

Applications Potential of Structural Path Analysis in Urban Agriculture: A Literature Review

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ABSTRACT Structural path analysis (SPA) is a specialized SAM technique in which transaction values and direction are loaded on to flow networks between market players in order to capture the size, direction and intensity of economic activities. This paper presents the SAM framework as a platform for understanding the possibilities of using SPA in investigating the role of urban agriculture. Based on a survey of contemporary literature, a critical review of sources is carried out in so far as they relate to coverage and application possibilities. The results indicate that urban agriculture does not yet attract scholarship where the SPA technique has been used. The reliance on macro-scale statistics means that smaller geographical areas may not possess applicable databases for SPA. A critical requirement for the use of SPA is that participating households and firms should have in place a developed system of record keeping to capture income and payments on a continuous basis. In the absence of this, only few participants in practice can be analysed using SPA. This is in spite of the use of field surveys and censuses to generate the requisite data for capturing urban agriculture.

INTRODUCTION

Structural path analysis (SPA) is a component of the social accounting matrix (SAM) framework, a technique for multiplier decomposition which is employed world-wide for measurement and analysis of the impact of exogenous shocks on the economy (Kucera et al. 2012; Civardi et al. 2010; Cardenete and Sancho 2012). The essence of SPA is the systematic tracing and or apportionment of income and expenditure in a national economy (Osorio et al. 2012). Through identifying role players, it is possible to trace the impact of income distribution over a wide range of destinations. In the process, SPA makes it possible to quantify the patterns of transactions between income sources and expenditure units. The common approach in the use of SPA as a component of SAM is to operate with aggregate statistics on production for

countries. The advantage of operating at this scale is that most countries tend to keep fairly up-to-date national trade and production statistics across all sectors in a time series version. A change in the scale of this approach should make it possible for SPA to be used at provincial, municipal and locality scales. The inherent dilemma arises with regard to the traditional area units into which primary data is recorded and organized. The purpose of this paper is to survey contemporary literature as a platform for understanding the applications potential of SPA specifically in urban agriculture. We justify this approach because the urban agriculture sub-sector remains poorly understood in terms of a quantification of its contribution and performance.

Today, urban agriculture is an area of research that has attracted a significant following (Lynch et al. 2013; Thornton et al. 2012; Taylor and Lovell 2012; Brinkley 2012; Egwu and Agbenin 2012). Since the 1980's, socio-economic approaches couched in the sustainable livelihoods model (SLM) (Donald et al. 2010; Clark et al. 2010; McClintock 2012) remain essentially a descriptive rendering of the characteristics of livelihoods (Idowu et al. 2012). The bulk of existing research work on urban agriculture presents it as a flexible development strategy with great potential in alleviating a number of urban problems

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(Schmidt 2012; Aubry et al. 2012; Li et al 2012). These include high unemployment and poverty, food insecurity (Thom and Conradie 2012), inadequate urban services, housing shortage, slum expansion and environmental degradation. More technical-biased work on urban agriculture is reported in McClintock (2012), Plant et al. (2012), Weindorf et al. (2012) and, Niang et al. (2012) on Senegal. The benefits of urban agriculture generated by contemporary researchers using qualitative based methodologies remain essentially descriptive, built around conceptual approaches but with limited capacity for quantifying actual production and impact on transaction flows in the household economy. This position is supported by research findings from the Eastern Cape, South Africa, which show great discrepancies between the claimed benefits of urban agriculture and the actual urban agriculture gains derived from the activity at local level (Webb 2000; Webb and Kasumba 2009).

A SAM based SPA is an empirical and quantitative-based methodology with widespread applications because of the inherent diversity of the individual analyses possible at different geographical scales. It is considered a practical approach that can be used to measure and analyse the role of urban agriculture at the local level. In particular, SPA can provide a reliable measurement and analysis of the impact of investment in urban agriculture on the wellbeing of the participants and the local economy. Lastly, common approaches currently used to assess the role of urban agriculture have inherent limitations in the context of tracing the value of pathways between households and the economy. The SAM based SPA is an empirical research methodology (Usami 2008:1) that could provide an alternative means of recording household transactions and their impact on the local market. Such an approach could then provide quantitative inputs into computing the role of urban agriculture in the household economy. On the basis of these qualities the SAM based SPA methodology is deemed to have great potential in providing a reliable mechanism for measurement and analysis of the role of urban agriculture in the developing countries. The purpose of this study is therefore to review contemporary literature on SAM and SPA and to test the applications potential for urban agriculture.

Objectives

The objectives of this paper are (i) to present an introduction to social accounting matrix (SAM) and structural path analysis (SPA) (ii) to highlight limitations of qualitative based research methodologies in urban agriculture, (iii) to describe the basic structure of the SAM framework, (iv) to present contemporary literature on SAM and SPA and critique these thereof, (v) to comment on the potential of using SPA in investigating the role of urban agriculture. The section on introduction has introduced SAM and SPA, highlighted limitations of qualitative approaches in urban agriculture, the research problem and the purpose of the study. The rest of this paper is made up of six methods of enquiry; the second presents the basic SAM framework while the third one centres on a literature review and corresponding critique. The fourth section presents results and discussion of the potential applications of SPA to urban agriculture. The fifth section covers a conclusion followed in the sixth section by recommendations.

METHODS

As the title of the paper indicates, this is a literature review centred on the use of social accounting matrix and structural path analysis with a view to testing applications potential to urban agriculture. The methods involved the use of internet search engines with “SAM”, “SPA”, “urban agriculture” as input terms. Relevant sources are retrieved and studied in so far as they relate to the SAM framework, the place of SPA within the SAM framework, evidence in the literature where the SPA technique has been used and, limitations of current approaches in the analysis of urban agriculture.

The Basic SAM Framework

As an accounting system, the existing literature emphasizes the unique features of the SAM. Firstly, a SAM is a comprehensive accounting system representing all economic agents (accounts) in a socio-economic system. Thorbecke (2000) points out that the matrix that constitute SAM is partitioned into accounts based on the number of economic agents to be represented. Each economic agent (account) has its own row and column. In the rows *income* is recorded and *expenditure* is captured in columns.

Following Breisinger et al. (2011) the total of all expenditure by a given account must be equal to the total of all income received by the same account. The production activities account represents producers of goods and services. These production activities combine raw materials/intermediate inputs and other factors of production to make goods and provide services. The expenditure incurred is recorded in the column account of production activities. For instance, expenditure on raw-materials is recorded in activities column and commodities row (C1-R2) account. Production activities allocate value-added to other factors of production in exchange of the services they provide. This expenditure is recorded in the activities column and the factor row (C1-R3) account. The value of the goods and services produced by the production activities is given in terms of producer prices. These goods and services are supplied to commodity markets and the income received is captured in the activities row and the commodities column (C2-R1). The aggregate expenditure by production activities on raw materials and other factors of production form gross output, while the aggregate demand for the goods and services constitutes the total income from production activities.

The sellers of commodities are represented in SAM by the 'commodities account'. Commodities are supplied from domestic (C2-R1) and/or foreign (C2-R7) sources. The sellers of these commodities pay indirect taxes and import tariffs to the government (C2-R5). The sellers of commodities receive payments, for example, when raw-materials are bought for production activities; this is captured in the commodities row and the production activities column (C1-R2) account. Income is received by sellers of commodities when households (consumption expenditure) and government (consumption and recurrent expenditure) spend on final goods; this income is recorded in accounts (C4-R2) and (C5-R2) respectively. Income is also received by sellers of commodities when institutions (households and government) invest (C6-R2) and when goods and services are sold to other countries – the income is received by the exporters (C7-R2). Factors of production (labour and capital) are represented by one account 'factors' in the basic SAM. Factors of production receive income (C1-R3) in exchange of the factor services rendered to the production activities. This in-

come is in the form of wages, rent and net factor receipts from the rest of the world. The income received by the factors of production corresponds with the value-added generated by production activities. Also, this income is distributed to households as labour income/factor income (C3-R4).

The domestic institutions include: households, government and companies. In the basic SAM, only households and government are considered. Households own factors of production and earn income received by factors of production employed in the production activities (C3-R4). Households also receive transfers from the government in the form of pension and social security grant (C5-R4) and remittance from abroad (C7-R4). In turn, households pay direct taxes to the government (C4-R5) and spend on consumer goods and services (consumption expenditure) (C2-R2). The remaining income is saved (C4-R6). The government spends on recurrent consumption (as it provides public services and pays wage to its workers); this expenditure is recorded in (C5-R7) account. The government also makes transfer payments to households (C5-R4) and saves its fiscal surplus recorded in (C5-R6) account. The government gets its revenue from a number of sources, including: direct and indirect taxes recorded in (C2-R5) and (C4-R5) respectively, and transfers from the rest of the world recorded in (C7-R5).

The entries recorded in the saving and investment account (capital account) comes from savings of households (C4-R6), government (C5-R5) and foreign savings (C7-R6). These savings are channeled into investment (C6-R2 R2-C6). Lastly, in the 'foreign account' (the 'rest of the world' account) are records of transactions between the home and foreign residents. When domestic residents buy commodities from other countries money flows out of the country (C2-R7); records the foreign exchange that flows into the country when goods and services are exported.

Literature Review

Apart from its function as an accounting system, SAMs are also used for modeling purposes, mainly to measure the multiplier effect of exogenous shocks on an economy. For this purpose, several applications on SAM accounts entries are noted. These involve, the need to

sub-divide SAM accounts into endogenous and exogenous accounts; the derivation of SAM multiplier; and the decomposition accounting multiplier effect (Parra and Wooden 2010; Banouei and Banouei 2004; Defourny and Thorbecke 1984). Defourny and Thorbecke (1984) have developed a simplified classification of SAM accounts into endogenous and exogenous accounts for showing the procedure for SAM multiplier derivation. Following the work of Defourny and Thorbecke (1984), the production activities, factors of production and institutions (households and companies) are grouped as endogenous accounts; while other accounts are classified as exogenous accounts. The transactions between the three endogenous accounts are represented by simplified matrices as follows: T_{13} represents the apportionment of value-added among various factors of production; T_{33} shows the intermediate input needs of the production activities; T_{21} represents the distribution of factorial income into household income; T_{22} shows income transfers within and among household groups; and T_{32} represents expenditure pattern of various institutions (household groups) on commodities they consume (Defourny and Thorbecke 1984: 112). Matrix X_1 , X_2 and X_3 represent the sum of exogenous injection by the government, investment and exports. Matrix I_1 , I_2 and I_3 show leakages in the form of savings, imports and taxation.

In a representation of transaction flows between endogenous and exogenous accounts matrix t represents transactions between exogenous accounts and called resid urban agriculture matrix and shows the current balance on the balance of payments. The total incomes of the three endogenous accounts are shown by matrix Y_n and Y_x (Banouei and Banouei 2004). It is indicated that the total income received by the three endogenous accounts is represented as y_n , which has two elements: (a) expenditure by the endogenous accounts shown as T_{nn} and summed up as n ; and (b) expenditure by the exogenous accounts (called injections) shown by T_{nx} and expressed by equation:

$$Y_n = n + x \quad (1)$$

In the same way, total income received by exogenous accounts is represented by Y_x , which has two elements: (a) leakages (T_{mx}), which are summed up as I ; and (b) resid urban agriculture balance T_{xx} , which is summed up as t . This is expressed by equation:

$$Y_x = I + t \quad (2)$$

For analytical purposes it is required that the elements of the endogenous transactions matrix (T_{nn}) should be converted to average expenditure propensities. This is done by dividing each transaction matrix by its corresponding column total/sum. Thus:

$$T_{nn} = A_n Y_n \quad (3)$$

Where Y_n is a diagonal matrix whose elements are Y_i , $i = 1, \dots, n$. In the same way:

$$T_{nx} = A_n Y_n \quad (4)$$

By introducing matrix A_n and A_p , n and I can be expressed as:

$$n = A_n Y_n \quad (5)$$

$$I = A_p Y_n \quad (6)$$

By combining (1) and (5), the Multiplier Matrix Ma is derived:

$$Y_n = A_n Y_n + x = (I - A_n)^{-1} x = Ma x \quad (7)$$

Equation (7) means that total endogenous income (Y_n) is derived by multiplying injections (x) by a Multiplier Matrix (Ma).

$$A_n = \begin{bmatrix} 0 & 0 & A_{13} \\ A_{21} & A_{22} & 0 \\ 0 & A_{32} & A_{33} \end{bmatrix} \quad (8)$$

Defourny and Thorbecke (1984) report that Ma is called the accounting multiplier because it only explains the results as observed in a SAM and does not show the process by which Y_n is generated. The conversion of endogenous transaction matrices (T_{nn}) into average expenditure propensities yields matrices for the three endogenous accounts expressed in equation (8).

RESULTS AND DISCUSSION

The first part of this section presents additional work on SAM and SPA, followed by evidence where the SPA technique has been applied in the past and a critique of the sources thereof. The third part of this section uses this as a platform in justifying the applications potential of urban agriculture. The theoretical developments of SAM framework were initiated by Sir Richard Stone with his 1954 article "Input-Output and Social Accounts" (Santos 2004). In that article Stone expressed the need for integrating disaggregated national accounts. His main objective was to form an economy-wide database that could not only present data on the production sector (Input-Output framework), but also include other economic agents and markets, such as government, households, fac-

tor markets, capital markets and the rest of the world (Kucera et al. 2012). It is on the basis of Stone's 1954 contribution that SAM is considered an extension of the Input-Output framework (Lofgren et al. 2002:142). As noted by Santos (2004), it was twenty two years later that the first description of the general shape of the SAM framework was presented by Pyatt and Thorbecke (1976). This work, as Thorbecke (2000) asserts, formalized the use of SAM as an accounting system and a concept framework for modeling. Since then the SAM framework has been applied in a variety of studies in developed and developing countries (Santos 2004).

A SAM is described as a matrix representing detailed data on transactions taking place between economic agents in a given socio-economic system during an accounting period, such as one year (Round 2003). The basic objective of compiling a SAM is to show the multiplicity of interdependence between economic agents in a socio-economic system as a whole. This is achievable through recording as comprehensively as possible the actual and imputed transactions and transfers between various economic agents in a given socio-economic system (Round 2003). The SAM framework is its role as an accounting system and as a modeling framework for policy analysis.

The development of structural path analysis (SPA) was initiated by Lantner (1974) who applied it to input-output tables. Defourny and Thorbecke (1984) applied SPA as a specialized methodology for decomposition of SAM multiplier effect to the 1968 SAM of the Republic of Korea (Parra and Wodon 2010). Their analysis focused on the effects of production activities on other production activities, on factors of production, on households, and finally they looked at the influence of households on production activities. Following Defourny and Thorbecke successful application of SPA to social accounting matrix, SPA has been used in a variety of studies. James and Khan (1997) examine the issue of the macroeconomic relationship between technology choice and income distribution from the manufacturing industry perspective. They suggest that there are historical reasons why labour intensive techniques tend to be more extensive in their impact than capital intensive techniques. They test these hypotheses by applying SPA to a highly disaggregated SAM for Indonesia. They conclude that in terms of in-

come distribution, traditional technology (labour-intensive oriented) benefits rural rather than urban households while modern technology tends to benefit urban more than rural households. But the benefits while variable in essence accrue to both rural and urban households because of the intrinsic transaction flows between the two areas.

Banouei and Banouei (2004) argue that the underlying assumptions limit the flexibility of *Ma* matrix for socio-economic policy analysis, as compared to other multipliers. Concerning the fixed expenditure propensities, Defourny and Thorbecke (1984:115) argue that a more realistic alternative is to use a matrix of marginal expenditure propensities C_n . In this approach C_n is marched with the observed income and expenditure elasticities of different economic agents (in a given socio-economic system), however, like A_n , it is based on the assumption of fixed prices when exogenous demand changes. Thus expressing equation (1) in terms of changes in injection, using marginal expenditure propensities, one gets:

$$dy_n = d_n + dx \quad (9)$$

Changes in income (dy_n) resulting from changes in injections (dx) gives

$$dy_n = C_n dy_n + dx = (1 - C_n)^{-1} dx = M_c dx \quad (10)$$

Where, M_c is the fixed price multiplier matrix: In spite of the limitations, Round (2003) argues that SAM multiplier analysis remains useful as it provides indication of the possible total effects of exogenous shock on endogenous accounts. However, to have more light on the effects of exogenous injection on the whole socio-economic system, several scholars propose the need for accounting multiplier (*Ma*) decomposition to capture more effects (Defourny and Thorbecke 1984; Parra and Wodon 2010; Arndt et al. 2010). One of the specialized methods of achieving this has been through the application of structural path analysis (SPA).

Banouei and Banouei (2004) points out that in order to use SAM multipliers (*Ma*) for analytical purposes three key assumptions must be taken in consideration. (1) The existence of excess capacity, which would allow all prices to remain constant. (2) The production technology and resource endowments during a given period are given. (3) The expenditure propensities of endogenous accounts remain constant and apply to any incoming injection.

Defourny and Thorbecke (1984: 116) point out that SPA identifies a whole network of paths by which the impact of exogenous shock on one endogenous account is transmitted through the economy to reach its destination account (s). In other words SPA shows how the influence of exogenous shock is transmitted from the pole (sector/account) of direct impact (i) through specific paths to the destination pole (j) and the extent to which it is amplified by indirect linkages represented by the circuits adjacent to these paths. They assert that SPA can help policy makers and analysts to breakdown the various channels through which the impact of shocks is transmitted among socioeconomic agents, thus contributing to decision-making.

Current literature distinguishes three types of exogenous influence-transmission in an economy, namely; direct influence, total influence and global influence (Defourny and Thorbecke 1984; Parra and Wodon 2010; Arndt et al. 2010). Defourny and Thorbecke (1984:120) describe direct influence as a change in the income (output) of pole j (sector of influence destination) resulting from a unitary change in pole i (sector where initial exogenous influence is felt). The transmission of direct influence takes place along an elementary path linking i to j . They point out that direct influence is based on the assumption that income (production) only change in poles along the elementary path between i and j but remain constant in other poles elsewhere in the economy. Furthermore they identify two ways of measuring direct influence along an elementary path i to j : (1) A case of direct influence of i on j measured along elementary arc/path (i, j).

$$I^p(i \rightarrow j) = a_{ji} \quad (11)$$

Where, a_{ji} is the (j, i)th element of the matrix of average expenditure propensities A_n . Hence matrix A_n is called matrix of direct influence. (2) A case of direct influence along an elementary path containing multiple arcs between i and j . The direct influence channeled from pole i to pole j along such elementary path is equal to the product of the intensities of the arcs forming the path, thus:

$$I^p(i \dots j)_p = a_{jn} \dots a_{mi} \quad (12)$$

Total influence is described by Arndt et al. (2010: 5) as a broader measure that registers how direct influence of path p is amplified by linkages adjacent the path. Thus total influence I^T is expressed as:

$$I^T(i \rightarrow j)_p = I^T(ij)_{pMp} \quad (13)$$

Banouei and Banouei (2004), note that M_p registers the extent to which the direct influence along path p is amplified by the effects of adjacent connecting circuits. They point out that global influence is directly obtained from the accounting multiplier matrix M_{aji} because it captures the full effects of an exogenous injection x on the endogenous variable j . In other words, global influence is the sum of the total influences of all elementary paths linking pole i and pole j . The global influence can be expressed as:

$$I^G(ij) = M_{aji} \quad (14)$$

While matrix $M_a = (I - A_n)^{-1}$ is called the matrix of global influence.

Thorbecke (2000) asserts that a SAM is a snapshot of an economic system, a complete representation of linkages among economic agents, capturing the circular interdependence characteristic of any socio-economic system, factors of production and institutions (households, government). Breisinger et al. (2011:1) compare SAM to the circular flow diagram, as the latter is also used to provide detailed representation of an economy, showing interactions and interdependence between and among economic agents. Furthermore, SAM is a flexible framework, both in terms of accounts and the emphasis put on parts of the socio-economic system (Usami 2008). Thorbecke (2000) points out that the question(s) SAM is designed to answer determines the level and pattern of account disaggregation.

Xie (2000) presents an environmentally extended SAM (ESAM) to capture the relationships among economic activities, pollution abatement activities, and pollution emissions. He provides a numerical example of the environmentally extended social accounting matrix (ESAM) using Chinese 1990 data. To this he applies SAM multiplier and SPA to enable the assessment of environmental impact of pollution-related economic policies. He concludes that ESAM can be a useful tool for environmental policy analysis. Note, however, that the complex overlaps between pollution elements and the bio-physical environment presents particularly difficult path ways to map, compared to agriculture in general and, urban agriculture in particular. Lanzen (2003) used SPA on a 1995 SAM for Australia to analyse the key sources of environmental and resource pressure. The environmental effects are measured through emis-

sion of greenhouse gas, energy consumption, water use and land disturbance. He concludes that great environmental and resource pressure is exerted along paths that lead to exports. While this conclusion is valid for Australia, which is an export-based economy, even such pressures on resources occur in countries where there is stiff competition for resources, irrespective of the pull exerted by trade.

Wood (2008) uses temporal structural path analysis (T-SPA) to examine the temporal changes in greenhouse gas emissions within a full production chain. He argues that rather than changing production processes, an alternative option is to promote trade which involves minimal greenhouse gas emissions. In the long run, policies that aim at changing production technologies are more likely to have a drastic effect than merely pushing for trade. He asserts that by applying T-SPA to such a problem, economic managers are provided a ranked assessment of production systems that would cause the greatest reduction in greenhouse gas emissions if the products concerned are made available to the local users through regional and international trade. Lima et al. (2004), use the SAMs for Andalusia of 1990, 1995, and 1999 to conduct a structural analysis of the economy of Andalusia by means of 'path analysis' and 'multiplier decomposition'. These techniques enabled them identify changes in productive structure; identify the impact of sectoral shocks on the Andalusian economy, and thus the production sectors which have most strongly contributed to Andalusian economic activity in the last decade. Simple trend analysis built on a time series platform-could, in theory generate similar results except that the impact of shocks would not be adequately factored into the computations.

Roberts (2005) uses path analysis to trace the role of different types of households in the rural economy of the Western Isles region of Scotland in 1997. While acknowledging the limitations of the technique, she concludes that households with children, compared to households without children and those with retired occupants, exert great influence in connecting production and consumption, and accounted for more than fifty percent of the total household related multiplier effects for every economic sector. Work on settlements, production and markets in Sub-Saharan Africa (Ruhiga 2011) and

on gender discrimination (Pena 2012) indicate a far more complex interplay of forces that go beyond simple family size.

Parra and Wodon (2010) apply SPA to the 2001 SAM for Tanzania to show how SPA methodology can be used to better understand the transmission channels through which sectoral growth patterns are likely to impact on male and female income; and argue that these impacts will be different. Studies of income distribution and female participation rates in the labour market commonly use econometric modeling but often fall short with reference to tracing impact.

Banouei et al. (2005) apply SPA to the 1996 SAM for Iran to analyse the Iranian production sectors and urban-rural income distribution in terms of factorial and institutional income distribution. Their results reveal that the global influences of all the seven Iranian production sectors benefit urban households more than rural households, thus tend to aggravate the existing urban-rural income inequalities. Empirical evidence from studies in many developing countries show the prevalence of rural-urban household transaction flows and multiple livelihoods in which urban households supplement their incomes through rural linkages (Ellis and Bahigwa 2003; Soltani et al. 2012; Bebbington 1999).

Ngandu et al. (2010) use the SPA methodology to analyse the economic impact of the planned R845 billion infrastructure development investments on the economy of South Africa. The result of their analysis show that the construction sector is a good choice for demand injection based on its stimulatory effect on other economic activities and households at all income levels. But where the bulk of supplies into the industry are imported finished products, this undermines the potential of stimulatory effects on households.

Temel (2011) applied SPA to a disaggregated SAM for Rwanda to analyse the role different household group's play in human capital development, sectoral growth and income distribution. The results of his study indicate that the smaller the family size, the higher the investment made in human capital. Households with one to three children act as important agents in the transmission of influence gained through human capital investment to agricultural production. He concludes that promoting family planning seems to be a promising strategy for eco-

conomic growth and poverty alleviation. It should, however, be noted that the “small family equals faster economic growth” notion is debatable because existing empirical evidence is not consistent.

Finally, Arndt et al. (2010) were inspired by the fact that economic growth does not generate uniform poverty reduction outcomes. They acknowledge that errors in growth accounting and differences in the composition of economic growth between countries are some of the factors that may account for this phenomenon. Their study takes the investigation about this issue further and examines the influence of economic structure on a country’s growth-poverty relationship and performance. Using SAM multiplier and SPA, they compare the experiences of Mozambique and Vietnam, and note that these two countries have similar levels and composition of economic growth, but with pronounced disparity in poverty reduction outcomes. Their findings indicate that Vietnam’s economy is structured in a manner that generates broad-based growth. A similar expansion of agricultural demand in Mozambique, other things kept constant achieve far less rural income growth than in Vietnam. Thus they conclude that structural characteristics are one of the key factors that account for the differences in the growth-poverty relationship observed across countries. This finding is important because it indicates that the diversity of economic structure at the country level directly feeds into the production dynamics which in turn filters down to what production activities households engage in. While state policies remain critical, understanding how different countries respond to anti-poverty interventions requires an appreciation of the role of economic structure.

The paper has asserted, on the basis of cited sources that SAM provides a reliable tool for measuring and analyzing the relative importance of specific economic activities. Secondly, SAM is a flexible framework in terms of the level of account disaggregation and the size of an economy for which it may be constructed (Pyatt 1988; Usami 2008: 43). It is noted, however, that in spite of such disaggregation, applications have not yet extended to smaller geographical localities. Evidence of SAM applications has been at both the macro-scale involving the building of SAMs for individual countries and, at the sectoral scale involving specific economic activi-

ties and policies. The applications of SPA across economic sectors, subsectors and different geographical scales have been presented and comments thereof, made.

On the basis of preceding sections, we now turn to the potential of using SPA in investigating the role of urban agriculture. It has been shown that the comprehensive database provided by the SAM has a diversity of analytical uses that cuts through the socio-economic environment of households. For instance, empirical evidence of the application of SAM and SPA for entire national economies as in Barboza-Carrasco et al. (2009) is reported for Mexico and Pal et al. (2012) for India. Lewis and Thorbecke (1992) report on the use of a regional SAM in Kutus, Kenya. Applications to specific sectors of the economy include (Morilla et al. 2009) for water resources and greenhouses gas emissions based on 2000 data on Spain; Pal et al. (2012) for India based on the 2003-2004 years period but with an emphasis on the energy sector, and by Cardenete and Sancho (2012) on supply constraints. Zheng et al. (2012) applied SAM to land use change in the Jiangxi Province of China. To date no study has employed SPA to examine the role of urban agriculture at either macro or micro levels. While no single explanation can account for this anomaly, the dilemma of acquiring the relevant household data disaggregated to the lowest scale, and configured for easy incorporation into national databases remains critical. The use of secondary data generated from country statistics which is already disaggregated into specific economic sectors makes operating at the macro scale attractive. As the scale is reduced, fewer and fewer studies appear. Hence, in the absence of key studies using SAM and SPA in mapping the performance of urban agriculture, it is understandable why this field of research is still poorly represented.

Agriculture remains an important economic sector across many countries and, Arndt et al. (2010), on Vietnam and Mozambique includes this in the constructions of SAMs for each of these two countries. But while agriculture exists side by side with other key sectors of the economy, urban agriculture is a sub-group that suffers the dilemma of reliable national statistics on its operations. National accounts are periodically reported for key economic sectors-labour and employment, access to services, manufacturing, energy, transport and communication. These

sectors have reliable data within a time series base at national, provincial and regional scale. The quality of such data bases varies with the level of economic development of individual countries and state policies that regulate the reporting of production. For developing countries and at the level of smaller aerial units—a district, a local municipality, a locality or even a village, such data is not commonly available. National statistics disaggregated to the smallest geographical units is likely to be deficient in that urban agriculture will most likely be reported in household surveys as unreported employment (informal activities) or simply as “others”. What this means is that a significant amount of household production is not captured using traditional household surveys, consumption and expenditure surveys, labour surveys and national census. Government and municipal planning and policy either ignores urban agriculture or actively pursues programs aimed at restricting it all together. In the same vein, households engaged in urban agriculture often claim that they are unemployed in spite of the impact of the labour input and the contribution to the household budget. The absence of reliable data sets reporting the state of urban agriculture across many countries can therefore be explained with reference to the perceptions of participating communities, a diversity of state and municipal policies and the design of collection instruments that do not adequately provide scope for a separate capture of activities falling within urban agriculture. Where urban agriculture is reported in the literature – for example in the introduction section of this paper, the focus has tended to be on the characterization of the activity in different localities, contribution to food security (Shillington 2012), land use competition (Aubry et al. 2012), sustainability of the activity (Schmidt 2012) technical inputs and problems of soil contamination (McClintock 2012), access to land (Lynch et al. 2012), household livelihood strategies (Brinkley 2012) and, gender and participation rates (Idowu et al. 2012).

Using SPA, therefore to trace the structure, volume, direction and impact of transaction flows involving household participation in urban agriculture requires that existing data be supplemented with primary data collected through household surveys. Such an exercise could provide raw data for incorporation in the building of a SAM at that level. And, it would indeed

reveal the diversity in the intensity of participation, the material benefits of participating households, the income impact on other accounts and how participating households may be better positioned to respond to periodic shocks in the local economy from unexpected adverse events. It is important to quantify the relative significance of urban agriculture at the household level because such information should feed into policies not only on urban planning but also on poverty alleviation. In the sense that it offers pathways for quantifying transactions between households and other economic agents, it should provide better insights on quantifying urban agriculture than is currently possible under the multiplicity of sustainable livelihoods approaches (Kirnbauer et al. 2012).

The use of SPA makes it possible to report household activities as income receipts and their use for payments. The relative size of these flows could be used to measure the significance of urban agriculture in the overall household income-expenditure budget at different scales. Note however that for SPA to be applied, the structure of UA has to conform to an agri-business framework. This calls for appreciating that beyond households, small holder farms within urban districts may represent very advanced forms of specialist commercial farming (piggery, poultry, dairy, crop farming). This category of UA is locally operating in City of Cape Town, Gauteng, Ethekewini metro (Durban) and Nelson Mandela Bay metro (Port Elizabeth). At this level of production, the practice of keeping records of all inputs and income is well entrenched and provides a favourable platform for using SPA. From a local economic growth perspective, this should generate the kind of information that directly feeds into urban planning and policy (Nhlapo et al. 2011). Underlying this assertion is the view that often urban policies with regard to how to manage and regulate the activities of urban agriculture consistently show a lack of understanding of the benefits of the activity for the population (Schmidt 2012; Thom and Conradie 2012). Thirdly, where SPA is applied to the SAM data system the whole network through which the influence of a change in exogenous variable is transmitted in an economy can be vividly analysed (Defourny and Thorbecke 1984: 1). Justifying the applications potential of SPA in urban agriculture is not meant to downgrade other approaches in contemporary literature. The

use of SPA is restricted to investigations in which the purpose is to capture and quantify transaction flows between households and the local economy. It is in essence an accounting technique which in the case of urban agriculture assumes that households keep a record of their inputs (payments) and returns (income). Without such information, it would be practically impossible to quantify UA and the transaction flows that it generates. Beyond this scope and depending on the purpose of such studies, the diversity of approaches on issues of urban agriculture is necessary.

CONCLUSION

This paper has presented the social accounting matrix (SAM) framework and contemporary literature on urban agriculture. The latter indicates a dominance of essentially qualitative and technical approaches that do not adequately provide scope for tracing transactions between households and the market. Cited sources on the applications of SPA have been centred on the analysis of macro socio-economic issues but specific focus on economic sub-sectors at micro-level remains almost non-existent. Given the limitations of qualitative approaches to urban agriculture, a justification has been advanced for the use of SPA. Potentially SPA can be used in analyzing UA but this paper has raised certain pre-conditions related to the keeping of records which drastically reduces the percentage of cases where the technique can be applied.

RECOMMENDATIONS

First, a significant amount of research work is still needed to test the application of SPA at lower resolution level (micro-level) in order to gauge economic performance for smaller geographical areas. Second, possibilities of integrating SPA and existing traditional approaches housed in the sustainable livelihoods literature should be pursued because this may offer a more comprehensive understanding of imbedded interactions. Third, the state of statistics on UA needs attention because without this, the operations of the sub-sector will not be adequately reported.

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