



Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries

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ABSTRACT

Urban agriculture may have a role to play in addressing urban food insecurity problems, which are bound to become increasingly important with the secular trend towards the urbanization of poverty and of population in developing regions. Our understanding of the importance, nature and food security implications of urban agriculture is however plagued by a lack of good quality, reliable data. While studies based on survey data do exist for several major cities, much of the evidence is still qualitative if not anecdotal. Using a recently created dataset bringing together comparable, nationally representative household survey data for 15 developing or transition countries, this paper analyzes in a comparative international perspective the importance of urban agriculture for the urban poor and food insecure. Some clear hints do come from our analysis. On the one hand, the potential for urban agriculture to play a substantial role in urban poverty and food insecurity reduction should not be overemphasised, as its share in income and overall agricultural production is often quite limited. On the other hand, though, its role should also not be too easily dismissed, particularly in much of Africa and in all those countries in which agriculture provides a substantial share of income for the urban poor, and for those groups of households to which it constitutes an important source of livelihoods. We also find fairly consistent evidence of a positive statistical association between engagement in urban agriculture and dietary adequacy indicators.

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Introduction

Urban agriculture (UA) is defined as the production of crop and livestock goods within cities and towns. According to some accounts, 200 million people are employed in urban farming and related enterprises, contributing to the food supply of 800 million urban dwellers (UNDP, 1996). In African countries 40% of urban dwellers are said to be engaged in some sort of agricultural activity and this percentage rises to 50% in Latin American countries (see studies quoted in Ruel et al. (1998)).

If these numbers are accurate (and they may well *not* be, as we discuss in this paper), urban agriculture may have a role to play in addressing urban food insecurity problems, which are bound to become increasingly important with the secular trend towards the urbanization of poverty and of the overall population in developing regions. Ravallion et al. (2007) estimate that about one-quarter of the developing world's poor live in urban areas, but also that poverty is becoming more urban and the poor are urbanizing faster than the population as a whole.

The recent world food price crisis has rendered the importance of understanding and confronting the causes of food insecurity of the urban poor even more apparent. Poor urban dwellers, being largely net food buyers and depending mostly on markets for their food supplies, are particularly vulnerable to adverse food price shocks, and are consistently the group in society that suffers most from higher food prices (Zeza et al., 2008; Dessus et al., 2008). Analyzing the extent to which urban agriculture might help shield the urban poor from some of these shocks becomes therefore a topical policy question.

Our understanding of the importance, nature and food security implications of urban agriculture is however hindered by a lack of good quality, reliable data. While studies based on survey data do exist for several major cities, much of the evidence is still qualitative if not anecdotal. This paper attempts to fill some of the key research gaps in this area, using a recently created dataset bringing together comparable, nationally representative household survey data for 15 developing or transition countries. Exploiting the wealth of data made available by the dataset, the paper analyzes, in a comparative international perspective, the importance of urban agriculture for the urban poor and food insecure.

The paper sets out to address two basic research questions: (i) which is the magnitude of urban agriculture, both in terms of

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households engaged in agricultural activities and in terms of income deriving from it, and (ii) is there evidence of any significant relationship between urban agriculture on household food security, dietary diversity and calories intake.

After a brief review of the literature (Section “The importance and role of urban agriculture: facts and artefacts. A brief review of the literature”), and a discussion of data and definitions, the paper sets out to quantify (Section “Opening the urban agriculture black box: what the data say”) the importance of urban agriculture in terms of urban households’ participation in agricultural activities; the share of income rural households generate from farming (in particular with reference to the poor); and the relative importance of crop versus livestock production. In Section “Urban agriculture and food security”, both descriptive statistics and multivariate analysis are used to gauge how participation in urban agriculture impacts dietary diversity and calorie intake. The key findings and policy conclusions of the paper are briefly outlined in the final Section.

The importance and role of urban agriculture: facts and artefacts. A brief review of the literature

Characterising urban agriculture

In this paper urban agriculture is defined as the production of agricultural goods by urban residents, according to the official definition of the urban space utilised by the surveys we work with. Our definition is eminently driven by the definition of rurality adopted by national governments and reflected in our dataset, and we do not deal with the conceptual definitional issues discussed for instance by Maxwell (2003), FAO (1996) and Ellis and Sumberg (1998).

The two main problems with our dataset (further described in the next section) are (a) the comparability of the definition of urban and rural across countries, and (b) that we have information on where the household resides, not necessarily on where their agricultural production is located. In that sense we should be strictly speaking of ‘agriculture practiced by urban households’. But having made those caveats, we will for simplicity stick to the standard expression ‘urban agriculture’.¹

One of the objectives of this paper is to attempt a rigorous quantification of the magnitude of urban agriculture in a reasonably large cross-section of countries, responding to the need for more efforts in this direction expressed by several of the authors who have contributed to this literature (Nugent, 2001; Egal et al., 2001; Ellis and Sumberg, 1998). Possibly the most widely cited claim concerning urban agriculture is that “the United Nations Development Programme estimates that 800 million people are engaged in urban agriculture world-wide” (Mougeot (2000); but see also Armar-Klemesu (2001) and Nelson (1996)). Tracing this source backward in time we arrived at UNDP (1996). Their Table 2.1 reports the following estimates: 800 million people actively engaged in urban agriculture, of which 200 million produce goods for market sale, with a full-time job equivalent estimate in production and processing of 150 million jobs. The source of the table is however “estimates by the Urban Agriculture Network based on the authors’ experiences and observations and extrapolation from data”. The authors also caution that their intent is simply to “present a thumbnail sketch” and that a more systematic estimation would be needed. Unfortunately many of their readers and citers have overlooked this caveat and the figures are frequently quoted as hard evidence. This may be partly due to the fact that one substantial strand of the literature on urban agriculture is driven by an advocacy objective,

more than by analytical rigour (Ellis and Sumberg, 1998). A very different figure is quoted by FAO (1996), which states (ironically quoting again a UNDP publication) that 100 million people are estimated to earn some income directly from urban farming (one eighth of the 800 million urban agriculture producers and one half of the 200 million commercial urban farmers recalled above).

Rigorous quantifications are in fact available, but mostly for case studies. Reviews of these case studies can be found in Egziaber et al. (1994), FAO (1996), Ellis and Sumberg (1998) and van Veenhuizen (2006). An annotated bibliography of 170 pages compiled by Sida and ETC (2003) also provides an interesting overview of the available figures as well as of the magnitude and directions in which the urban agriculture literature has expanded. Figures vary widely between and within countries and regions, and differences in definitions and methodologies compound the uncertainty.

Urban agriculture and food security

One major theme of the literature on urban agriculture is the discussion of how it can contribute to the food security and nutrition of cities as a whole, and of the households that are engaged in farming within urban boundaries.

One distinction that is often made in the literature refers to the extent to which urban households that engage in agriculture have some degree of market orientation or are purely producing agricultural goods for own-consumption. There seems to be a consensus, based on case study reviews, that the direct food security purpose prevails, but that a substantial number of urban farmers also sell their produce on the market, and more so in Latin America than in Africa (Maxwell, 2003; Ellis and Sumberg, 1998).

There are a number of ways through which urban agriculture can, in principle, have an impact on urban food security. At the household level, urban agriculture can be a source of income, can provide direct access to a larger number of nutritionally rich foods (vegetables, fruit, meat) and a more varied diet, can increase the stability of household food consumption against seasonality or other temporary shortages, and can increase the time mothers spend caring for their children, as opposed to non-agricultural activities that are more likely to be located further away from home (Maxwell, 2003; Maxwell et al., 1998; Armar-Klemesu, 2001; Egal et al., 2001). There is also some evidence, again based on case studies, that it is the poor households that are mostly engaged in UA, although not necessarily the poorest, which may lack access to land (Ruel et al., 1998).

Moving beyond the household to a more aggregate level, urban agriculture can account for an important share of the production of some foods, particularly the more perishable ones such as vegetables and milk, and there is evidence that this is indeed the case in several of the case studies mentioned above.²

Despite the relatively large number of studies that have looked at the link between UA and food security, the amount of quantitative work that has been published is surprisingly limited. We could only identify one paper (Maxwell et al., 1998) that explored this link using a multivariate framework. Their findings, based on data from Kampala, indicate that there is indeed an impact of UA on child nutritional status, an outcome indicator of food and nutrition security.

Data and definitions

As previously mentioned, this study is fundamentally different from any other study on urban agriculture we are aware of in as much as it uses (a) nationally representative data; (b) a compara-

¹ We also cannot make any distinction between urban and peri-urban areas.

² Nugent (2001) reports on the importance of urban agriculture for some of these foods in a number of cities worldwide.

ble definition of agricultural activities; and (c) a comparative international perspective.

The data in this study does not allow dealing with another dimension of comparability, which is the definition of what constitutes an urban area. Countries have their own unique mechanisms of defining what constitutes urban or rural, and these mechanisms determine the definition of urban and rural in the dataset used. On the other hand, it may make sense to use government definitions since presumably these reflect local information about what constitutes rural and is the definition used to administer government programs.

One additional important caveat is that with the information available we identify an agricultural activity to be urban via the domicile of the household, not the location of the activity. It is probable that a number of what we identify as urban agriculture activities in this study are in fact taking place in nearby rural areas. In that sense the study/discussion focuses on urban households' involvement in agriculture, rather than strictly *urban* agricultural activities, and for that reason our results may not be fully comparable with other studies on urban agriculture which only include crop and livestock activities taking place within the city boundaries.

A narrow definition of agriculture is used, whereby agricultural income accounts for the sale of crops and livestock, crop and livestock by-products, sharecropping earnings, the consumption of home-grown crops and livestock products, net of all expenditures related to these activities, such as seed and fertilizer purchases and the hire of farm labour. Participation in agriculture is defined as the production of any crop or livestock product, whether for sale or for own-consumption. Activities related to the marketing and processing of agricultural goods are therefore not included in our definition of urban agriculture.

Our analysis is based on the Rural Income Generating Activities (RIGA) database, which is constructed from a pool of several Living Standards Measurement Study (LSMS) and other multi-purpose household surveys made available by the World Bank and other national and international institutions. The choice of countries to be included in the dataset was guided by the desire to ensure geographic coverage across the four principal development regions – Asia, Africa, Eastern Europe and Latin America, as well as adequate quality and sufficient comparability in codification and nomenclatures. Furthermore, an effort was made to include a number of IDA (International Development Association) countries as these represent developing countries with higher levels of poverty and are therefore of particular interest to the development and poverty reduction debate.

Using these criteria, survey data from the following countries were utilized (corresponding survey years in parentheses): Ghana (1998), Madagascar (2001), Malawi (2004), Nigeria (2004); Bangladesh (2000), Indonesia (2000), Nepal (2003), Pakistan (2001), Vietnam (1998); Albania (2005), Bulgaria (2001); Ecuador (1995), Guatemala (2000), Nicaragua (2001), Panama (2003). While clearly not representative of all developing countries, the list does represent a significant range of countries and regions and has proved useful in providing insights into the fundamental aspects of livelihood strategies of households in the developing world (Davis et al., 2010; Winters et al., 2009; Valdés et al., 2009).

The RIGA database consists of income and household characteristic variables that were constructed by using uniform definitions and data handling protocols, drawing on data that are collected using broadly similar survey instruments. Clearly some differences in questionnaire design across countries remain, but the degree of comparability in the RIGA data is very high.³ While most of these

data are fairly recent (collected within the last decade), three of them were collected in the 1990s. In the presence of rapid urban transformation, the picture we paint for a few of the countries covered by our data may therefore have become out of date.⁴

Opening the urban agriculture black box: what the data say

The first research question of the paper, i.e. the quantification of the magnitude of the UA phenomenon in a cross-section of countries is addressed in this section. To quantify the magnitude of UA in the countries at hand we first look at the rates of participation in, and the shares of income from, urban agriculture.⁵ The nature of our data also allows us to separate agriculture into crop and livestock activities. The picture that emerges from these data is one of an extreme variation (Table 1). The shares of urban households that earn income from agriculture vary from 11% in Indonesia to almost 70% in Vietnam and Nicaragua. In 11 of the 15 countries in our dataset, the share of households participating is over 30%. In general livestock activities are less common than cropping activities, but there are cases (Bangladesh, Nepal, Ecuador and Nicaragua) in which livestock is reared by about one in three urban households.

The income shares coming from urban agriculture are, as expected, smaller than the participation rates (Table 2). They range from 1% to 27%, but they are higher than 10% in just five cases (Ghana, Madagascar, Malawi, Nepal and Nigeria).

Looking at regional patterns, no clear regularity can be found in terms of participation rates, while it is interesting to note that it is the four African countries in the sample that display the four largest income shares. Should this result be representative of Africa at large, one may indeed be inclined to conclude that urban agriculture is a significant source of livelihoods for urban households in that continent. Outside of Africa, the highest share of income in our dataset are in Nepal at 11% and Vietnam at 9%, with most other countries displaying shares of 5% or less, and in several cases much lower.

It needs to be emphasised however that these averages across the urban population may mask the fact that there are particular groups in urban areas for which agriculture makes up a sizeable share of their livelihoods. When only households engaged in urban agriculture are taken into consideration, average shares of income from primary activities are in fact much more substantial. The African countries still top the table, but three of the five Asian countries also have shares around 20% or greater and another three countries have shares over 10% (see third column in Table 2).

For between 18% and 24% of all urban households in the African countries in the sample agriculture constitutes 30% of total income or more. The same is true for 13% of urban households in Nepal, and for 7–10% of households in Guatemala, Nicaragua and Vietnam (fourth column in Table 2).

These results show how urban agriculture – while by no means negligible – does not appear to be the major urban economic activity that some of its most enthusiastic advocates sometimes claim it to be. On the other hand, the data do confirm that in a number of countries there is a significant share of the urban population that relies on the production of crop and livestock products for their livelihoods.

By decomposing participation rates and income shares by quintile of expenditure levels (our preferred welfare measure) we find

³ Details of the construction of the income aggregates can be found in Carletto et al. (2007). The RIGA data and their full documentation can be obtained at <http://www.fao.org/es/ESA/riga/>.

⁴ For a couple of countries (Nepal, Madagascar) we have analyzed survey data from earlier years. From the comparison we gained further confidence that while the specific country situations may certainly be changing over-time, the results of the overall cross-country analysis that is the focus of this paper would not be significantly affected if we were to substitute our older datasets with more recent ones.

⁵ In this paper the definition of income includes also income in kind as well the production of goods for own-consumption by the household.

Table 1
Participation in urban agriculture.

Country and year	Total % participation in crop activities (urban sample)	Total % participation in livestock activities (urban sample)	Total % participation in agricultural activities (urban sample)	Total % participation in agricultural activities (rural sample)
<i>Africa</i>				
Ghana 1998	38	14	41	89
Madagascar 2001	30	13	33	85
Malawi 2004	45	14	46	97
Nigeria 2004	29	12	32	90
<i>Asia</i>				
Bangladesh 2000	26	14	30	90
Indonesia 2000	10	3	11	64
Nepal 2003	52	36	57	98
Pakistan 2001	4	13	14	74
Vietnam 1998	65	35	69	99
<i>Eastern Europe</i>				
Albania 2005	18	10	19	95
Bulgaria 2001	23	13	27	78
<i>Latin America</i>				
Ecuador 1995	17	28	35	93
Guatemala 2000	35	21	42	93
Nicaragua 2001	65	29	68	95
Panama 2003	31	12	34	87
<i>Mean</i>	33	18	37	88
<i>Max</i>	65	36	69	99
<i>Min</i>	4	3	11	64

Table 2
Share of total income from agriculture.

Country and year	Share of total income from agriculture (urban sample)	Share of total income from agriculture (urban sample and hhs participating in urban agriculture)	% of hhs with income coming from urban ag. equal or higher than 30% (50%) (urban sample)	Share of total income from agriculture (rural sample)
<i>Africa</i>				
Ghana 1998	18	44	23 (20)	61
Madagascar 2001	21	63	21 (18)	68
Malawi 2004	12	26	18 (12)	77
Nigeria 2004	27	71	24 (23)	80
<i>Asia</i>				
Bangladesh 2000	3	9	3 (2)	37
Indonesia 2000	3	27	5 (3)	35
Nepal 2003	11	19	13 (8)	51
Pakistan 2001	3	22	5 (4)	41
Vietnam 1998	9	13	10 (7)	62
<i>Eastern Europe</i>				
Albania 2005	3	14	3 (1)	43
Bulgaria 2001	2	8	5 (4)	20
<i>Latin America</i>				
Ecuador 1995	2	4	3 (2)	23
Guatemala 2000	5	11	9 (5)	50
Nicaragua 2001	5	8	7 (4)	57
Panama 2003	1	3	1 (0.5)	35

confirmation that urban agriculture is eminently an activity practiced by the poor. With very few exceptions, a clear negative correlation between participation in agricultural activities and level of welfare is noted. Participation rates for the poorest quintile are extremely high, over 50% in 8 out of 15 countries, proving how urban agriculture plays an important role for a non-negligible number of poor households in the developing world (Fig. 1).

The importance of the role played by urban agriculture activities can be best perceived by looking at the shares of income derived from agricultural activities in urban areas across quintiles of the consumption expenditure distribution (Fig. 2). The picture that emerges, points to a stark contrast between the African countries in our dataset and other regions. Ghana, Madagascar and Nigeria stand out with over 30% of the income of the poorest quin-

tile originating in agriculture, but rates higher than 20% are also found in the poorer strata of the Malawi sample as well. Outside of Africa, only a handful of the Guatemala, Nepal and Vietnam quintiles display shares surpassing 10%, with all the others well below that mark. Again, should this picture be confirmed by a larger cross-section of countries, it is hard to see UA playing a substantial role in poverty alleviation outside of Africa.⁶ Also, no clear pattern seem to emerge from these data in terms of how participation and income shares may evolve with the level of development (e.g. a

⁶ One caveat is that our data being nationally representative, we cannot rule out that agriculture may be playing a more substantial role in some specific urban settings within a country.

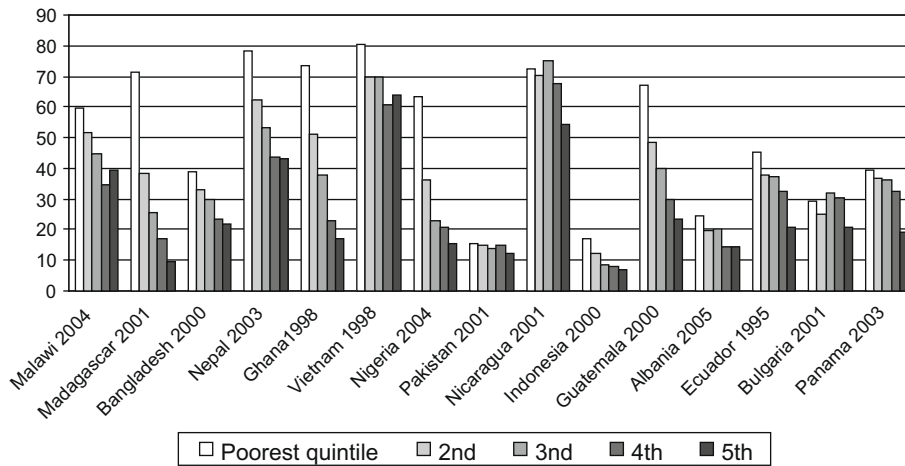


Fig. 1. Percentage of households participating in urban farming, by expenditure Quintile. *Note:* The bars correspond to expenditure quintiles, from the poorest ('Poorest quintile', on the left) to the richest ('5th', on the right). Countries are ordered by level of Purchasing Power Parity GDP per capita.

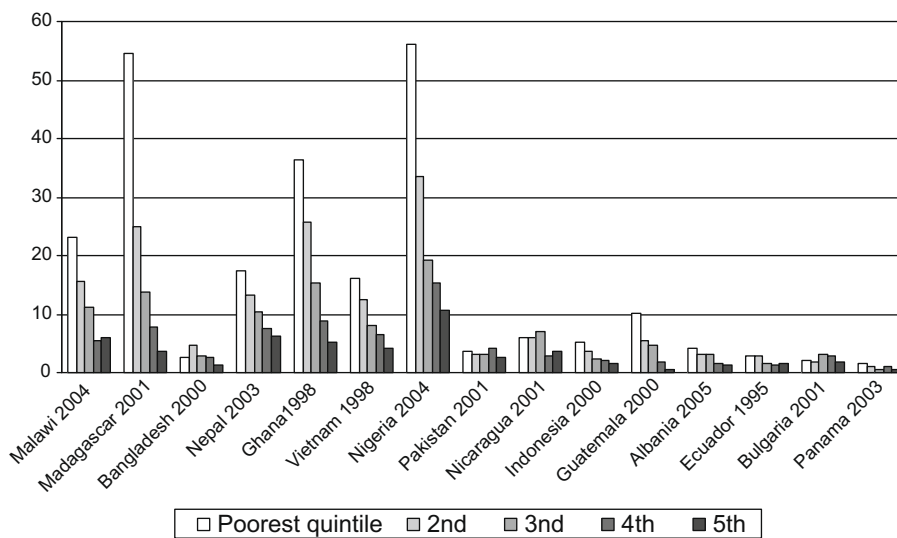


Fig. 2. Share of income from urban agriculture, by expenditure quintile. *Note:* The bars correspond to expenditure quintiles, from the poorest ('Poorest quintile', on the left) to the richest ('5th', on the right). Countries are ordered by level of Purchasing Power Parity GDP per capita.

possible decline in participation and income share as GDP levels increase), but this may also be due to the small sample size.

A final point concerns the quantification of the role of urban agriculture as a proportion of total agricultural production and its degree of market orientation (Table 3). According to the data in the surveys we use, in most countries urban agriculture accounts for 5–15% of total agricultural production with peaks above 20% in Madagascar and Nicaragua and a low of 3% in Malawi.⁷ A common feature of urban agriculture in most countries appears to be that it is largely geared towards own-consumption. In only four of the countries in our sample (Madagascar, Bangladesh, Nepal and Nicaragua) is more than a third of agricultural production marketed. In another seven countries sales account for between 15% and 26% of the total volume of agricultural production. In the remaining two countries for which this could be computed as

much as 92% to 93% of the production is consumed within the household.

Urban agriculture and food security

Urban agriculture, as explained in Section “The importance and role of urban agriculture: facts and artefacts. A brief review of the literature”, can have a positive impact on household food security as it generates direct income for the household concerned as well as providing direct access to the food produced. Households that engage in farming may have access to comparatively cheaper food and to a wider variety of particularly nutritious foods, such as vegetables and products of animal origin (milk, eggs, meat). The latter mechanism may be particularly relevant should urban food markets, particularly in the poorer neighbourhoods, be inefficient. Under such conditions direct access to food may allow households to consume greater amounts of food and a more diversified diet, richer in valuable micronutrients.

In this section we analyse whether this is the case, by looking at the correlation between participation in agricultural activities

⁷ It should be noted that large commercial farms tend not to be sampled in LSMS-type surveys. To the extent that these farms are concentrated in rural areas, this may induce an upward bias in our estimates of the share of urban agricultural production. The bias will be greater the larger the commercial farm sector in each country.

Table 3
Urban agriculture: share in total production and percentage marketed.

	Urban production/total ag. production (%)	Urban ag. production sold (%)
<i>Africa</i>		
Ghana 1998	15	26
Madagascar 2001	27	39
Malawi 2004	3	15
Nigeria 2004	5	17
<i>Asia</i>		
Bangladesh 2000	7	35
Indonesia 2000	15	n/a
Nepal 2003	13	34
Pakistan 2001	n/a	n/a
Vietnam 1998	8	26
<i>Eastern Europe</i>		
Albania 2005	7	24
Bulgaria 2001	13	7
<i>Latin America</i>		
Ecuador 1995	8	17
Guatemala 2000	15	15
Nicaragua 2001	22	45
Panama 2003	12	8

within urban areas and a series of indicators of dietary adequacy. We will first look at two dietary diversity indicators for which we have data for the full set of countries. Dietary diversity is often used as a food security proxy in nutrition surveys, and has been generally found to be closely correlated to both caloric adequacy (the amount of kilocalories consumed) and anthropometric outcomes (for a review see Ruel (2006)). We use two measures of dietary diversity. One is based on 13 food groups, including a food group to account for prepared foods that could not be otherwise classified, which are listed in Appendix Table 1. We will refer to this as model 1 in what follows. The second is a simple count of the different food items household report having consumed during the survey reference period. This is our model 2. Appendix Table 2 reports key summary statistics for the dietary diversity variables as well as synthetic information on the questionnaire design (number of items listed, recall period, type of survey instrument used).

We then perform a somewhat more detailed analysis of a subset of four countries (Malawi, Bangladesh, Guatemala and Nicaragua) for which data on kilocalorie consumption were available. For these four countries we also investigate whether any association can be detected between engagement in urban agriculture and (a) the total amount of kilocalories per capita consumed (model 3) and (b) changes in the composition of the diets as measured by share of calories from different major food groups (model 4).

As previously mentioned we could only find one study (Maxwell et al., 1998) that investigates the link between UA and food security in a multivariate framework, using child nutritional status as the dependent variable. Our dependent variables are however different, and they allow us to look at only part (albeit a large part) of the food security picture. In fact dietary diversity and kilocalorie consumption are the product of the food access, availability, and stability dimensions of food security, but do not reflect the dimension concerning the utilization of food, its preparation, and care and sanitation practices that are instead subsumed in anthropometric indicators.

The analytical model used is very simple, and builds on the conceptual links between household food security and participation in urban agriculture previously outlined. Models 1–3 are thus specified as follows:

$$Outcome = \alpha_0 + \alpha_1 p_onfarm + \alpha_2 X + \varepsilon \quad (1)$$

where *Outcome* is our dietary diversity measure (simple count of food or food groups for models 1 and 2 respectively), or total calorie consumption (model 3), *p_onfarm* is the dummy variable indicating whether the household participates in agriculture, and *X* is a vector of household demographic and socio-economic control variables including per capita consumption expenditure, land ownership in hectares, household size, education and age of the household head, the female share of the working age adults and the number of children aged between 0 and 5. The regressions also include a set of geographic dummy variables, and square terms for the age and education variables and ε , an independently, identically distributed error term. Households' identifiers are omitted from the notation for simplicity.

Model 4 is different in that it consists of a system of simultaneous equations, specified as follows:

$$Kilocalories_f = \alpha_{0f} + \alpha_{1f} p_onfarm + \alpha_{2f} X + \varepsilon_f \quad (2)$$

subject to the constraint that

$$\sum_{f=1}^{10} \alpha_{1f} p_onfarm = 0$$

where *Kilocalories_f* are the amount of kilocalories consumed for each of 10 food groups, *f*. The constraint allows quantifying how the composition of food consumption changes with participation in agriculture keeping the total amount of kilocalories constant. The other variables are defined as in Eq. (1) above.

The models are run separately for the full urban sample for each country, so that we have 15 regressions in total for each of models 1 and 2, and four regressions each for models 3 and 4. As it would be cumbersome to report the complete results for all the regressions, we summarise in Table 4 the results related to the main explanatory variable of interest, participation in urban agriculture.⁸

After introducing the set of controls specified above, we do find evidence that engagement in farming in urban areas is positively associated with greater dietary diversity in 10 out of 15 countries when it is measured using the dietary diversity score, and in 11 out of 15 when it is measured with the simple food count. Positive and significant coefficients are found in at least one model specification in the four Latin American countries, the five Asian ones, Nigeria and Ghana in Africa, and in Albania and Bulgaria.⁹

These results provide a fairly robust confirmation of earlier suggestions of city case studies, nutritional surveys, and qualitative and anecdotal observations, that engagement in farming by urban households can allow them consuming better, more nutritious diets. The magnitude of the coefficients varies quite extensively suggesting that engagement in urban agriculture may be associated with increases in the average number of food consumed in the order of 34% in Albania, 11% in Panama, 9% in Nicaragua, and 6–7% in Bangladesh, Nepal, Vietnam, Guatemala and Ecuador. The associated increase in the number of food groups consumed is obviously smaller, in the range of 1–5%. This is not surprising however, given that the variability in the dietary diversity variable is not all that large either, as in this surveys the recall period for food consumption is quite long, usually between 2 weeks to 1 month.

When looking at calorie consumption the results go in a similar direction (Table 5). In two of the four countries (Bangladesh and Guatemala) for which data on calorie consumption were obtain-

⁸ The full regression results are available from the authors.

⁹ In Madagascar, Malawi and Nigeria we find negative and significant coefficients in one or both regressions.

Table 4
Regression results for models 1 and 2 – coefficients on the urban agriculture participation dummy.

Dependent variable	Africa			Asia			Eastern Europe			Latin America					
	Ghana 1998	Madagascar 2001	Malawi 2004	Nigeria 2004	Bangladesh 2000	Indonesia 2000	Nepal 2003	Pakistan 2001	Vietnam 1998	Albania 2001	Bulgaria 2001	Ecuador 1995	Guatemala 2000	Nicaragua 2000	Panama 2003
<i>Dietary diversity</i>															
Coefficient	0.25***	-0.97***	-0.19*	0.33***	0.52***	0.22	0.19***	0.09	0.03	-0.01	0.26***	0.36***	0.17***	0.22***	0.56***
Standard error	0.08	0.08	0.08	0.07	0.07	0.11	0.07	0.04	0.05	0.07	0.06	0.08	0.06	0.06	0.09
R-squared	0.20	0.44	0.44	0.22	0.33	0.25	0.04	0.19	0.18	0.15	0.24	0.18	0.12	0.17	0.15
Number of obs.	2154	3085	1421	3759	2396	4913	1154	5852	1722	1996	1690	3225	3418	2327	3417
<i>Food count</i>															
Coefficient	0.16	-2.60***	0.18	-2.13***	1.63***	0.60**	1.35***	0.42*	0.75***	3.80***	0.73**	2.72***	3.27***	2.06***	5.37***
Standard error	0.39	0.32	0.33	0.29	0.38	0.26	0.27	0.24	0.12	0.74	0.36	0.51	0.52	0.32	0.50
R-squared	0.32	0.47	0.55	0.27	0.36	0.26	0.28	0.41	0.28	0.24	0.46	0.26	0.32	0.42	0.23
Number of obs.	2154	3085	1421	3759	2396	4913	1154	5852	1722	1219	1690	3225	3418	2327	3417

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

able a positive and statistically significant association between calorie availability and engagement in urban agriculture was noted. That is related to higher consumption of calories from meat and fruits and vegetables (both countries), and dairy and staple products (Guatemala). In Malawi no statistically significant difference in calorie consumption can be detected, but involvement in agriculture is nevertheless associated with higher consumption of calories from fruits and vegetables and staples, partly offset by lower amounts of calories from meat. In Bangladesh the diet of urban households engaged in agriculture appears to have a smaller staple component.¹⁰

Taken together these results confirm the existence of an association between urban agriculture and indicators of dietary adequacy and diversity in a majority of the countries for which we have data. We find that controlling for other factors, households engaged in urban agriculture are more likely, in several but not all countries, to enjoy a more diverse diet, to consume more calories and to have access to a greater number of calories from both basic staples and fruit and vegetable products. It is worth recalling that an increase in calorie consumption is not necessarily a positive development if it is concentrated in households that already consume an adequate amount of calories. Obesity is a problem even in low income countries such as Guatemala (Marini and Gragnolati, 2003), and these results should therefore be interpreted with some care.

Concluding remarks

This paper set out to tackle two very specific research questions concerning (1) the importance and magnitude of agricultural activities for urban households and (2) the relationship between engagement in urban agriculture and household food security. Our findings indicate that agriculture is indeed a not negligible reality of the urban economy, involving anywhere between about 10–70% of urban households. In terms of income generation, though, its role appears to be much more limited, with the important exception of the African countries in our sample, and of the households in the poorer quintiles in Nepal and Vietnam. Our data confirm that urban agriculture is an activity in which the poor are disproportionately represented, and that this occurs in all regions.

This study also highlights that urban agriculture does appear to be associated with greater dietary diversity and calorie availability, both measures of an improved diet and hence closely related to food security. In two thirds of the countries analyzed results showed a correlation between an active participation of urban household in agricultural activities and greater dietary diversity, this after controlling for economic welfare and a set of household characteristics. Using a smaller set of countries some evidence is also found of a relationship with greater calorie consumption, with fruits and vegetables being the food group more consistently found to contribute to the increase in calorie consumption associated with the engagement in urban agriculture.

In the context of the recent trends in food markets and the overall economic crisis, and in light of the well known fact that the urban poor are the most vulnerable to an increase in food prices, these findings acquire particular policy relevance. A common household response to a real term increase in food prices (or a corresponding decrease in disposable income) is to adjust consumption towards cheaper sources of calories, which often means trading off a richer set of micronutrients in the diet to keep calorie consumption constant. This type of response can be detrimental for the nutrition of specific population subgroups such as women of

¹⁰ The regression results for Nicaragua buck these trends and show a negative association between participation in urban agriculture and most of the outcome variables.

Table 5
Regression results for models 3 and 4 – coefficients on the urban agriculture participation variable.

Dependent variable	Malawi 2004	Bangladesh 2000	Guatemala 2000	Nicaragua 2001
Kilocalories per capita	30.30 (101.07)	88.31*** (24.30)	213.21*** (65.84)	–106.58 (82.46)
<i>Calories from</i>				
Main staple	741.10*** (262.29)	–36.43*** (8.76)	128.87*** (21.82)	–9.9 (14.15)
Fruit and vegetables	122.20*** (34.58)	7.10*** (1.79)	18.68*** (3.24)	–12.28 (10.75)
Dairy and eggs	21.87 (32.50)	–0.03 (0.17)	25.89*** (5.46)	–25.67* (14.63)
Meat	–68.02** (33.50)	1.75** (0.91)	9.30*** (3.69)	–0.95 (1.04)
Number of obs.	1421	2392	3416	2313

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. Standard errors are reported in parentheses.

reproductive age and children, with the effects likely to persist over the longer term. Having direct access to a wider variety of foods (especially to more fruits and vegetables) via urban agriculture can therefore play a potentially important role in protecting the poorest urban dwellers as they cope with an economic crisis that hit on the heels of a food price crisis.¹¹

However it is important to reiterate that results traced on possible impacts were small, and that this should be taken into account when assessing the likely contribution of urban agriculture to address food insecurity problems in urban areas. More in-depth, country case studies are needed to better grasp the precise magnitude of these effects under different circumstances, and to fully explore the existence of causal links. Thus far such studies have been limited to large cities, and expanding these to nationally representative samples of the urban population should form part of the research agenda on this topic.

It is not for a paper of this kind to make specific recommendations about what urban planners should do about urban agriculture. We know very well from case study literature that cities are very different in the characteristics of their urban agriculture, and that even different neighbourhoods in the same city might require different approaches. The evidence presented seems however strong enough to urge urban planners and policymakers to think twice before taking drastic action against urban agriculture, as it has often been the case in the past. At a minimum, the poverty and food security implications this might have on the households that participate in urban agriculture should be properly assessed. If urban households are engaging in agriculture (and the data suggest that to be true for a fair number of households) this means that, under the circumstances, they are benefiting from their involvement in this activity. How large these benefits are, and to whom they accrue is difficult to quantify, but the message that comes from our analysis is that they are often (but by no means always) large enough to play a non-negligible part in the livelihood and food security strategies of several poor urban households.

We do not want to overemphasise the potential for urban agriculture to play a role in urban poverty and food insecurity reduction: the agricultural production of households participating in this activity is often minimal, as indicated by the income shares in Table 2 and Fig. 2. Our view is that a more balanced, evidence-based approach than what is found in some of the existing literature is needed. While some of the literature on urban agriculture is driven by advocacy purposes and is therefore some time guilty of ‘promoting’ the sector based on scant data, that argument should not be used to dismiss all arguments in favour of urban agriculture.

Whether urban agriculture makes economic sense is an empirical question,¹² and will depend on its profitability and on the extent to which it provides food for the food insecure at a lower opportunity

cost in the use of their resources than alternative means of procuring that food. Whether urban agriculture is worthy of direct public policy support is debatable and not a question this paper can address, as each case requires exploring specific alternative pathways out of poverty and possible alternative measures to increase household’s access to food, be it through the promotion or different income generating activities and employment opportunities, or by improving the efficiency of the urban food markets the poor rely on.

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Appendix A

Tables A1 and A2.

Table A1
List of food groups and content of each group.

Food group	Content of the group
Food group 1	Cereals and grain products
Food group 2	Starchy, roots, tubers and legumes
Food group 3	Nuts, seeds and legumes
Food group 4	Vegetables
Food group 5	Fruits
Food group 6	Sugar, syrup and sweets
Food group 7	Meat and poultry
Food group 8	Fish and shellfish
Food group 9	Milk and milk products
Food group 10	Oil and fats
Food group 11	Beverages
Food group 12	Eggs
Food group 13	Miscellaneous

Table A2
Average value for ‘food group index’ and average value for ‘food count’ (total number of food items included in questionnaire in parentheses).

Country and year	Food group index	Food count (max.)	Food consumption record technique	Recall period
<i>Africa</i>				
Ghana 1998	10.5	26 (79)	Questionnaire: six enumerator visits, 5 days apart	30 days
Madagascar 2001	10.9	23 (57)	Questionnaire: one visit	7 days
Malawi 2004	9.9	19 (53)	Questionnaire: one visit	7 days

¹¹ We thank an anonymous referee for noting this important point.

¹² The issue of environmental externality and competition over scarce natural resources (e.g. water) will likely form a substantial part of the response to this question, which this paper has not touched upon.

Table A2 (continued)

Country and year	Food group index	Food count (max.)	Food consumption record technique	Recall period
Nigeria 2004	8.9	21 (122)	Questionnaire: six enumerator visits, 5 days apart	30 days
<i>Asia</i>				
Bangladesh 2000	10.5	27 (63)	7 day diary compiled by the household	7 days
Indonesia 2000	9.9	17 (37)	Questionnaire: one visit	7 days
Nepal 2003	11.8	24 (35)	Questionnaire: one visit	31 days
Pakistan 2001	10.4	42 (83)	Questionnaire: one visit	14 days
Vietnam 1998	11.1	11 (20)	Questionnaire: one visit	365 days ^a
<i>Eastern Europe</i>				
Albania 2005	10.7	11 (74)	14 day diary compiled by the household	14 days
Bulgaria 2001	10	27 (56)	Questionnaire: one visit	31 days
<i>Latin America</i>				
Ecuador 1995	9.8	40 (80)	Questionnaire: one visit	14 days
Guatemala 2000	10.4	51 (88)	Questionnaire: one visit	15 days
Nicaragua 2001	9.4	24 (61)	Questionnaire: one visit	15 days
Panama 2003	10.8	47 (82)	Questionnaire: one visit	15 days

^a Fourteen days recall data are also collected in this survey.

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