25% of the maize produced in Zimbabwe was produced in and around the cities (AGRITEX, 2008).

UA contributes to local economic development through boosting urban poor asset base, increasing income, alleviating poverty, and including the urban poor and women into mainstream economic activities, thus reducing vulnerability and food insecurity (Mbida, 1995). UA is a direct and indirect occupation provider in cities; it is estimated that 200 million urban residents world over provide food for the market and that 800 million urban dwellers are actively engaged in UA (RUAF, 2009).

In urban areas, virtually everything consumed is purchased; the low purchasing powers are undermined by economic shocks leaving households at the mercy of food insecurity. It is estimated that poor household devotes 60 to 80% of their income on food purchases. Income to purchase food matters less if the food is not available. At the height of food insecurity in 2007, food was available in Zimbabwe's rural areas, whilst food shortages were prevalent in urban areas (ZIMVAC, 2008).

Food security

The four pillars of food security are access, availability, safety and stability. FAO (2001) defined food security as a state in which all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and health life. Food security includes food supply; physical, social and economic access; adequacy; utilization; safety; nutritious and

cultural acceptability.

Problem statement

Since the 1970s, UA has been growing in developing nations, in terms of land usage and number of farmers taking part. In the midst of loss of industrial jobs, decreasing income, and harsh macro-economic conditions, urban households have found it difficult to continue with rural agricultural activities, and these have led to increased UA activities. Despite UA growth in urban areas, households have continued being vulnerable amidst growing urban household food insecurity and outbreaks of food riots.

METHODOLOGY

Primary data was used as a main source of inference, while secondary data was used to validate the primary data collected. There was systemic and purposive Stratified sampling of UA practicing households. First areas practicing UA the most were selected and then the urban agriculturalists were randomly selected in the fields. Data was collected through structured and semi-structured questionnaires. The respondents were randomly selected with a bias towards the UA practicing households. A total of 150 questionnaires were administered of which 69.3% were UA-practicing households. The questionnaire captured data on household characteristics, economic activity, asset endowment, UA production and performance, non-participation in UA, food basket and consumption. The data was entered into the SPSS and STATA for analysis by cross tabulation, mean differencing, gross margin analysis, food security indexation and regression modeling. The study was undertaken in 2009, soon after the country adopted the multi-currency regime.

Descriptive statistics

Were used to describe the differences between UA-practicing and non-participating households. Cross tabulations were used to determine the interaction of socio-economic characteristics with UA participation. Descriptive statistics were also used to explore linkages between urban household food security and UA participation.

Determination of household food security status

According to FAO (2011) the energy requirement is 2100 kcal per person per day. Food security index was calculated by dividing household energy consumed per month by total requirements; households failing below 70% were deemed food-insecure. These Index values were used to explore food security differences between UA-participating and non-UA-participating households.

Regression analysis

Logit model examined the factors affecting UA participation. The study assumed the following model:

$$Y_0 = \alpha + \beta_0 X_1 + \beta_1 X_2 + \beta_2 X_3 + \beta_3 X_4 + \beta_4 X_5 + \beta_5 X_6 + \beta_6 X_7 + \beta_7 X_8 + \beta_8 X_9 + E$$

Table 1. Household demography characteristics and urban agriculture participation.

Demography characteristic	UA-practicing households	Non-UA-households	Z value
Household size	4.62 (1.66)	3.61 (1.82)	0.62**
Average age	41.41 (14.14)	42.53 (14)	0.65**
	UA participating households (%)	Non-UA participating households (%)	Chi value
HH Sex			
Female	33.62	54.05	6.65
Male	66.38	45.95	
HH employment status			
Formal employed	62	32	
Informal employed	38	68	

Source: Survey data.

Where: α , β_0, \dots, β_8 are coefficients, and E=error term; X_1 =Household head (HH) sex; X_2 =HH age years; X_3 =HH educational status; X_4 =Household size; X_5 =HH employment status; X_6 =Total household income; X_7 =Rural homestead; X_8 =Informal activities, and X_9 =Residential status.

Two minimum least squares regression model were used to examine the factors affecting urban household food security:

$$Y_1; Y_2 = \alpha + \beta_0 X_1 + \beta_1 X_2 + \beta_2 X_3 + \beta_3 X_4 + \beta_4 X_5 + \beta_5 X_6 + \beta_6 X_7 + \beta_7 X_8 + \beta_8 X_9 + \beta_9 X_{10} + E$$

Where Y_1 = household food expenditure; Y_2 = household energy adequacy; α , β_0 – β_{10} are coefficients; E=error term; X_1 =HH sex; X_2 =HH age; X_3 =HH educational status; X_4 = HH size; X_5 =HH employment status; X_6 =Total HH income; X_7 =Rural homestead ownership; X_8 =Informal activities; X_9 =Residential status; X_{10} =UA participation, and X_{11} =Maize meal price.

RESULTS AND DISCUSSION

Demographic and endowment characteristics

Despite respondents hailing from the same socioeconomic environment, heterogeneous traits between UA farming and non-farming households were noted in household head age, sex, employment status; and household size. UA practicing households were headed by slightly younger heads and also households with more members. It can be postulated that the motive behind the UA participation is to feed the large household. Therefore, comparatively more households with more members are expected to venture into UA activities. Older household members may shun UA because of its laborious nature, and these households may not require UA as a safety net (Table 1).

An association exists between HH sex and UA participation. UA participation is dominated by male-headed households. Households headed by the formally employed stand a better chance of getting UA plots. Low returns accruing from UA resulted in the unemployed

households shunning it. Hyperinflation that eroded the formally employed incomes resulted in households participating in UA as a way to augment incomes.

Factors affecting household participation in urban agriculture

In order to better understand household decisions and insights into household factors significantly influencing UA participation, a logistic model was run. The decision to farm and the level of effort spent on UA are affected by household factors such as educational status, household size, and household head sex and age. The R^2 value of 0.618 implies a degree of weak relationship between the independent variables and the dependent variable (Table 2).

Household size is positively related to UA participation. Increase in household size increases vulnerability and leads to households venturing into UA as a coping mechanism.

Household head sex is positively related to UA participation. The haphazard manner of plot allocation, and conflicts inherent in UA plots, favor male participation as compared to females.

Household age is negatively related to UA participation, contrary to expectations. The life cycle hypothesis postulates that older households, after accumulating wealth, will be better cushioned against vulnerability, as they have more assets than younger ones.

Household head educational status is negatively related to UA participation. Well educated households are less likely to venture into UA, as they would be better paid at their workplace and will not require any income augmenting.

Urban agriculture participation

Multi-question interviews with urban farmers revealed

Table 2. Urban agriculture practice logistic regression model.

Urban agric participation	Coefficient	Standard error	P> z	Exp(α)
Residential status [+]	-0.48	0.83	0.56	0.62
Household size [+]	1.38	0.52	0.01***	0.92
HH sex [+]	0.10	0.31	0.93**	0.77
HH age [+]	-0.08	0.05	0.09*	3.97
Educational status [-]	-0.70	0.33	0.03**	0.49
Employment status [-]	-0.10	0.37	0.79	0.92
Informal activities [-]	-0.26	0.24	0.29	1.10
Rural home ownership [-]	1.14	1.00	0.26	3.13
Income range [-]	-0.12	0.33	0.73	0.89
Remittance	-0.36	0.38	0.31	0.68
Constant	3.08	3.61	0.39	21.72

[], A priori expected signs; ***, **, *significance at 1, 5 and 10% respectively. Source: Survey data.

that push factors into UA include cultural, economic and food security incentives. Ranked in order of importance, survey respondents gave the following reasons for engaging in UA:

1. Production for home consumption (96.2%),
2. Food shortages (74%),
3. Income enhancement (61.5%),
4. Hobby or tradition (37.5%),
5. Supplementary employment (9.6%).

The top three motivating factors for UA engagement are economic. A household's perception of food insecurity risk will affect its farming effort because of the insurance value of own food production (Seeth et al., 1998). Food insecurity, or the perceived risk of it, pushed 96.2% of the respondents into UA for production of food for home consumption so as to enhance household food supplies. The food shortages prevalent in 2008 caused 74% of the respondents to venture and/or intensify UA activities to alleviate the food shortages. About 61.5% highlighted that UA was a form of income-enhancing activity. Vegetables produced would be sold in the markets as well as surplus grain and other products yielding direct income.

UA yields both direct income through sales and indirect income through reduction of expenditures on food. UA offers direct and indirect employment opportunities in Gweru, highlighted by 9.6% of the respondents. During the summer, UA acts as a form of short-term employment.

Farmers migrating from rural areas would want to continue with their farming practices, and hence would look for UA plots. There has been an influx of the rich, who view UA as a hobby. These accounted for 37.5% of the respondents who highlighted that UA practicing was taken as a hobby.

The major crop produced was maize, cultivated by

99.3% of the respondents; this validates the notion that engagement of UA is mostly for food security reasons. This was followed by sweet potatoes, beans, groundnuts, round nuts, vegetables and cowpeas, at 72.1, 62.5, 14.4, 1.9, 0.9 and 4.8%, respectively. The crops produced are mostly for food and nutrition security, though a surplus could be sold to generate income.

Urban household food security

Urban household food security is a contentious issue in the endeavor to reduce food insecurity. Of importance is the question: how significantly does UA produce contribute to the household food basket?

Time family food runs dry and coping or adaptive strategies adopted

During the height of food shortages in 2008, households were affected by food run-outs. Table 5 shows that non-UA participating households were mostly affected by food run-outs during the hyperinflationary era.

More non-UA practising households had food running out at the start of the month, middle of the month and month end as compared to UA-participating households, whilst more UA participating households never ran out of food during the hyper-inflationary era (Table 3). When households were affected by food shortages, they adopted strategies to see them through the month.

In the aftermath of rampant food shortages that bedevilled the country in 2008, 50% of the households borrowed food, 43.3% opted for less preferred foodstuffs, 45.3% reduced their number of meals, and 46% reduced meal quantity and frequency during times when food ran out. Approximately 22.7% of households reported that they would sometimes spend the night without eating,

Table 3. Household food shortage and urban agriculture participation.

Time food ran out	UA participating households (%)	Non-UA participating households (%)	Critical value	Chi value
Start of the month	26	30		
Middle of the month	28	28	7.81	9.42
Month-end	24	26		
Never	22	15		

Source: Survey data.

Table 4. Coping strategies when food runs dry.

Strategy	Urban agriculture participating households (%)	Non-urban agriculture participating households (%)
Opting for less preferred food	38.5	54.4
Reducing quantity consumed	36.5	65.2
Reducing number of meals	38.5	41.3
Borrowing food	45.2	60.9
Selling assets	33.7	21.7
Spending night without eating	21.2	26.1

Source: Survey data.

Table 5. Expenditure by income category.

Parameter	Income category		
	Lower 20%	Middle 60%	Upper 20%
Food proportion	0.5	0.48	0.46
Per-capita food consumption	29.1	26.59	23.4
Total non-food consumption	70.64	108.76	147.46

Source: Survey data.

whilst 30% liquidated assets to purchase food. Table 4 summarizes the coping strategies that were adopted by respondents when they were faced with food shortages.

Expenditure approach

Expenditure responses showed the proportion of income devoted to food; this is affected by household wealth, employment status, residential status and sex. A priori the proportion of food expenditure and per-capita food consumption would decrease as income increases, whilst non-food expenditure would increase with rise in income. Table 5 shows expenditure profiles according to income category.

This is consistent with the Engelian relationship between income and the proportion of income allocated to food. As income increases, the percentage of the budget allocation to food falls whilst the converse is true. The respondents in the study area purchased a variety of

food commodities: staples, luxuries and inferior commodities. Foodstuffs that were classified as essential included maize grain, maize meal, flour, rice, potatoes, beans and beef. The proportion of households purchasing beef and rice increased with income levels. For the inferior foods chunks and kapenta, purchase decreased with increase in income. As income increases, the consumption of less desirable commodities decreases, as shown by chunks and kapenta. Table 6 shows the consumption of foodstuffs according to wealth category.

Table 7 shows expenditures of foods and non-foods according to UA participation. The mean food expenditure for UA participating households was significantly lower than for non-UA participating households as well as proportion of food purchased. Households engaged in UA do not purchase grain and other products such as vegetables and pulses. The mean percentage food expenditure for non-UA-practicing households is greater than that of UA-practicing households,

Table 6. Food purchases according to wealth category.

Food items	Lower 20% (%)	Middle 60% (%)	Upper 20% (%)	Chi value	Critical value
Beef	73	76	87	45.06	18.3
Rice	53	58	100	35.80	23.7
Chunks (soyacake)	63.3	63.3	30.0	27.79	26.3
Kapenta	76.7	67.8	53.3	33.00	32.7

Source: Survey data.

Table 7. Expenditure profiles.

Households	Total food expenditure	Percentage expenditure on food	Non-food expenditure
UA participating households	\$93.52	47.11	111.43
Non-UA participating households	\$95.91	50.13	109.84

Values with** are significant at 5%; Source: survey data.

Table 8. Factors affecting household food expenditure.

Parameter	Coefficient	R ²	F	P
		0.5959	5.20	0
		Std. Error	t	P> t
UA participation [-]	-0.04*	6.33	-1.2	0.08
Residential status [+]	-6.76	6.27	-1.08	0.28
Educational level [+]	4.04	1.99	2.03	0.44
Employment status [+]	0.51	2.84	0.18	0.86
Household size [+]	5.62***	2.03	2.77	0.01
HH age [+]	0.31	0.27	1.14	0.26
Rural home ownership [-]	-0.65	6.25	-0.1	0.92
Income [+]	4.52**	2.14	2.12	0.04
HH sex [+]	-9.94*	5.96	-1.67	0.09
Informal activity [+]	5.67	8.28	0.68	0.49
Maize meal price [+]	1.99***	0.68	2.95	0.01
Constant	43.43	22.50	1.93	0.06

***, ** and * indicate statistical significance at the 1, 5 and 10% levels respectively, [] indicate *a priori* expectations.

mainly because UA-practicing households purchase less grain, maize meal and vegetables, resulting in low food basket costs.

The mean non-food expenditures for UA-participating household are significantly greater than those of the non-UA-participating households. UA-practicing households purchased more non-food items as compared to non-UA practicing households; mainly because money saved from not purchasing grain and maize meal was spent on non-foodstuffs.

Factors affecting household food expenditure

Household food expenditure is affected by both social and economic factors. UA participation, household size,

total household income, household head sex and maize meal price are shown to significantly affect household food expenditure (Table 8). The R² value shows that 60% of the variation in household food expenditure is explained by the model.

UA participation is significant at the 1% level, and an increase in UA participation lowers food expenditure. UA produce-mainly maize grain-results in reduced maize meal purchase and inevitably household food expenditure.

Male-headed households are likely to be food-secure than their female counterparts. This is because female-headed households are normally unemployed, and as such they are deprived of the much-needed finances to purchase adequate food as compared to male-headed households.

Table 9. Household own food security assessment.

Food status	UA-practising households (%)	Non-UA-practising Households (%)	Critical value	Chi-value
Food insecure	2	7		
Sometimes food insecure	44	54	5.99	7.017
Food secure	54	39		

Source: Survey data.

As the household size increases, the household food requirement also increases, as well as household food expenditure. Smaller households have less food expenditure than large households.

Household educational status increases employment opportunities as well as the adoption of new technologies, which includes consumption of new foodstuffs and as such changes in preferences. Usually these new foodstuffs cost more, and as such this increases the food expenditure of the household.

Income increase by the household will also result in increased food expenditure. As income increases, household food expenditure also increases. This stems from the fact that maize meal is one of the major components of the food basket, and, with an increment in its price, the household food expenditure will increase.

Caloric and energy requirement

Before calculating the caloric food intake, households were asked to judge their own food security status. This assessment reviews what households egoistically¹ felt their food security status to be. At the time of the survey, 56.7% of the households felt that they were food-secure, whilst 40% and 3.3% felt that they were sometimes food insecure and food insecure, respectively.

Participation in UA gives sovereignty to households, hence the likelihood of been food security increases with participating in UA activities (Table 9).

The foods consumed by the households were converted into calories using the UNHCR 1996 caloric requirements per day to obtain the monthly household energy requirements. UA participating households consumed more energy than non-UA participating households. The caloric and energy requirements showed that 47% of the households were food-secure whilst 53% of the households were food-insecure, with 52.9% of the UA-participating households being food-secure, compared to 47% from the non-UA-participating households. This is consistent with earlier assertions about household own assessment. Household food

security was enhanced by UA participation.

Factors affecting urban household food security

To determine the factors that affect household food security, a regression model of caloric index² was run. The R² value was 0.6019, whilst the P value shows that the equation is significant at the 1% level (Table 10). The estimated model shows that, household head sex and age, UA participation, household size, and informal activity significantly affected urban household food security.

There is a positive relationship between UA participation and food security, significant at 5%. This is expected as UA produce fosters food base resulting in increased availability of grain to the household and as such improves the food security of the households. UA produce also lowers food costs. By not purchasing maize meal, money can be channeled to other foodstuffs, improving the food base and food security status of the household.

Household head sex is significant at 5% and is positively related to the food security. Male headed households during the heist of food shortages fared better as they could use their muscular power in queues to get foodstuffs.

Household size is significant at 1%, and is negatively related to the food security. Higher household size results in reduction in per-capita food consumption increased household food dependency greatly compromising food consumption. This is as expected, since the larger the household the more vulnerable it is to food insecurity.

Household head age is positively related to the food security status of the households, and is significant at the 10% level, consistent with the life cycle hypothesis. The life cycle hypothesis assumes that assets are accrued as one advances in age, and that these assets can be liquidated during times of income constraint. During the time of the survey, the country was experiencing hyperinflationary conditions, and, as such, the workers' income was greatly eroded and households failed to

¹Ego of the respondent, which can be ego positive or ego negative. Ego positive respondents tend to overestimate their food security status, whilst ego negative respondents would underestimate their food security status.

² The caloric index was calculated by the calories consumed divided by the calories required and this was converted into a percentage

Table 10. Factors affecting household food security.

Variable	R ²	F	P	P> t
	0.6019	3.7071	0.0005	
	Coefficient	Std. error	t	
Rural homestead ownership [+]	0.14	10.84	0.01	0.99
HH sex [+] (0 female, 1 male)	0.18**	9.71	1.8	0.08
HH education[+]	1.62	3.53	0.46	0.65
Income range	1.12	3.40	0.33	0.74
UA [+]	0.30**	0.14	2.13	0.04
Household size [-]	-1.24***	3.58	-3.47	0.00
HH age [+]	1.10*	0.56	1.95	0.06
Informal activity [+]	0.32**	3.21	-0.99	0.33
Maize meal price [-]	2.06	0.70	2.95	0.01
HH employment[+]	-0.52	4.20	-0.12	0.90
Residential status [±]	11.16	10.91	1.02	0.3
Constant	6.69	39.59	-0.21	0.83

***, ** and * indicate statistical significance at the 1, 5 and 10% levels respectively; [], *a priori* expectations. Source: Survey Data.

secure adequate food. Households endowed with assets could liquidate these so as to purchase or even import foodstuffs.

There is a positive relationship between food security and informal activity participation. This is consistent with expectations as participation of informal activities increases income, which can be used to purchase foodstuffs. During hyperinflation, foodstuffs were very expensive, and, by participating in many informal activities.

Conclusions

Household size as well as household head sex, age, and employment status were found to affect household participation in (UA) in Gweru city, Zimbabwe. UA participation is dominated by bigger families, male-headed, formally employed and relatively young-headed households. The risk of food insecurity drove people into UA activities, as shown by pull factors into UA participation, such as meeting household food consumption, food shortage, income enhancement, hobby and supplementary employment. Major UA products were predominantly food crops, showing the importance of UA in food provision. Household size, UA participation, income, household head sex, and maize meal price affected household food expenditure. Households participating in UA were found to have lower food costs whilst the non food costs were higher. Household food security was affected by household head sex and age, UA participation, and informal activities carried out by the household members. UA has a positive impact on urban household food security as it provides

food as well as income through money saved from buying food, hence raising the standard of living.

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