

# From past to future agricultural expertise in Africa: Jola women of Senegal expand market-gardening

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**Jola women farmers in the Casamance region of southern Senegal use their “traditional” knowledge and farming skills to shift crop repertoires and techniques so as to embark on market-gardening, thus innovating in response to new needs and perceived opportunities. The argument is relevant to present-day concerns about regional food systems and the role of women in securing an income and providing extra food for the family.**

With an annual rate increase in agricultural production of only 1.7%, but a 2.8% rate in population growth, it is evident that sub-Saharan Africa cannot feed itself (1). As a result, it is estimated that approximately 33% of its inhabitants are under-nourished (2). In fact, the number of poor people in the region has doubled, from 150 million to 300 million, in the past 20 years (ref. 3, p. xvii). This is the same period during which the World Bank has admitted to a neglect of African agriculture (as discussed later). Climate change has affected rainfall, and the value of African currencies has decreased on the foreign exchange markets. Economic conditions have been particularly adverse for rural innovation and growth. For >35 years, sub-Saharan Africans have been increasing food imports, mainly cereals, while decreasing commercial export crops so that these latter crops now constitute only approximately 20% of the GDP of member countries. Having been a source of exports during the mid-20th century, much of African farming is now devoted to food crops, grown by smallholders on plots measuring 0.5 to 2.0 hectares (ref. 3, p. xxiv) and sold to local and national markets. It is from this food production and the indigenous urban food supply systems that African farming needs to resume patterns of growth in the future.

It should be remarked at the outset that the damage caused to sub-Saharan Africa's agriculture by the indifference and neglect of large donors to the plight and the aspirations of farmers goes a long way toward explaining the under-performance of rural economies. Thus, in an Independent Evaluation Group (IEG) review of World Bank assistance, one of the largest sources of finance, candidly acknowledged “that the agricultural sector has been neglected both by government and the donor community, including the World Bank” (ref. 3, p. xi). The report emphasizes that “the Bank's limited, and until recently, declining support has been largely piecemeal and ‘sprinkled’ across several critical areas” (ref. 3, p. xiii). Thus, the lack of coordination existing within World Bank initiatives in sub-Saharan Africa among the various activities of research, extension, policy reform, credit, inputs, and so forth is responsible for its inability “to respond adequately to the agro-ecological diversity and the needs of diverse production systems” (ref. 3, p. 48). Given this situation, the IEG report makes several recommendations to the World Bank, among which are to focus on (i) improved irrigation and land quality, (ii) ways to make critical inputs available to farmers, (iii) increased research and technical skills, and (iv) ways to assess the progress, or lack thereof, of Bank-supported agro-ecological projects (ref. 3, pp. 72–73).

There are many lessons to be learned from the IEG report on the failure of the World Bank to address the challenges posed by agricultural development in Africa. Among these are the importance of taking a serious in-depth look at local communities

within their own ecologies, and the avenues open to local farmers to explore new options and find new avenues for agricultural innovation on a basis in established agricultural expertise and confidence. In the discussions that follow, I will focus on one such area, women's vegetable gardens, keeping in mind that one of the most critical factors in the recent success of this endeavor in certain places has been the willingness of non-governmental organizations (NGOs) to shift their attention to in situ practical support of women's creative initiatives. This shift in focus is in no small measure a result of NGOs showing the same willingness as the World Bank to evaluate critically the areas in which they have failed to foster the innovative productive efforts of local farmers in the recent past.

Casamance in southern Senegal has been the location of my studies for 40 years. It is by virtue of following agricultural dynamics in several villages in detail during almost two generations that I can tease out the technical, climatic, social, and political factors in the fluctuations in agricultural production. Senegal has not escaped from the general downturn in agricultural productivity. Thus, for the country, GDP growth estimates ranged from 4.2% to 4.6% in 2007 and decreasing to 3.9% in 2008. Even though >60% of the population is rural, with agriculture and raising livestock being the main subsistence pursuits, approximately one fourth of the country's population would be defined as under-nourished by international standards of anthropometry. In fact, >2 million Senegalese (of the nearly 13 million total population) confront food insecurity, half of whom face severe food shortages (4).

In Senegal as elsewhere, a number of factors account for the failures of the agricultural sector. Among these are the erratic rainfall of the past 20 years; the out-migration of young people; lack of roads and other infrastructure; absence of affordable farm inputs such as seed, plantules, and fertilizer; environmental degradation; and limited credit facilities. Policies have not been favorable. Skilled Jola rice farmers have struggled to maintain their complex system of irrigated and upland production.

Clearly, then, a crucial need exists to find new avenues to increase and diversify agrarian pursuits in Senegal as in the entire sub-Saharan region. From my studies in Senegal and those of others elsewhere, I argue here that knowledge is not at such low an ebb as policy. There is a great deal of accumulated expertise among farmers, and several decades of accumulation of research and experience, that are available to be drawn upon and extended.

One of the themes of scholarship before this 25-year decline in policy attention to African agriculture has been the importance of women in rural economies as workers, producers in their own right, artisans in primary transformation, market buyers and sellers, and custodians of local cuisines.

That earlier scholarship showed that women account for 60% to 80% of the agricultural labor in sub-Saharan Africa (5). Their

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important role in the production process here is so great that the economist Boserup (6) characterized the region as being dominated by “female farming systems.” Despite their prominence, however, women in many areas faced—and still face—gender bias, lack of access to cultivable land and credit, and absence of general education and specific agricultural training. Overcoming these impediments can encourage agricultural growth, provide women with independent incomes, ameliorate the family food and nutrition situation, and encourage environmental conservation (1). Returning in the 21st century to new directions that hold great promise for meeting the challenge of an adequate food supply and dynamic skill development in Africa, one urgent task is to engage women farmers seriously and effectively in the effort to augment food production for home consumption and for sale. This article shows how women have turned their past skills in production to new crops and new techniques.

**The Jola and Their Rice-Growing Systems.** The Jola have been among the most skilled rice producers of West Africa for centuries, growing both upland and flood rice in the inundated valleys and mangrove-lined river channels (*marigots*) lying along the flood plains and the tributaries of the Casamance River. They have produced mostly for home consumption, but their history tells us something about the gendered development of farming skills in complex rural economies.

Numbering approximately 400,000 persons, they live in numerous scattered communities located in the southwestern corner of Senegal known as Lower Casamance. Initially, they grew only the indigenous African species of rice known as *Oryza glaberrima*, then shifted to introduced varieties of the Asian species *Oryza sativa* (7). Their sophisticated rice-growing technologies include bunding the rice parcels to retain rainwater, cutting down the mangrove and then flushing out the salts, carving out deep fields surrounded by tall walls, and building sturdy dikes to keep the brackish *marigot* water out of their fields. Farmers in some communities raise fish in ponds along the tall dikes. The Jola distribute and circulate rainwater and fresh water from uphill springs among various categories of rice fields by cutting through, or plugging up, the bunds. Everywhere, they transplant the seedlings from numerous rice varieties into flooded fields, or direct-seed (i.e., broadcast the seed) into upland fields, during the 3-month rainy season (extending from June/July to September/October), and harvest the crop with a hand-held knife during the ensuing dry season.

Important regional differences underlie the Jola rice-growing cultures (8). In the southernmost area of Oussouye, where rice is grown in deeply flooded fields, men and women work side by side. During the dry season, women head-load enormous amounts of manure and spread it on their fields to fertilize them. After the rains have begun, men ridge and furrow the flooded rice parcels with the aid of a long shovel called the *kajandu*, and women gradually transplant seedlings of several rice varieties that have been grown in nurseries. When the dry season promptly arrives, causing the crop to mature, women harvest and bundle the rice panicles while their husbands help to carry them into their separate granaries.

North of the Casamance River, in the area known as Fogy, men also ridge and furrow the rice fields, but they spend a large part of their time preparing the upland fields where they grow, with the occasional help of animal traction, some millet and sorghum for the family, and groundnuts (i.e., peanuts) for sale. As in the Oussouye area, women plant and transplant the rice and also harvest the crop.

In a third Jola region called the Kalounaye, located in the upland valleys surrounding the town of Bignona, the gender separation of cropping tasks is complete. Men cultivate only the upland fields, where they grow some millet and sorghum for the household, but mostly groundnuts for sale. To plow their fields,

they regularly use animal traction and, quite often, also hire a tractor. Women tend to only rice. They prepare the rain-fed fields using a long-handled hoe, plant and transplant the fields, and do all of the harvesting of the rice crop, which they carry in bundles to their own granaries. This is the rice that feeds the family.

Beginning in 1968, and for nearly two decades, Senegal and adjacent countries suffered a severe drought that nearly wrecked the rice-growing system. Although the rains have come back—if not as abundantly as before, at least enough to still grow rice in flooded fields—other factors have caused severe inroads into the Jola subsistence system. In the most productive rice-growing areas, the migration of young men to Dakar and other large cities have caused the neglect and eventual collapse of the dikes protecting the mangrove-recovered fields. As a result, brackish water has invaded and ruined what were once the best-yielding fields. In other areas, years of drought have caused the salinization and total disappearance of all deeply flooded fields, so that only the second-best fields remain in production. Only in the upland valleys, away from the brackish water of the *marigot*, have the rain-fed rice fields survived the drought.

Most importantly, all Jola rice-growing activities, wherever they take place, suffer from severe labor shortages as young men and women leave the countryside to find work in the cities. If Jola rice-growing systems are to avoid stagnation or gradual decline, serious efforts need to be made to mechanize agriculture. Unfortunately, however, this enormous task would require substantial financial and technical inputs that are well beyond the reach of the Senegalese state.

In most Jola areas, then, the rice-growing system is in decline. Surfaces covered with rice fields are smaller than they once were, and those that are cultivated do not always yield more than, at most, 1,200 kg of rice per hectare. Upland crops such as millet and sorghum are being replaced by manioc, which is tolerant of dry conditions but not very nutritious; and maize, which is more nourishing but vulnerable to pests. In some other regions, groundnut cultivation is also contracting, bringing less monetary revenue to the household. Obviously, conditions are not the same everywhere, but, overall, traditional crops are not doing as well as before, and families are poorer and less well fed. For these reasons, it is imperative for the Jola people to find new ways to intensify agriculture and raise productivity. In these efforts, women are bound to play an important role, as they indeed do in all other agricultural activities.

Macro-dynamics, including the declining productivity of rice production and commercial crops, is only part of the story, however. An explanation of how Jola women became engaged in market gardening requires a local perspective. It is important to focus on how women’s creative efforts led them to seize perceived opportunities, and to enlist the help of experts with the technical know-how and commitment to facilitate their new ventures.

**Growing Vegetables for Sale.** Market-gardening is one of the ways in which African farmers intensify production. Numerous studies have demonstrated how men and women living in peri-urban zones, in the proximity of large markets and labor pools, have become engaged in producing and selling garden vegetables during the dry season (9–13). These endeavors contribute to dry season income, and hence to food security, and also strengthen gender and occupational identity (12). They also encourage cooperation between urban inhabitants belonging to various ethnic groups, and contribute to urban bio-diversity (9). In some localities, it is only men and boys who do the gardening (11), whereas in others women have become vegetable wholesalers (12). Overall, however, women are not as involved as men in urban and peri-urban farming because they lack land and cash to invest (13). This said, this kind of agriculture has, in many

countries, come under scrutiny for its hazardous practices, including irrigating with untreated waste water and excessive use of pesticides. Because urban and peri-urban farming supply producers with cash and city dwellers with a nutritious source of leafy vegetables, solutions must be found to modify dangerous practices.

Focusing on African women living in rural communities, their gardening activities have been analyzed primarily from the perspective of how they contribute to the food security of their households. Researchers have only secondarily focused on the monetary gains that these efforts bring to women's lives. Improving women's income, however, can bring substantial benefits in the form of cash to buy clothes for the family, pay for their children's schooling, buy necessary items for the household, and, when necessary, even purchase additional foodstuffs.

In the 3 Jola rural areas previously mentioned, namely Oussouye, Fogny, and the Kalounaye, women have adopted market gardening of vegetables in various forms during the dry season. The success of their endeavors depends upon the proximity of towns and hotels in which to sell their products, the accessibility of electricity to run irrigation pumps and hoses, the involvement of government extension personnel, and the interest of NGOs in helping women with their efforts. It also depends on having access to irrigation water in the off-season. Fortunately, however, the water table in most locales is within reach, facilitating the excavation of wells from which water is drawn by buckets suspended from pulleys.

Much has been written about the fact that African women do not own land, and hence have limited security of tenure (14). It should be emphasized, however, that even though Jola women do not own land, for it is the sole property of men and the patri-group, they have secure usage rights to the upland perimeters they convert into dry-season market-gardens. This is communal land, controlled by members of the various concessions, who turn over sizable tracts to their resident wives for them to plant with vegetables for sale. The market-gardening activities of Jola women in the communities discussed later illustrate how local conditions dictate the form and function of their vegetable plots.

It should be emphasized that the various factors making possible for Jola women to innovate are different in each of the communities considered here. Local conditions vary markedly among communities, so it is not surprising that the circumstances that allowed their efforts to take root also diverge. These conditions are important, for they highlight the unique local opportunities and constraints faced by enterprising women to charter new productive paths.

**Market-Gardening in Samatiit, Located in the Southern Oussouye Region.** Samatiit is a small community next to Elinkine, a village harboring several tourist encampments and a dock from which large boats take numerous persons to a few islands, including Carabanne, where they reside. The proximity of tourist hostels and offshore islands offer timely outlets for women to market their vegetables. An additional resource is the presence of an NGO nearby that is particularly committed to helping pursue new productive activities. It is the foresight and energy of the Samatiit women, however, that has made this new effort succeed. Particularly important is the fact that they, as well as all Jola women everywhere, are skillful farmers, having an extensive and practical knowledge of how to make plants grow.

Thus, for the past 2 years, the women of Samatiit have been cultivating a large vegetable garden, which for the time being they irrigate with water drawn manually from a well (Fig. 1). Federation d'Appuei pour le Department d'Oussouye (FADDO) is the Spanish NGO that dug the well, constructed the reservoir where women will dip their watering cans, built a fancy metal fence with a gate, and will shortly supply the pump that will



Fig. 1. A young girl from Samatiit waters her vegetable garden.

fill up the reservoir. The women are not charged for these constructions. Here, it should be noted that fences and wells/reservoirs are the most crucial structures that women's gardens must have, and these can be provided only by NGOs, with the monetary resources they command. Other items, such as watering cans, hoes, and seeds are within women's reach to acquire.

All women belong to a work association called *Kabongetor*. Belonging to corporate work is part of the local rice-growing tradition. Within the garden, each woman has a parcel where she plants onions, lettuce, tomatoes, cabbage, and cauliflower in separate beds (Fig. 2). They buy the seed from Federation d'Appuei pour le Department d'Oussouye. The fertilizer they use on their vegetable plots consists of droppings from chickens, goats, and cattle, which they mix with pounded shell. The crop is carried to Elinkine, but if there is a surplus, it is sold to the hotels of nearby Cap Skirring.

It is interesting to note that the men of Samatiit have little to do with the gardens their wives cultivate. Men do not provide any labor, nor benefit from the proceedings of the vegetable sales. Yet, in this community, husbands and wives work cooperatively in the rice fields. The explanation given by most women for keeping the men out of their market-gardens went something like this: "we have toiled long and arduous hours helping our husbands cultivate rice, so we have earned our independence and the right to keep all benefits for ourselves." In reality, however, men in this region spend long summer hours tapping wine from their *Elaeis guineensis* palm groves, so they have little time to help their wives with their gardens.

**Katinong, in the Fogny Region.** This community of Katinong is located inland, approximately 36 km from the large town of Bignona and at least 10 km from the secondary town of Baila. It is fairly isolated, because there are no tourist encampments or hotels nearby, and the dirt roads leading to it are often in bad condition. This is the reason why the women of the ward (*quartier*) called Linten have not made dry-season vegetable gardens for many years. They used to do so long ago, but were unable to keep the goats out of their gardens when their husbands refused to help them build an enclosure to protect their vegetables. The indifference of men to their wives' efforts goes a long way toward explaining why women had given up this option.

However, in 2009, the Linten women have a chance to make a common garden. To that end, they are pulling out the weeds from a 1-hectare parcel, to clear the area before the visit of a



Fig. 2. A Samatiit woman shows us the vegetables she planted.

local-born (and United States-educated) agronomist, who will bring a European with him. The presence of this local expert, and his European sponsor, have made it possible for the Katinong women to consider once again embarking on market-gardening activities. The agronomist and his companion had visited previously to talk with the women and hire a man to build an enclosure. The latter created only part of the enclosure and pocketed the rest of the money the European gave him. Dishonesty is one of the numerous hurdles that powerless women have to face. On this latter visit, however, the agronomist and his companion will verify that the parcel is clean before paying for a company to dig a well so that the women can water their vegetables. They will also hire another man to finish fencing the area, and keep a close eye on him that he does so.

After these works are finished, the Linten women plan to cultivate vegetables such as potatoes, tomatoes, cabbage, onions, and lettuce. They will try to transport their vegetables for sale in the Bignona market or, alternatively, engage traders to come to the village and buy the crop on site. If all these arrangements work out as envisioned, the women plan to enlarge their garden 1 hectare more and hence secure a small income for themselves. However, there is no denying that they face considerable marketing difficulties because the community is fairly isolated, and the roads to get to the Bignona market are often impossible to traverse.

**Falmeré, Near the Town of Bignona.** Less than 2 km from the large town of Bignona (population >30,000), the women living in the community of Falmeré cultivate a very large vegetable garden during the dry season. In this endeavor, they are helped by the NGO called Association pour le Développement du Yəmækei



Fig. 3. The drip-irrigation system of Falmeré.

(ADE), whose offices are in the adjacent town of Tangori. There are 34 villages in the Yəmækei commune. The vegetable garden the Falmeré women cultivate is a test trial by ADE, who in 2009 enlisted the women of other communities to also engage in the experiment. With the help of the Cooperation Française, ADE has set up an impressive system of drip irrigation in which an electric pump sends water up to a large elevated tank, from which water flows into pierced rubber hoses running along rows planted with onions and cabbage (Fig. 3). It is to be noted that Falmeré benefits from having electricity, and when this fails, a portable generator run on *gazoile* (gasoline) powers the drip irrigation system. More than any other innovation, drip irrigation saves the women countless hours of very hard work.

Outside this irrigated section, fresh water comes from wells, dug by local government agencies, from which the women haul up water using a heavy bucket tied to a rope, lifted by a wheel and pulley system (Fig. 4). Then they sprinkle the water on their crops with the help of watering cans. All ground preparation in the garden is done by women using the long-handled hoe called the *ebirai*. ADE provides them with seed for the onions that are planted in the drip-irrigated zone, and the *gazoile* for their pump, on credit. In the drip-irrigated area, women cultivate in a group. The money they make goes to reimburse ADE the sum of 35,400 CFA Francs (≈\$90 US) for the seed and *gazoile*.

Outside of the drip-irrigated area of the garden, women cultivate separately. They buy the vegetable seeds in stores in Bignona and Ziguinchor, the regional Casamance capital. They prepare beds (*planches*), which they plant with one kind of vegetable each, such as tomatoes, cabbage, peppers, radishes, okra, or carrots. Some women prepare two *planches*; others prepare as many as 10. The only fertilizer used is the dung from cattle, sheep, and goats; chemical fertilizer is considered toxic and hence avoided. Women water their vegetables once a day, in the morning. When the time comes, they sell their crop in the Bignona market or wait for buyers to come to the village and buy their vegetables to then be sold to hotels in the resort area of Cap Skirring located past Oussouye or transported for sale in the Senegalese capital, Dakar.

In the back of the vegetable area is a large parcel planted with sunflowers. Apparently, rows of male plants are grown in alternation with female plants. After the plants mature, the female plants are left to ripen as they glow yellow, and harvested to be converted into sunflower oil. Beyond the sunflower are rows of maize plants and, to one side, tobacco. These areas are the domain of women as well as their husbands, for the latter build up the ridges on which



Fig. 4. A Falmeré woman draws water from a well to irrigate her vegetables.

the sunflower plants grow. Hence, part of the crop belongs to them. This is interesting, for in Falmeré, during the rainy season, the gender division of agricultural labor is complete; women work solely on the rice fields, whereas men cultivate their plateau crops, namely millet and sorghum, and also grow fruit trees. However, in the section of the market-garden where sunflower, maize, and tobacco are grown during the dry season, wives and husbands share the benefits of their labor. It should be noted that these are commercial crops, usually grown by men. Also, because in this region, where Muslims make up the large majority of the population, men do not engage in palm wine gathering, as they do in Samatiit, so they have plenty of leisure time available during the dry season to work on this section of the garden. Moreover, there are a few technically competent men to install and oversee the electricity and run the generator that gives power to the drip-irrigation system.

### Conclusions

The huge benefits of long-term observations and understanding that comes with 40 years of long-term field research on Jola agricultural practices have allowed me to see how past expertise can inform innovation. Important insights and useful knowledge

can be gained from protracted observations of how and why various aspects of agrarian systems change in different ways and at different rates. Many otherwise laudable projects and programs by international agencies and NGOs lack a historical perspective, one that could increase their prospects for achieving their goals. Thus, an appreciation of the reasons why Jola rice growing efforts have met with increasing difficulties through the years helps to understand their need to charter new paths and innovate in other areas.

The vegetable gardens Jola women cultivate during the dry season are new and successful endeavors in which their skill and knowledge of agricultural matters plays a crucial role. It is undeniable that geographic location, the presence of NGOs, and various extension services have greatly facilitated these novel departures. However, it is women's extensive knowledge about plants, and how to make them grow, that is ultimately responsible for the success of their market-gardens. Their experience clearly shows that the farming confidence and familiarity of the past can help people become engaged in new undertakings with the self-confidence and determination that underscores substantial achievements.

These new efforts contribute to women's independence and reaffirm gender equality while also being an important source of cash. Although it is difficult to estimate the exact revenues women derive from the sale of their product because they do not keep a record of the various transactions in which they are involved, I estimate that they earn between \$75 and \$150 per season, with some women making considerably more. What is significant, however, is that women unanimously believe their work to be profitable and well worth pursuing. With the earnings they make, they buy clothing for themselves and their children, necessary items for their kitchen, and rice for the daily meals, and also pay for the schooling of their numerous offspring. It should also be noted that onions, cabbage, and tomatoes, when not sold because they are slightly spoiled or insect-damaged, are consumed by members of the producer's household or fed to their domestic animals. Hence, women's gardens also nourish the family.

Equally important is the role these gardens play in offsetting the gradual decline in the rainy-season production of rice and plateau crops. Not being subject to the vagaries of rainfall, the consequent fluctuation in the rice harvest, or the increase and decrease of the price paid for groundnuts, the women's vegetable gardens are a sustainable form of production. They are not only commercially viable but also ecologically sound. By improving soil conditions, preventing erosion, and combating pests, the gardens contribute to enriching the man-made environment.

As Hesseling (ref. 14, p. 15) has observed, "The ingenuity and tenacity of rural women is such that in some situations they know how to skirt handicaps and draw on their know-how. They have launched themselves into [the production] of food crops. They have made a specialty of this and have taken the opportunity to invest in the new urban markets where food crops have become 'merchandise'."

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1. Squire PJ (2003) Strategies for enhancing women's participation in sustainable agricultural development and environmental conservation in sub-Saharan Africa. *J Internatl Agricult Extension Ed* 10:5.
2. Benson T. Africa's food and nutrition security situation. *Intl Food Policy Res Inst* 37:1.
3. World Bank (2007) *World Bank Assistance to Agriculture in Sub-Saharan Africa: an IEG Review* (World Bank, Washington DC).
4. Integrated Regional Information Networks (IRIN) (2008). Senegal: food insecurity threatens 2.1 million. (IRIN, Dakar, Senegal).

5. Staudt K (1988) Women farmers in Africa: research and institutional action, 1972–1987. *Can J Afric Studies* 22:567–582.
6. Boserup E (1970) *Women's Role in Economic Development*. (St. Martin's, New York).
7. Linares OF (2002) African rice (*Oryza glaberrima*): history and future potential. *Proc Natl Acad Sci USA* 99:16360–16365.
8. Linares OF (1992) *Power, Prayer and Production: the Jola of Casamance, Senegal*. (Cambridge Univ Press, Cambridge).

9. Linares OF (1996) Cultivating biological and cultural diversity: urban farming in Casamance, Senegal. *Africa* 66:104–121.
10. Guyer J (1997) *An African Niche Economy: Farming to Feed Ibadan, 1968–88*. (Edinburgh Univ Press, London).
11. Freidberg S (2001) To garden, to market: gendered meanings of work on an African urban periphery. *Gender Place Culture* 8:5–24.
12. Freidberg S (2001) Gardening on the edge: the social conditions of unsustainability on an African urban periphery. *Ann Assoc Amer Geogr* 91:349–369.
13. Levasseur V, Kouamé C, Pasquini MW, Temple L (2007) A review of urban and peri-urban vegetable production in West Africa. *Proc Internatl Symp Horticultural Plants Urban Peri-Urban Life* 762:245–252.
14. Hesseling G (1997) Femmes, pouvoirs, sociétés. *Polit Afric* 65:3–20.