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Production of and trade in African indigenous vegetables in the urban and peri-urban areas of Durban, South Africa

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This paper reports on the farming and trade of lesser known crops, here termed African indigenous vegetables (AIVs), in the Durban metropole. Most households grow AIVs, and collect them from the wild, primarily for home consumption. Modal income from sale was approximately R30 per month per farmer, most of whom were middle-aged to elderly females, with limited education, who had been cultivating AIVs here for many years. The main constraints to greater sales were deemed to be low market demand and adverse climate. The commonest AIVs grown were pumpkin leaves, taro and amaranth. Although most farmers sold very little, there is a thriving retail trade in AIVs. Generally, retailers were females, but younger and more educated than the farmers. The majority viewed retailing as a full-time occupation. Modal income for retailers was R450 per month, but included non-AIV produce. Most of the traders thought there was insufficient market demand for AIVs.

Keywords: African indigenous vegetables; gender; peri-urban; markets; urban agriculture

1. Introduction

A striking difference between the major cities of the developed and developing world is the extent of agricultural production within the city limits and peri-urban peripheries. In the developed world, urban and peri-urban agriculture has been long established (Mougeot, 2006) but is largely invisible, being mostly confined to vegetable gardens (or summer gardens in Scandinavia) hidden in suburban plots. In contrast, in the cities of the developing world, private and public open spaces are dotted with agricultural production, including vegetables, herbs, spices, fruits and livestock.

The potential of urban agriculture has been debated for decades (Egziabher et al., 1994; Drakakis-Smith et al., 1995; Mougeot, 2006), although the promise of cities being able to feed themselves has never been realised. Previous work has identified numerous benefits of urban agriculture, including the supply of fresh and nutritious produce to the inner cities, maintenance of green spaces, productive use and care of undeveloped lands, contributions of food and income to the gardeners and farmers, and productive use of waste water. With increasing urbanisation, resulting in expansive urban creep and sprawl into productive farmlands, the rural farming areas are becoming increasingly distant from urban consumers. Consequently, the potential contribution of urban agriculture to

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livelihoods and markets is growing. Yet in many countries this potential is little appreciated or understood, firstly because of a scarcity of appropriate research into the contributions of urban and peri-urban agriculture to local livelihoods and markets, and secondly because of urban planning processes and policies that directly undermine urban agriculture (Drakakis-Smith et al., 1995; Ashebir et al., 2007). In Africa, detailed empirical studies of urban and peri-urban agriculture can be found for less than a dozen countries. In South Africa, work has spanned a long period but is fragmented and, in the absence of a full body of knowledge, has had little impact on urban and peri-urban planning processes at a national level. However, there have been notable exceptions at local level, where a number of successful programmes have been fostered (Rogerson, 2003).

Even the few studies from Africa have mostly focused on conventional species, mainly the staple cereals and domesticated vegetables. Indigenous and lesser crops are often overlooked. African indigenous vegetables (AIVs) comprise scores of vegetable species that are consumed throughout the African continent (FAO, 1988; Grubben & Denton, 2004). A precise definition of the term 'African indigenous vegetables' (and similar terms) in both the scientific and farmer knowledge sphere is elusive, as it encompasses indigenous and non-indigenous species, leafy and root vegetables, cultivated and wild collected ones, leaves from trees, herbaceous species, both annual and perennial, and fruits of leafy species, and includes plants used for home consumption as well as income generation (Modi, 2003; Grubben & Denton, 2004; Keller et al., 2006). But an overriding characteristic is that AIVs have received relatively little research and market development attention from formal research and development agencies (Pasquini & Young, 2009).

Hence their contribution to local diets and economies is little understood, quantified or appreciated, despite a number of advantageous attributes, including (i) widespread use (e.g. Guarino, 1997; Shackleton et al., 1998; Lykke et al., 2002; Keller et al., 2006), (ii) high nutritional status and consequent role in combating malnutrition (e.g. Maxwell et al., 1998; Nesamvuni et al., 2001; Steyn et al., 2001; Gockowski et al., 2003), (iii) medicinal and anti-malarial properties of some species (e.g. Hilou et al., 2006), (iv) contribution to conservation of biodiversity, local knowledge and traditions (FAO, 1988; High & Shackleton, 2000; Cocks & Wiersum, 2003; Keller et al., 2006; Maundu et al., 2009), (v) ease of cultivation with low inputs (e.g. Modi, 2003; Olouch et al., 2009), (vi) relative drought resistance (e.g. Dzerefos et al., 1995; Slabbert et al., 2004), (vii) contribution to food security, especially for the poor (Shackleton et al., 1998; Yiridoe & Anchirinah, 2005), and (viii) potential to provide supplementary or significant income (Shackleton et al., 1998; Shackleton, 2003; Gockowski et al., 2003; Yiridoe & Anchirinah, 2005).

Since AIVs have been insufficiently studied, a consortium of African and European institutions known as IndigenoVeg (n.d.) recently instigated a systematic and comparative survey of the cultivation and marketing of AIVs in 14 African cities throughout the continent (Pasquini & Young, 2009). The surveys in each city and its peri-urban surrounds all used the same approach and interview schedule, comprising a comprehensive survey both of the growers and of the retailers, collectors, wholesalers and middlemen. The primary objectives of the surveys were to understand (i) the characteristics of AIV production systems in urban and peri-urban areas, (ii) the main players in the market, the size of the market, and incomes at each stage, and (iii) the constraints experienced by the urban and peri-urban farmers and the retailers in participating in these markets (Pasquini et al., 2009). This paper reports on the cultivation and marketing of AIVs in

the Durban Metropolitan area (eThekwini) in South Africa. It comprises a comprehensive survey of both farmers and gardeners,[1] and the retailers and several formal markets, with their profile disaggregated by gender.

2. Study area

The study city site is in KwaZulu-Natal Province, South Africa, under the eThekwini District municipality (29° 53′ S; 30° 53′ E). Durban has a humid subtropical climate, with mean monthly temperatures ranging from 18°C to 26°C, where summer temperatures reach the lower thirties, and winter temperatures seldom fall below 10°C (Ceroi, 1999). Humidity levels range from 50 per cent to 70 per cent. Coastal Durban has a mean annual rainfall of 1000 mm (Ceroi, 1999), decreasing to 800 mm in the peri-urban areas to the west.

The total population is approximately four million (Ceroi, 1999). The region is culturally diverse, with a majority of African residents (68 per cent), a large Indian community (20 per cent), and a white and coloured minority (9 per cent and 3 per cent, respectively) (StatsSA, 2001). There is relatively high unemployment, with only 37 per cent of the total population employed, and 28 per cent unemployed and 35 per cent not economically active (StatsSA, 2001). The municipality has a polarised economic landscape, with the city centre and selected suburbs supporting wealthy households, but with regions flanking the city that contain informal settlements, low-cost housing and betterment schemes. One-quarter of the employed residents earn less than R800 per month (StatsSA, 2001). It is estimated that 16 per cent of the labour force is active in the informal sector, with approximately 20 000 street traders in Durban.

One third of the eThekwini area is peri-urban to rural, characterised by dispersed settlements of traditional dwellings that cover hilly and rugged terrain. These areas suffer from severe poverty and unemployment, with many households relying on localised social assets, government grants and natural resources. The situation is exacerbated by fragmented service delivery, unresolved land tenure, a shortage of substantive information, and a legacy of lack of planning (eThekwini Municipality, 2007).

3. Methodology

A three-phase approach was adopted: a questionnaire survey of 165 farmers and gardeners, a survey of markets, and a questionnaire survey of 55 retailers and vendors. The interview schedule was a standardised one from the broader multi-country IndigenoVeg Project (IndigenoVeg, n.d.). All interviews were conducted in the local language preferred by the respondent. Many of them did not keep records and hence quantities traded, incomes and costs were often missing.

3.1 Farmer survey

For the survey on the production of AIVs, 165 farmers (78.4 per cent female; 21.6 per cent male) were approached on their farms in 11 different wards across the city (15 to 20 per ward) and asked a series of questions to gather information about the value of

[1]Farmers are those with significant areas of land, the produce from which makes a substantial contribution to the household needs, whereas gardeners typically cultivate small areas (less than 500 m^2), the produce from which is supplementary.

production, consumption and marketing. Nearly all farmers produced other crops alongside the AIVs and did not consider inputs and incomes separately, either between AIVs and the other crops or between different species of AIVs – a problem also noted by Gockowski et al. (2003).

3.2 Market and retailer survey

During November 2006 we visited five formal markets (Chatsworth, Hammersdale, Market Street, Verulam and Victoria Street), including the largest and most central fresh-produce market in Victoria Street. At each market site the project team assessed the scale of trade in AIVs by recording what proportion of *all* traders operational in the market on the particular day sold one or more AIVs. For those who did sell AIVs the species were noted. All the traders in these markets who sold AIVs and were willing to be interviewed (85 per cent female; 15 per cent male) were asked for details of their profile, the species of AIV they traded, the costs and incomes associated with the AIV trade in total and their three top selling AIVs. Thereafter the project team surveyed the streets adjacent to the market in search of street vendors. These were only present at Victoria Street Market and 20 were interviewed. Nearly all traders traded in other goods as well as AIVs and did not consider inputs and incomes separately. A total of 55 traders were interviewed, of whom 35 were within the markets and 20 were street vendors nearby.

All data were summarised in frequency tables and proportions or percentages of selected responses were calculated. Means are reported along with the associated standard error. Differences in selected response distributions between male and female farmers were tested via chi-squared tests. The low sample number of male retailers precluded gender comparison for retailers. Differences between genders, or retailers and farmers in continuous variables such as age or residency time in the city were examined via *t*-tests.

4. Results

4.1 Profile of participants

More than 60 per cent of the farmers were over the age of 50, with 33.5 per cent falling in the '60+ years' category. Only 1.2 per cent of the farmers were below the age of 30 and only 12.8 per cent were below 40. The retailers were generally slightly younger, with 11 per cent below the age of 30 and only 3.7 per cent over 60.

When it came to levels of education, 67.7 per cent of the farmers had either no education or only a primary school education and 29.1 per cent had a high school education. A small proportion had college or university (1.9 per cent) or technical (1.3 per cent) education. There was no statistically significant difference between genders. The retailers were slightly better educated overall, although almost 50 per cent also had either no education or only primary school level, while the rest had a high school education. All the male retailers had some formal education, whereas almost one-fifth of the female retailers had no formal education at all. Just less than half of the female retailers had a high school education, compared to 75 per cent of the male retailers ($\chi^2 = 2.17$; $p > 0.05$).

The majority of the farmers and retailers grew up in villages in, or within a short radius of, what now forms part of the Durban Metropolitan area. None of the respondents had moved to the city within the last 2 years. In the case of the farmers, and taking gender into consideration, the mean residency time in the metropolitan area

for males was 39.3 $\pm$ 1.6 years (the range was 2 to 63 years), which was significantly greater than that of females ($t = 3.10$; $p < 0.005$). For females the mean residency time was 28.8 $\pm$ 1.5 years (the range was 2 to 71 years). The residency periods, in terms of gender, were similar for the retailers: males = 37.7 $\pm$ 1.6 years (the range was 14 to 50 years); females = 24.6 $\pm$ 1.8 years (the range was 1 to 60 years). These data indicate that new male migrants to the city do not engage in selling AIVs whereas females might, but neither males nor females engage in farming to generate income.

Only slightly more than one-third (37.5 per cent) of the farmers considered farming to be their main occupation, followed by 25.6 per cent who considered themselves unemployed, 17.5 per cent who saw themselves as housewives, while 13.1 per cent were pensioners. With respect to gender, 48.5 per cent of the male farmers considered farming to be their main occupation compared to 34.7 per cent of their female counterparts ($\chi^2 = 2.29$; $p > 0.05$). Considerably more retailers (67 per cent) considered retailing to be their primary occupation, although their retailing activities were not necessarily restricted to AIVs. This was followed by 13 per cent who saw themselves primarily as farmers, 7.4 per cent who considered themselves unemployed, and 5.6 per cent who saw themselves as businesspeople or wholesalers. The high percentage of retailers who considered retailing to be their primary occupation highlights the importance of this livelihood strategy for these people. It also suggests that the income people receive from retailing can be sufficient for them to consider this a primary occupation and not a stopgap.

4.2 The nature of urban and peri-urban production of AIVs in the Durban Metropolitan area

4.2.1 Land used for farming

Most of the farmers (92.7 per cent) cultivated their own land, with similar proportions for male and female farmers. Only 9.3 per cent rented land from others but most of those who did this also owned land, and therefore the rented land was a strategy to increase the area they had. The cost of rental was low, ranging from R40 to R100 per year, with a mean of R72 $\pm$ 16 per year. The cost of rental was not related to size of land rented. More female than male farmers rented land. Approximately one-sixth (16.6 per cent) of farmers used land that was neither rented nor owned, such as church land, school premises or municipal land (e.g. at roadsides, under power lines, on vacant land).

Taking into consideration the total land area that farmers had at their disposal (i.e. land owned, plus land rented plus land neither rented nor owned), the average land area available was 10 628 m^2. However, this is skewed by several farmers with large land holdings. The median and the mode were both 3000 m^2. Male farmers had on average more land at their disposal than their female counterparts. It should be noted that male and female farmers owned similar areas of land on average, but that female farmers rented a greater average area while male farmers had access to larger areas that were neither rented nor owned.

4.2.2 Produce

Most of the farmers were growing maize, followed by potatoes, sweet potatoes, cassava and other vegetables. This is similar to the main food items traded by retailers. Other

produce included poultry, fruits, livestock (cattle, sheep, goats) and, to a very small extent, pigs and fish. Vegetables were grown by 61.6 per cent of females compared to 84.9 per cent of males ($\chi^2 = 7.25$; $p < 0.01$). The main item sold by the retailers was vegetables (80 per cent), followed by potatoes and fruits, which suggests that maize grown by the farmers is more commonly used for home consumption and storing seed for the next season than for sale. Less than half of the sampled farmers produced four or more crops. Only 6.1 per cent produced a single product, while most produced three (33.3 per cent) or four (21.1 per cent). There was no difference between male and female farmers in this respect (see Table 1).

The farmers grew nine different AIVs: amaranth (*Amaranthus* spp.), pumpkin leaves (*Cucurbita* spp.), African eggplant (*Solanum aethiopicum*), nightshade (*Solanum* spp.), cowpea (*Vigna unguiculata*), okra (*Abelmoschus esculentus*), sweet potato (*Ipomoea batatas*), taro (*Colocasia esculenta*) and an unidentified species locally called *dahl*, a broad term for various leguminous crops. Farmers were growing on average 3.5 $\pm$ 0.1 AIVs with a range from one to six. No farmers reported growing all nine. There was no difference between female and male farmers regarding the mean number, or range in number, of AIVs grown.

For the majority of farmers, the main AIVs grown were pumpkin leaves, sweet potato and taro, each of which were grown by more than 70 per cent of farmers (Table 1). Cowpea was grown by 46.1 per cent and dahl and amaranth by more than 10 per cent. Pumpkin leaves were the vegetable traded by the greatest proportion of retailers, followed by amaranth, taro and sweet potato.

Most of the farmers (96.9 per cent) said they grew AIVs for home consumption, while 50.3 per cent grew them to earn income from selling the surplus and 44.1 per cent for cultural reasons. Only 6.5 per cent were growing AIVs because of good prices

Table 1: Farmers' main produce and AIVs (percentage of respondents; $n = 165$)

Product	Type	Total sample	Males	Females
Primary produce	Maize	88.8	84.9	89.6
	Potatoes/sweet potatoes/cassava	84.9	91.4	84.3
	Other vegetables	65.2	84.9	61.6
	Poultry	41.6	27.3	44.8
	Fruits	32.9	42.4	31.2
	Cattle/sheep/goats	23.0	27.3	21.6
	Pigs	3.1	6.1	2.4
	Fish	2.5	3.0	2.4
AIVs	Pumpkin/butternut leaves (white *boerpampoen*)	92.7	91.4	92.9
	Sweet potato leaves and tubers	79.5	78.8	80.8
	Taro leaves and tubers (*amadumbe*)	78.2	68.6	80.3
	Cowpea (*dinawa/imbumba*)	46.1	51.4	44.1
	Dahl	34.6	40.0	33.1
	Amaranth (*thepe/imbuya*)	13.9	11.4	13.4
	Black nightshade (*umsobo*)	1.8	2.9	1.6
	African eggplant	1.2	0	1.6
	Okra (*mandande*)	0.6	2.9	0

and only 0.6 per cent because of an available market. A greater proportion ($\chi^2 = 3.18$; $p < 0.05$) of male farmers reported good prices as their reason, while a greater proportion ($\chi^2 = 4.14$; $p < 0.05$) of female farmers reported the potential opportunity to earn income from AIVs (see Table 2).

Nearly all the farmers were also supplementing their diet with wild-occurring AIVs. The most commonly eaten ones were *Bidens* spp. (blackjack) (95.8 per cent of farmers), wild *Amaranthus* spp. (90.9 per cent), *Chenopodium* spp. (goosefoot) (69.7 per cent) and *Solanum* spp. (57.6 per cent). When asked why they were not growing them if they were eating them so much, most respondents (79.3 per cent) said these species grow naturally as weeds and therefore there was no need to grow them. A few reported scattering the seeds to encourage propagation. Approximately one-fifth (19.6 per cent) said there was no market for these wild species.

4.2.3 AIV production systems

The production of AIVs is relatively unsophisticated and parallels that of other produce on the farm or in the garden. Seed or propagation material was mainly stored from year to year or obtained from kin, or in the last resort bought from local shops. The most common input used by most of the farmers (93.7 per cent), whether male or female, was organic manure. Pesticides were used by 27.9 per cent of farmers and chemical fertiliser by 16.5 per cent. Chemical fertiliser was used by 21.2 per cent of male farmers compared to 14.6 per cent of female farmers, and hired labour by 21.2 per cent of male farmers compared to 10.6 per cent of female farmers, but neither difference is significant. These various inputs were applied to all crops, not necessarily simultaneously, but there was no specific selection of some crops receiving and others not. Application frequency was low, and usually corresponded to one or two applications per production cycle. Farmers who used hired labour did so for an average of 12.3 ± 0.8 days per production cycle (see Table 3).

The majority of farmers, both male and female, reported growing AIVs in pure stands and not intercropped with other crops. However, direct observation revealed that frequently each AIV was planted in a small area of several square metres. Thus, while direct intercropping might have been low, the cultivated area consisted of a mosaic of small patches each of one or two vegetables. Often these were of different ages, with sowing having been spread over several months in response to rainfall, climate and labour availability. Typically, in the mild climate of Durban, sowing can be done in

Table 2: Reasons for growing AIVs (percentage of respondents; $n = 165$)

	Total sample	Males	Females
Home consumption	96.9	94.3	97.6
Opportunity to earn extra income	50.3	37.1	54.0
Cultural reasons for AIVs	44.1	40.0	46.0
Good prices	6.8	14.3	4.8
Production experience	3.7	0	4.8
Contract with partner	0.6	0	0.8
Available market	0.6	2.9	0
Other	1.9	2.9	1.6

Table 3: Inputs for the production of AIVs (percentage of respondents; $n = 165$)

	Total sample	Males	Females
Pesticide	27.9	30.3	26.8
Chemical fertiliser	16.5	21.2	14.6
Organic manure	93.7	93.9	93.5
Hired labour	13.4	21.2	10.6
Other	3.2	6.1	2.4

practically any month, so harvesting was done over several months to ensure a supply of AIVs throughout most of the year, with peaks in late summer and late autumn. Farmers said they usually avoided mid-winter because it was too dry and mid-summer because of high temperatures.

Over 95 per cent of farmers on both farms and home gardens relied on rainfall to irrigate their AIVs, followed by approximately half who also relied on buckets. No farmers reported using drip irrigation on farm land but it was reported for home gardens. The category 'Other' included the use of tap water, a storage tank and pipe, dam water, a watering can, roof water, and wetland water (see Table 4).

Farmers were asked about their total yield of each of the main AIVs as well as the quantity sold. Most declined to answer, firstly because they did not keep records, and secondly because yields varied from season to season owing to the different sizes of land planted, the quantity of rainfall and other factors such as pests and diseases. Consequently, the final sample was relatively small, and in most instances inadequate. For example, many responded that they could not estimate a final yield because they sowed (or planted) and harvested throughout the rainy season. In several instances the estimate of quantity sold was higher than the estimate of yield per production cycle. After harvest, the AIVs were stored, either on the ground under shade (69.1 per cent) or on the ground in the sun (14.4 per cent), for home consumption or until sale.

4.2.4 Sale of AIVs by farmers

Altogether eight different AIVs were sold by farmers, the commonest being pumpkin leaves, taro, sweet potato and amaranth (see Table 5).

Table 4: Forms of irrigation (percentage of respondents; $n = 165$)

	Farm			Garden		
	Total sample	Males	Females	Total sample	Males	Females
Rainfed	97.6	95.2	99.0	92.3	90.5	92.7
Bucket	51.2	47.6	54.1	58.2	47.6	61.8
Drip irrigation	0	0	0	1.1	0	1.5
Sprinkler irrigation	5.7	4.8	6.1	4.4	14.3	1.5
Water conservation methods	9.8	14.3	9.2	15.4	23.8	13.2
Other	8.1	14.3	6.1	8.8	9.5	8.8

Table 5: Primary AIVs sold by farmers (percentage of respondents; $n = 165$)

Crop	Percentage selling	Crop	Percentage selling
Pumpkin leaves	61.5	Cowpea	18.0
Taro tubers and leaves	59.0	Potatoes	5.1
Sweet potato	56.4	Jugo beans (Bambara groundnut)	5.1
Amaranth	38.5	Okra	2.6

Of those farmers who sold their surplus, the majority (62.1 per cent) sold directly from their farm or garden, with a further 21.6 per cent selling in the neighbourhood, on street corners or door-to-door. The rest transported their produce to the city centre, which was on average 24.1 $\pm$ 8.2 km away. There were no middlemen. The average frequency of sale was 2.4 $\pm$ 0.3 times per week, usually at 2-day to 3-day intervals, or more typically 'when a buyer comes to my house'.

On average, between 50 per cent and 60 per cent of the total yield for each of the top three crops was sold. Male farmers typically sold approximately 10 per cent more of their yield than their female counterparts. Very few (<2 per cent) sold their entire yield and many (52 per cent) did not sell at all (although they might do if they found themselves with a surplus and at the same time an unanticipated need for cash). In terms of quantity sold few farmers could supply figures. The range for the most important AIV was from 2 kg per year to just over 2000 kg per year, with a mode of 50 kg per year. The mean income from the sale of the three most important AIVs was approximately R670 $\pm$ 256 per month. However, the mode was only R30 per month, which indicates how the mean was increased by a few farmers who earned significant amounts. The maximum amount earned was R3000 per month.

4.2.5 Perceived barriers to farming and increased sale of AIVs

Since only one-third of farmers were selling AIVs, it was hardly surprising that the majority (88.7 per cent) said they would like to start selling or sell more than they currently did. This matches the 88.7 per cent of retailers who also said they would like to sell more. However, a variety of barriers to sale were cited, the most common being what almost half the farmers perceived as inappropriate climatic conditions, especially high temperatures in summer and low rainfall in winter. This was followed by a lack of land and a lack of ploughing services. Others, mentioned by more than 20 per cent of the farmers, were lack of capital, poor infrastructure and competition (i.e. too many sellers and too few buyers). The top three barriers mentioned by the farmers were those that affect the production rather than the marketing of AIVs, whereas the top three mentioned by the retailers were competition, low market prices and lack of capital (see Table 6).

4.3 Market surveys

For the sample period of November only one AIV vendor operated at Hammersdale and only two at Market Street, and even in the major markets of Chatsworth, Verulam and Victoria Street only a small minority of vendors sold AIVs. The highest numbers were found at Verulam, where almost one-quarter of the vendors traded in at least

Table 6: Barriers to greater production or sale of AIVs by farmers (percentage of respondents; $n = 165$)

Factor	Barrier	Total sample	Males	Females
Insufficient assets	Lack of land	33.6	44.8	30.4
	Lack of capital	31.5	17.2	34.8
	Poor infrastructure	21.7	27.6	20.5
	Lack of fence (theft/livestock)	6.3	10.4	5.4
Insufficient inputs	Lack of ploughing services	32.8	34.5	32.1
	Lack of good quality seeds	18.9	34.5	14.3
	Lack of labour	12.6	6.9	14.3
	No irrigation system/shortage of water	2.1	3.5	1.8
	Lack of own transport	1.4	0	1.8
	No fertiliser	0.7	3.5	0
Poor market	Too many sellers and few buyers	25.8	34.5	24.1
	Low market prices	13.3	17.4	12.5
	No/lack of market/no consumer interest	12.6	6.9	13.4
	Food taboos	0.7	0	0.9
Poor conditions	Climatic reasons	49.0	48.3	48.2
	High susceptibility to pests/diseases	17.5	20.7	17.0
	Infertile soil	0.7	0	0.9
Other	Sickness/too old/tired/no time	4.2	3.5	4.5
	No knowledge about farming/markets	1.4	0	1.8
	Conflict between members in the community gardening project	0.7	0	0.9

one AIV, while at Victoria Street less than 5 per cent did. Most stocked more than one species of AIV, with a mean of 1.6. Several were trading four or five different species. Across the three markets the most commonly traded AIVs were amaranth and taro (see Table 7).

4.4 The retail trade in AIVs in the Durban Metropolitan area

4.4.1 The nature of retail trading

All the retailers were selling one or more of the following food items: maize, potatoes, sweet potatoes, cassava, conventional vegetables, fruits and poultry. Of these, potatoes and other vegetables were the main items. Poultry was the only livestock traded. Most of the male retailers were trading leafy vegetables, followed by potatoes, with equal proportions selling maize and poultry. No male retailers sold fruit, although nearly one-third of the female retailers did. Less than 5 per cent of the female retailers were selling poultry. Most of the female retailers were selling leafy vegetables, followed by potatoes, fruits and then maize (see Table 8).

The number of different food items sold by each retailer was small. Most sold only one or two items, less than 2 per cent sold four and none sold more than this. No male retailers sold more than two main food items and half of them sold only one. About one-third of the female retailers sold one item, about 60 per cent sold two, less than 20 per cent sold three and less than 3 per cent sold four.

Table 7: Most commonly encountered AIVs at each market (percentage of stalls/vendors selling; $n = 941$)

	Chatsworth	Verulam	Victoria	Mean
Number of stalls surveyed	297	176	468	314
Stalls selling only dry goods (%)	42.4	25.0	3.8	3.7
Fresh goods – including AIVs (%)	17.5	23.9	4.7	15.4
Fresh goods – excluding AIVs (%)	40.1	51.1	91.5	60.9
Of those stalls with AIVs – species stocked				
Amaranth	50.0	47.6	40.9	46.2
Taro (tubers)	30.8	21.4	54.5	35.6
Arum lily leaves	40.4	19.0	0	19.8
Pumpkin leaves	13.5	21.4	13.6	16.2
Unidentified sp.	17.3	19.0	0	12.1
Okra	3.8	14.3	9.1	9.1
Dahl	1.9	19.0	4.5	8.5
Taro leaves	7.7	14.3	0	7.3
Sorrel	5.8	7.1	0	4.3

Table 8: Main food items and AIVs traded (percentage of respondents; $n = 55$)

	Food item	Total sample	Males	Females
Primary produce	Maize	21.8	12.5	23.9
	Potatoes/sweet potatoes/cassava	52.7	50.0	52.2
	Other vegetables	80.0	75.0	80.4
	Fruits	25.5	0	30.4
	Poultry	5.5	12.5	4.4
AIVs	Pumpkin/butternut leaves (white *boerpampoen*)	74.6	62.5	76.1
	Amaranth (*thepe*/*imbuya*)	67.4	75.0	67.4
	Taro leaves and tubers (*amadumbe*)	63.6	37.5	69.6
	Sweet potato leaves and tubers	52.7	50.0	54.4
	Cowpea (*dinawa*/*imbumba*)	20.0	12.5	21.7
	Dahl	20.0	37.5	17.4
	Black nightshade (*umsobo*)	10.9	0	13.0
	Spider plant (*lerotho*/*ulude*/*rirhudzu*)	1.8	0	2.2
	Okra (*mandande*)	1.8	12.5	0

For the total sample, the average number of years of trading AIVs was 13.2 $\pm$ 1.1 (between 2 and 45 years), with female retailers having sold for an average of 12.9 $\pm$ 1.1 years and male retailers for 13.7 $\pm$ 1.0 years. No retailer had been selling for less than 2 years, suggesting either a lack of new entrants or a high failure rate. One female retailer said she had been selling AIVs for 45 years.

Almost all the retailers (96.4 per cent) had sourced their AIVs from farmers, while 25 per cent and 17.9 per cent had sourced from wholesalers and collectors respectively. No retailers said they sourced their AIVs from middlemen. On average, each retailer had bought from 4.8 $\pm$ 0.6 farmers, with a minimum of one and a maximum of 20. Those

who had sourced from collectors sourced from an average of 2.0 $\pm$ 0.3, with a minimum of one and a maximum of four. Generally, the retailer was responsible for purchasing the AIVs from the farmer's home or farm and transporting them to market, using family cars (57.9 per cent), public transport (18.4 per cent) or rented vehicles (31.6 per cent).

Two-thirds of the retailers (69.8 per cent) had repackaged the AIVs after purchasing from their suppliers, mostly into plastic bags (84.2 per cent). Information about the cost and number of bags was limited as some used old plastic bags from home and others asked customers to bring their own bags.

4.4.2 Main AIVs traded

All the sampled retailers were selling one or more AIVs. Overall, they reported selling nine different ones: amaranth, spider plant, pumpkin/butternut leaves, black nightshade, cowpea, okra, sweet potato, taro and dahl. Most were selling three or fewer AIVs, with 20 per cent of respondents only selling one. Only 21.8 per cent were selling five or more. The most commonly traded AIVs were pumpkin leaves (74.6 per cent), amaranth (67.3 per cent), taro (63.6 per cent) and sweet potato (52.7 per cent) (Table 7). Dahl and cowpea were both sold by 20 per cent of retailers. Male retailers most commonly sold amaranth, while for female retailers it was pumpkin leaves or butternut.

In the absence of records the quantity estimates were poor, with many respondents simply saying they 'sell as much as they have, and then buy more'. Thus, if sales were brisk, they obtained more, if slow they delayed purchasing more stock. The quantities sold were also strongly related to the amount of time they spent in the market and the range and types of other goods they were trading. Full-time retailers earn more than those who only sell for a half a day or less, and those selling mainly AIVs will probably sell more than those offering a wide range of fresh produce. Thus the estimated quantities sold ranged from as little as 2 kg per month to over 800 kg. The mode was 70 to 140 kg for each of the top three AIVs per month. Retailers estimated that they sold 81 $\pm$ 9 per cent of what they purchased. The balance was either discarded or consumed at home. Several commented that at times they had to discard significant quantities because they had sold so little. This suggests that sometimes there is inadequate demand for AIVs.

Retailers identified four classes of trading partners who purchased their AIVs: households, middlemen, wholesalers and street vendors. Approximately 85 per cent of the produce was sold to households, with the balance spread about equally between wholesalers and street vendors, and an occasional middleman.

4.4.3 Gross income derived from trade

The survey question on income derived from AIVs revealed that many of the traders did not keep records or keep information about the AIVs separate from information about other food items they sold. Most were reluctant to even estimate what proportion of their total income came from AIVs, stating that it varied depending on the season, the day of the week, and when they had time to go and purchase more stock. Thus the figures in this study, which are based on information from the previous 2 months only, can only be regarded as indicative. With respect to the total sample, the average gross monthly income was R1792 $\pm$ 2130. Male respondents reported earning a 43 per cent higher average gross income than their female counterparts, R2237 $\pm$ 2185 and

R1567 $\pm$ 1735, respectively. The highest reported income monthly was R12 000, and the lowest R180. The mode was R450 per month.

4.4.4 Perceived barriers to greater retail sales of AIVs

Most of the retailers (88.7 per cent), whether male or female, said they would like to sell more AIVs. However, they were not selling more because of perceived barriers to trade, such as insufficient assets, insufficient inputs, poor markets, and poor conditions. More than 80 per cent of those who wished to increase their AIV sales saw high levels of competition as the most significant barrier, mirroring the farmers' perceptions about market barriers. Poor market prices (47.8 per cent), a lack of capital (43.5 per cent) and climatic reasons (32.6 per cent) were the next three most commonly cited barriers (see Table 9).

5. Discussion

Our study, which provides a comprehensive picture of both the cultivation and the marketing of AIVs in South Africa's third largest city, builds on the growing work on urban and peri-urban agriculture in South Africa over the last two decades (Rogerson, 1993; May & Rogerson, 1995; Webb, 1998; Slater, 2001; Reuther & Dewar, 2005). However, a major difference between the earlier work and ours is the focus on AIVs, previously examined only at rural sites (e.g. Wehmeyer & Rose, 1983; Shackleton et al., 1998; Dovie et al., 2007). This study's new contribution is to bring together knowledge about urban agriculture and AIVs.

Our finding that most farmers cultivating AIVs were middle-aged or elderly females with limited formal education and skills is at odds with work elsewhere on the continent which suggests urban agriculture is mainly the domain of males (Asomani-Boateng, 2002; Ashebir et al., 2007). However, we did not ask whether tasks or seasonal responsibilities were shared in the Durban production systems, as Yiridoe & Anchirinah (2005) found was the case in Ghana. Most of our sample had been born in what is now the metropolitan area (i.e. the city has expanded to encompass their formerly rural village), or had spent most of their lives there, which suggests that urban and peri-urban agriculture is not the domain of new immigrants. In keeping with previous South African and southern African

Table 9: Constraints to selling more AIVs – retailers (percentage of respondents; $n = 55$)

Factor	Barrier	Total sample	Males	Females
Insufficient assets	Lack of capital	43.5	57.1	40.0
	Poor infrastructure	17.4	0	20.0
Insufficient inputs	Lack of labour	23.9	42.9	20.0
Poor market	Low market prices	47.8	57.1	45.0
	Food taboos	2.2	0	2.5
	Too many sellers and few buyers	82.6	85.7	80.0
Poor conditions	Climatic reasons	32.6	28.6	32.5
	High susceptibility to pests/diseases	15.2	0	17.5
Other	(Too expensive to buy and resell, market stall is in poor repair, supply is inadequate in winter, the distance is too far to secure more)	21.7	42.9	17.5

studies showing that urban and peri-urban agriculture is largely, if not solely, the purview of those with few formal skills and hence limited competitive ability in the formal employment sector (May & Rogerson, 1995; Asomani-Boateng, 2002), our respondents mostly regarded themselves as farmers, housewives or unemployed. That said, the majority do not regard themselves as full-time farmers, and for many cultivation was an activity supplementary to the primary livelihood activities of the broader household, or a temporary activity until they found formal employment, or simply maintenance of a home garden. This is in contrast to East and West Africa where urban cultivators frequently view farming as their primary livelihood (Asomani-Boateng, 2002; Ashebir et al., 2007), possibly because there are fewer formal job opportunities. In comparison, farmers in Durban were not cultivating large areas, or farming or gardening as a full-time occupation, both of which are important factors in determining the production of surplus for sale. The average area of land was just less than one hectare, but the mode was closer to 3000 m^2. The primary area cultivated by most respondents (93 per cent) was the area around the homestead. The role of farming or gardening as a part-time activity fits the profile of multiple demands on women's time, which limit the option for many to engage in full-time income-generating activities (Mead & Liedholm, 1998).

All the farmers were cultivating a variety of crops, with AIVs being only one component. The dominant crop was maize, cultivated by almost 90 per cent of respondents. The farmers listed nine different AIVs that they were cultivating. Equally noteworthy though, was that over 95 per cent of households were also collecting wild AIVs, of weedy species such as *Bidens*, *Chenopodium* and *Amaranthus*, mirroring the statistics from rural areas (e.g. Shackleton, 2003). Similarly, Keller et al. (2006) found that wild species were more important than cultivated ones in four villages in Tanzania, and High & Shackleton (2000) found that one-third of the total value of trees and crops in homestead plots was from wild species. The three most frequently cultivated AIVs were pumpkin leaves, sweet potato and taro, all grown by more than half the respondents.

The bulk of the produce was consumed at home, with the result that most of the farmers were not selling AIVs or only in small quantities and at irregular intervals. In Accra, Asomani-Boateng (2002) found an increasing proportion of farmers producing for the market as one moved towards the city centre. Thus, farmers in the peri-urban areas were largely cultivating for home consumption supplemented by ad hoc sales, but city centre farmers occupied vacant land and sold most of their produce. The bulk of the farmers in Durban would be best described as peri-urban, although it is worth noting that it is difficult to define these zones as peri-urban since they are not static. Home production of AIVs and other crops is an important contribution to household food security and a strategy to save cash resources to cover other household expenses, such as school fees (Webb, 1998). This can be of significant value; for example, Shackleton (2003) showed that the direct-use value of home consumption of AIVs across several rural sites was just over R1000 per year (or approximately R1500 per year in today's terms). The value in urban and peri-urban settings would be greater because of the higher local prices. Nonetheless, the relatively small number of farmers from this study who were earning reasonable cash incomes from their farming activities in the urban and peri-urban areas (the mode was R30 per month), shows that most of the sample could be classified as 'home subsistence farmers' rather than entrepreneurial, as per the typologies of May & Rogerson (1995) and Van Veenhuizen (2006) and, furthermore, that scaling up to more market-driven production systems is unlikely for most,

due to lack of land, labour and capital – problems that seem to have been solved to some extent in West Africa.

The lack of significant trade, combined with the low levels of education, meant that none of the respondents kept records of yield, inputs or incomes. The bulk of the trade was local, in the same area or suburb in which the farmers resided. There was no value addition or processing, other than sorting out substandard produce. The primary AIVs sold were pumpkin leaves, sweet potato and taro. Many stated that they would like to sell more if the opportunity arose. The three most frequently cited barriers to producing more AIVs were unsuitable climate, insufficient land and limited access to ploughing services. Thus, the primary barriers to greater sales, in the eyes of the farmers, were related to production rather than demand. In contrast, the work of Keller et al. (2006) at several rural sites in Tanzania found that pests and diseases were the most often cited constraint to greater production of AIVs across sites. In contrast to other studies (e.g. Lynch et al., 2001; Asomani-Boateng, 2002) lack of or insecure land tenure was not mentioned.

The profile of the retailers was similar to that of the farmers in most respects except that they had typically received more formal schooling. Most were middle-aged females with low formal skills who had lived most of their lives in the metropolitan area. Unlike the farmers, most of the retailers saw retailing as their primary occupation. Most were selling a variety of fresh or dry products, or both, and only a few specialised in AIVs. In the actual formal markets, fewer than one-quarter of the retailers sold any AIVs.

Those who did sell AIVs typically stocked from two to five different types, mostly amaranth, taro and arum. In contrast, the retailers stated that the ones most in demand were pumpkin leaves, amaranth and taro. Interestingly, only about one-tenth of the farmers grew amaranth, even though it was common in the markets and mentioned by the retailers as the second most popular AIV. There was no value addition to the AIVs other than sorting and repackaging into smaller units, usually in front of the customer, which is typical of informal traders in general (Mead & Liedholm, 1998). Not surprisingly, most would welcome any opportunity to earn more income, but felt that there were insufficient buyers of AIVs because many people grew their own or collected wild species. Because of low demand, the local prices were low. Gender differences were relatively limited, but most striking was the dominant role of women both in cultivation and trade, although male farmers reported better incomes.

Overall, it is clear that there is limited trade in AIVs in the formal markets of the Durban metropolitan area, and nowhere near the amount of trade observed elsewhere on the continent, especially in West Africa (e.g. Lykke et al., 2002). However, consumption is widespread, with over 90 per cent of households reporting consuming their AIVs, either collected from the wild or grown at home, or both, and approximately half selling small surplus amounts to neighbours. The widespread availability of wild species and home cultivation probably limits growth in trade, and restricts it mainly to residents in the inner city who have very limited access to land, and to those in peri-urban areas who lack the time, physical prowess or inclination to cultivate the land at their disposal. A survey of customers in the marketplace would be informative in this regard.

In terms of policy considerations, this study suggests that agriculture does play some role in the livelihoods of the South African urban and peri-urban poor, and access to land and support services should therefore be promoted. Equally important is that AIVs make a large contribution to household food security, with almost all households collecting

them from the wild, a practice which may also be cultural or traditional (Cocks & Wiersum, 2003). Interventions would probably best be packaged with the suite of activities supporting the informal trade sector in general, while also ensuring compatibility with other livelihood activities (Scherr, 2004). In addition, providing local language information in public spaces such as commuter ranks and the formal markets would help promote awareness of the merits of AIVs, particularly their nutritional and traditional aspects. On the planning side, the role of urban agriculture in supporting livelihoods and providing green space in the metropole should be recognised by urban planners as one contribution towards developing sustainable cities and supporting the poorer sectors of society (May & Rogerson, 1995; Gockowski et al., 2003).

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