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Managing seasonality in West African informal urban vegetable markets: The role of household relations

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Abstract

Seasonality influences African informal agricultural markets, but existing literature inadequately explores its interactions with market actors' social relations and livelihood outcomes. Thus, agricultural commercialisation policy ineffectively supports such actors to manage seasonality. Across Bamako, Ouagadougou and Tamale, we conducted interviews, focus group discussions, and a survey of farmer and marketer profits across seasons. Hot, dry season lettuce transactions performed by marketers are more likely to make profit. Farmers and marketers rely on household and community relations and reproduce gendered skills to optimise profit and secure future income streams. Policies supporting household reproduction, and infrastructure, may best support their marketing activity.

KEYWORDS
agricultural markets, Burkina Faso, Ghana, Mali, performance, seasonality, social relations, West Africa

1 | INTRODUCTION

Informal African vegetable markets are socially and environmentally embedded. Economics has examined influences on farmer and marketer incomes in such markets, while social anthropology has been concerned with the interactions of household and social relations with market activity (Clark, 2010; Fairhead & Leach, 2005; Lyon, 2000; Plattner, 1985; Porter & Lyon, 2006). Neither discipline has effectively addressed the role of seasonality in small-scale informal African markets, and its interactions with income generation and social market relations, including gender dimensions. Exploration of seasonality in rural and urban African agriculture and food markets has

focused on agricultural commodity price fluctuations (Gilbert et al., 2016) and rural livelihood security (Longhurst et al., 1986). One result of this is that policy has also overlooked how seasonality shapes interactions between market relations and income.

Current agricultural policy across Africa has been strongly influenced by economic literature. It is largely guided by the African Union's Comprehensive African Agriculture Development Programme, focusing on agricultural value chain development, involving technical solutions and formal credit, seen as empowering women and smallholders. For example, Mali's Programme National d'Investissement dans le Secteur Agricole focuses on modernising and commercialising irrigated rural vegetable production, and Ghana's 2017 Planting for Food and Jobs (PFJ) policy provides grain crop farmers holding over a hectare with subsidised fertilisers, mechanisation services, hybrid seeds and access to export markets. Some policies do consider social aspects relevant to markets: the Burkinabé Programme National du Secteur Rural (II) aims to professionalize agriculture, but the sub-programme on agricultural marketing recognises that some aspects of marketing and production are situated in the context of households, lauded as diverse and resilient. Across these policies, integration of seasonal aspects is weak, partly because there is limited academic research on the interaction of seasonality with household and market roles and practices.

This paper combines insights from economics and social anthropology to understand how seasonality influences interactions between social relations and income in small-scale African informal agricultural markets. It draws on methods from both disciplines to show connections between natural and social worlds, hitherto less strongly highlighted in rural or urban agriculture literatures, but having social and policy implications. The paper advocates renewed academic attention to questions of seasonality in such markets, which will eventually inform policy to be more cognisant of the seasonal context male and female farmers and marketers operate within. By understanding how these people could better be supported to deal with seasonality, the work offers critical points for consideration in the design of development interventions.

The paper's objectives are:

1. to understand how seasonality affects the profits of farmers and marketers in informal African vegetable markets;
2. to understand gender dimensions of these effects;
3. to understand how men and women's social relations inform the ways they manage profit fluctuations that stem from seasonality; and
4. to suggest how people can be supported to make profitable transactions consistently across seasons.

The article uses data on profitability of vegetable transactions in three West African cities to understand how seasons affect the incomes of male and female farmers and female marketers. Our qualitative data show that people draw on social relations to counteract unfavourable crop responses to seasonal fluctuations. This involves negotiating relationships within and between household and occupational spaces and protecting and transferring gendered occupational skills and roles. Richards' notion of performance (1989, 1993) proves useful in uncovering these strategies.

The next section of this paper reviews key ideas on seasonal management strategies, social relations in market-farm households and performance. The results begin with a binary stepwise regression testing whether seasonality and the occupation and gender of the vendor affects the chance of a transaction being profitable. Qualitative data show the importance of roles, relations and skills. The discussion relates the notion of performance to the farm-market system, with reference to rural and urban agriculture literatures. The conclusion makes policy inferences.

1.1 | Coping with seasonality

Development economists describe how seasonal changes in crop abundance affect farm household livelihoods through food price fluctuations and subsistence supply (Devereux, 2009; Kaminski et al., 2016; Longhurst

et al., 1986). Market integration can help agricultural communities minimise negative effects on livelihood security—if people can generate income to purchase food throughout the year and avoid becoming net consumers when prices rise. Those who sell surplus may benefit from the typical patterns of staple prices rising through the farming season and falling after harvest. Yet this is only possible where adequate storage is available.

Different intrahousehold responsibilities mean that men, women and children experience seasonality differently (Devereux, 2009). Seasonal patterns work differently for crops traditionally associated with men and women in West Africa: though prices of vegetables (traditionally grown by women) fluctuate with scarcity as do those of cereals (traditionally men's crops), their perishability complicates storage. Vegetable trading has traditionally been a women's occupation. The details of how seasonality affects vegetable crop marketing at household level thus warrant further investigation not only as a food security issue but also considering its role in generating income for small-scale female marketers.

Strategies for dealing with seasonality include cash gifts and the sale of labour or assets such as livestock (Anderson et al., 2018; Khandker & Mahmud, 2012). Many are gendered, such as creation of women's insurance groups (Jiggins, 1986). Less tangible social management strategies have been less commonly investigated by economists, though Longhurst (1986) mentions how reciprocal social relations are used as an 'insurance mechanism' against seasonal fluctuations in household food supply in rural northern Nigeria. Contemporary agricultural policy generally encourages incorporation into formal systems of insurance and credit rather than these vernacular modes.

1.2 | Social relations in markets, farms and household

When such social relations have been studied in West African marketplaces, they have been theorised as mechanisms for dealing with information asymmetry and thus a form of longer term 'security' (Geertz, 1978; Plattner, 1985) or as 'social capital' (Golub & Hansen-Lewis, 2012). More broadly, they can be seen as a set of institutions for governing markets that are not neo-classical in form but neither entirely relational—what have been termed 'real' or 'people's' markets. In these markets, actors do not necessarily rationally maximise profits (Fairhead & Leach, 2005). The Sustainable Livelihoods framework highlights heterogeneous alternative imperatives of social network formation, optimisation and risk minimisation that inform individual and household strategies within these markets (Loison, 2015). Trust, and sometimes local market organisations (Lyon, 2000), are cast as ways to manage shocks and stresses, though seasonality is rarely recognised as such a stress in the economic anthropology literature. Farm and market businesses are thus understood as embedded in, or at least connected to, a household or social context.

Gender relations literature contributes to this understanding, showing that households comprise distinct but related individuals, who share relations of cooperation, conflict, competition and support, among others (Jackson, 2007). In these relations, they draw upon various aspects of their intersectional multifaceted identities, for example as women or men, household members and market actors. In contrast, contemporary policy constructions of 'agriculture as a business' pose the separation of household and business domains as a normative aim (e.g. https://agra.org/planting-for-food-and-jobs-revolutionizes-agriculture-in-ghana-agriculture/).

Development programmes and policies to address women's empowerment in agricultural value chains have begun to move beyond a focus on raising production of women farmers to addressing their more general involvement in value chains (Hoffman & Walther, 2017). Some recognise the well-recorded and longstanding role of women as powerful actors in West African agricultural markets (Bayer, 1985; Bellwood-Howard, 2017; Clark, 2010; Coquery-Vidrovitch, 1997), while treating aspects such as the role of market queens in an ambivalent fashion (e.g. Pepper, 2017).

1.3 | Agricultural performance

Richards' notion of agriculture as a performance (1989, 1993) describes how such social and environmental considerations as described above shape how people run their farms, in a flexible strategy which evolves over time: generally a growing season. Forward planning is as critical as ability to adapt to change; social mechanisms and skills as important as technical abilities and equipment, to the extent that they may be considered a form of habitus (Glover, 2018). Weather fluctuations, for example, may change immediate labour requirements, which are managed by gendered and generational social negotiations. The performance framework integrates environmental situatedness and social relations to explain agricultural practice. For example, Crane et al. (2011) show how agricultural performances are important in responding to climate change in the medium term. Markets have occasionally been conceptualised as an extension of the domain farmers perform within, for example with Sen (2018) showing how women may perform as tea 'entrepreneurs'. Yet the farm-household-market configuration has rarely been such a direct focus of attention as it will be in this paper.

2 | METHODS

2.1 | Study context

While field cropping in the West African savanna is dominated by maize and legume cultivation, urban and peri-urban agriculture contributes vegetables to urban markets, especially in the dry season where irrigation is viable.

Our three study cities are Bamako, capital of Mali; Ouagadougou, capital of Burkina Faso; and Tamale, a Northern Ghanaian secondary city. These were study locations for a larger project this research sat within, studying year-round production of field and vegetable crops in and around West African cities. Each represents the largest city in the savanna zone of the corresponding West African study country, with somewhat similar marketing and cropping systems and human development situations, facilitating comparison (Table 1). Although Tamale is a regional, not national, capital, it is the largest Ghanaian savanna city and the only one comparable to Ouagadougou and Bamako.

Rapid growth in all three cities has enveloped formerly rural farming locations, creating continuities between urban and rural agriculture, and development on former farming sites in city centres obliges farmers who used them to seek land towards the periphery (Kêdowidé et al., 2010; Nchanji et al., 2017). Urban agriculture persists both in isolated backyard farms and larger, more commercialised open-space sites, within which multiple farmers' plots are contiguously arranged. This study took place in these open-space farms. Within open-space areas, individual farmers'

TABLE 1 Study sites

Variable	Bamako, Mali	Ouagadougou, Burkina Faso	Tamale, Ghana
Population at time of study	c. 4.3 m (2017)	c. 2.6 m (2016)	c. 427 000 (2016)
Status	National capital	National capital	Regional capital
Main ethnic groups	Bambara	Mossi	Dagomba
Main religion	Islam	Islam, Christianity	Islam
Agro-ecological zone	Savanna	Savanna	Savanna
Mean temperature (Celsius)	27.46	28.17	27.96
Total annual rainfall (mm)	1098, in a single season	897, in a single season	1090, in a single season
2015 National HDI	0.442	0.402	0.579

Sources: www.populationdata.net, www.climadata.eu, www.undp.org and fieldwork.

plots are generally below a tenth of a hectare, diversely cropped and intensively managed (see Bellwood-Howard et al., 2018, for full description). Farmers' and marketers' incomes are poorly quantified. Seasonality is important to farmers and marketers: some farming sites flood in the rains, and the lack of irrigation infrastructure renders others non-cultivable in dry season. Minimal storage infrastructure accentuates the resulting fluctuations in vegetable supply—and therefore price—in the markets, meaning perishable crops such as leafy vegetables are mostly traded locally. Women dominate marketing in all three cities and may also farm, though much less commonly in Tamale. Household members may trade with each other.

Our study crops are lettuce, a temperate leafy crop, and amaranthus, a tropical leafy crop. These crops are commonly grown, traded and consumed across the three cities and across the three seasons that all study locations experience: the rainy season (approx. June–October); the cool, dry, windy Harmattan season (approx. November–February); and the hot dry season (approx. March–May).

Amaranthus can be grown using saved seeds, rarely requiring synthetic inputs. It flourishes in the rainy season, and the hot dry season if well irrigated. Lettuce seed is more usually purchased, its cultivation requires fertiliser, and it is difficult to maintain in tropical temperatures. It flourishes in the harmattan but requires intensive watering, especially in the hot dry season, and suffers diseases in the rains. Both crops are grown on beds, often raised but sometimes sunk in dry seasons. The leaves of amaranthus, which grows as a bush, can be harvested weekly, around four times before the plant is uprooted. Young plants are occasionally uprooted for sale. Whole lettuce heads are harvested at 8–12 weeks. In the 20th century, amaranthus was used in African soups and sauces, and lettuce in European salads. Now, both may be served, all year round, in various traditional and modern home and street food dishes, for example, lettuce garnishes for beans and amaranthus in the Ouagalais *babenda*, a rice and leaf stew.

2.2 | Study design

Our research design built on our comprehensive working knowledge of farms and markets in the study cities. First, we performed individual qualitative interviews in each city to confirm prior knowledge of agricultural system processes and address our second, third and fourth objectives. Secondly, we performed a quantitative survey of marketers and farmers, addressing our first two research objectives, through three hypotheses:

a. seasonality influences profits;
b. occupation influences profits; and
c. gender influences profits.

Thirdly, we addressed our second, third and fourth objectives through Focus Group Discussions (FGDs) in which farmers and marketers evaluated quantitative results and constructed expenditure ranking diagrams.

2.2.1 | Individual qualitative interviews

We interviewed respondents who were purposively selected, from accessible markets, on the basis of gender and occupation, as well as the crop they worked with and their willingness to participate (Table 2). Reviewing interview transcripts after 10–15 interviews in each city indicated content saturation. Interview schedules addressed seasonal patterns of crop cultivation, marketing and farming strategies, gender roles and farmer-marketer relations. Interviews were performed by a researcher fluent in local language or with a translator, audio recorded and transcribed into English and French.

TABLE 2 Individual interviews

Job	Crop	Ouagadougou	Tamale	Bamako	Total
Farmer (all male)	Amaranthus	2	3	4	
	Lettuce	3	5	4	
Marketer (all female)	Amaranthus	2	3	4	
	Lettuce	3	4	3	
	Total	10	15	15	40

TABLE 3 Survey Sample

Season	Occupational group	Crop	Ouagadougou	Tamale	Bamako	Total
Rainy season	Farmer	Amaranthus	50	50	0	
		Lettuce	51	50	0	
	Marketer	Amaranthus	50	50	0	
		Lettuce	52	50	0	
Harmattan	Farmer	Amaranthus	50	50	50	
		Lettuce	50	50	50	
	Marketer	Amaranthus	51	50	50	
		Lettuce	51	50	51	
Hot dry season	Farmer	Amaranthus	50	50	50	
		Lettuce	51	50	50	
	Marketer	Amaranthus	51	50	50	
		Lettuce	50	50	50	
Total			607	600	401	1608

2.2.2 | Quantitative survey

The survey recorded daily profits from farmers' and marketers' lettuce and amaranthus transactions.

Lettuce and amaranthus marketers and farmers were sampled across the three seasons in each city, between July 2016 and May 2017 (Table 3). They were asked about the most recent transaction they had made. We sampled equal numbers of farmers and marketers, obtaining a sample containing slightly more women than men (Table 4). The 2016 rainy season stopped in Bamako before we arrived in the field.

All markets and open-space farming sites in each city were randomly numbered. Within sites, enumerators conducted a census, visiting sites in random number order and interviewing every marketer and farmer who worked with lettuce and/or amaranthus until the quota of approximately 50 people in each category was fulfilled.

We recorded the season and city each transaction was performed in and the gender, occupation, crop traded, marital status, household headship and size, education, age and additional crops of the vendor, as well as how long they had been farming or trading.

We calculated daily profits, not profits per unit weight. This can be more meaningfully related to people's household expenditure responsibilities and livelihood needs, such as the daily need for food and water, and marketers could sell varied weights of produce each day. It was possible to record weight in marketplaces, but not farms, because farmgate goods were sold too rapidly for them to be weighed.

TABLE 4 Gender disaggregation

City	Occupational group	Gender	Frequency	% gender within occupational group
Bamako	Marketer	Male	0	0
		Female	201	100
	Farmer	Male	139	69.5
		Female	61	30.5
Ouagadougou	Marketer	Male	0	0
		Female	305	100
	Farmer	Male	164	54.3
		Female	138	45.7
Tamale	Marketer	Male	0	0
		Female	300	100
	Farmer	Male	290	96.7
		Female	10	3.3
Total	Marketer	Male	0	0
		Female	806	100
	Farmer	Male	593	74.0
		Female	208	26.0
Total		Male	593	37.0
		Female	1015	63.0
Total *N*			1608	

TABLE 5 Variables Recorded

Revenue	Expenditure	
Farmers and marketers	**Farmers**	**Marketers**
Revenue was divided into that received up-front and credit; default was noted	Paid non-family labour	Paid non-family labour
	Paid family labour	Paid family labour
	Food purchased at work, including for labourers.	Food purchased at work, including for labourers.
	Seed	Cost of goods
	Fertiliser	Transport cost
	Manure	Market toll
	Pesticide	Costs of plastic bag packaging
	Land rent	Other costs: including porterage and paying people to sweep around the stall.
	Irrigation water bill	
	Fuel for water pump	
	Other costs: including group membership dues	

Interview data informed how we recorded the profit of a transaction: highly complex in this unregulated, informal market system. We measured revenue and expenditure for each transaction (Table 5) from which we calculated transactional profit. Expenditure on 'food purchased at work' deserves explanation: when challenged that this was

not a work-specific expenditure, interviewees countered that home-cooked food cost less than that purchased outside the house. Those who took non-working children to work noted that they also incurred expense for the children's food.

Varying credit repayment times and different harvesting patterns across crops and cities made daily or weekly income and expenditure records inappropriate, especially for comparing farmers' to marketers' profits. We therefore recorded the number of days over which a transaction occurred in order to obtain daily profit for a given crop.

Daily profits were converted to EUR, which West African Francs (CFA) are pegged to. The mean Ghana Cedis (GHS)-EUR exchange rate was taken for the week before data collection began, as responses were retrospective.

2.2.3 | Modelling

We recorded 10.5% of transactions with zero or negative profits. For individuals and firms that aim to maximize profit, conventional microeconomic theory requires estimation of a profit maximising function of the form presented in Equation 1 below:

$$\pi = f(y, w, z) \tag{1}$$

where π denotes profit, f is a functional relation connecting profit to its determinants, y is output, w is a vector of input costs and z is quasi-fixed factors.

This profit maximising function works best where markets are complete and actors continue operating until their marginal revenues equal marginal costs, implying that household resources and social endowments matter less in their risk-coping behaviour (Hagos, 2003). Yet, when markets are incomplete, market actors' social capital becomes more important. Furthermore, prospect theory shows that economic actors are not always guided by rational profit and loss computations but that other social factors play stronger roles (Molla et al., 2020).

As outlined, we are dealing with such a group of socio-economic actors, whose basic goal in vegetable production and marketing is not necessarily profit maximisation, but who employ relational tactics to cope with seasonal income shocks and safeguard their livelihoods. Our individual interview data confirm this.

As the fundamental assumptions governing the conventional profit function do not hold in our context, we adopt a theoretically informed model which allows us to test the hypotheses listed in Section 2.2, which are suggested by interview data and the literature described in Sections 1.1–2. Following Simon (1959), Lau (1980) and Shi et al. (2011), we adopt the concept of profit satisficing, which relates to the probability of reaching a profit target conditional on other goals such as seasonal risk coping and maintaining social capital. Therefore, we estimated a stepwise binary probit regression of the form presented in Equation 2, where the dependent variable is a dummy indicating whether a transaction makes positive profits or not.

$$Pr(y = 1|x) = \Phi(xb + e) \tag{2}$$

where Pr denotes probability, $y = 1$ if a transaction made positive profits and 0 otherwise, x is a vector of socioeconomic and seasonal factors that influence the probability of making positive profits, Φ is the cumulative distribution function of the standard normal distribution, b is the vector of parameters that measure the effects of the independent variables on the probability of making positive profits, and e is the random error term. Among the vector of explanatory variables, x, we include seasonality, occupation and gender as the key determinants based on our leading hypotheses. However, the model also includes the other socioeconomic and demographic variables listed in Section 2.2.2 as controls, in order that any possibilities of those variables confounding the results of the key explanatory variables are eliminated.

This method allows us to compare farmers' and marketers' likelihoods of making profits, while considering other factors indicated as important in interviews, which could not have been done within a conventional profit function due to different input costs.

2.2.4 | Focus group discussions

Acknowledging that participants' situated knowledge may provide novel perspectives on our quantitative data, we used these as a prompt for FGDs. Few participants have statistical expertise, so we presented descriptive statistics of the survey data described in Section 2.2.2. We aggregated mean daily profit data by occupational group and crop and represented these on diagrams, showing the data relevant to each city (Figure 1). We presented these to female and male farmers and female marketers in FGDs in Ouagadougou and Tamale (Table 6).

We invited participants to relate patterns shown in the diagrams to their strategies for managing seasonal crop-specific price changes within their overall cropping portfolio, and how this interacted with relations between and within occupational groups and households. Finally, we asked how their trading activities connected to their household roles and responsibilities.

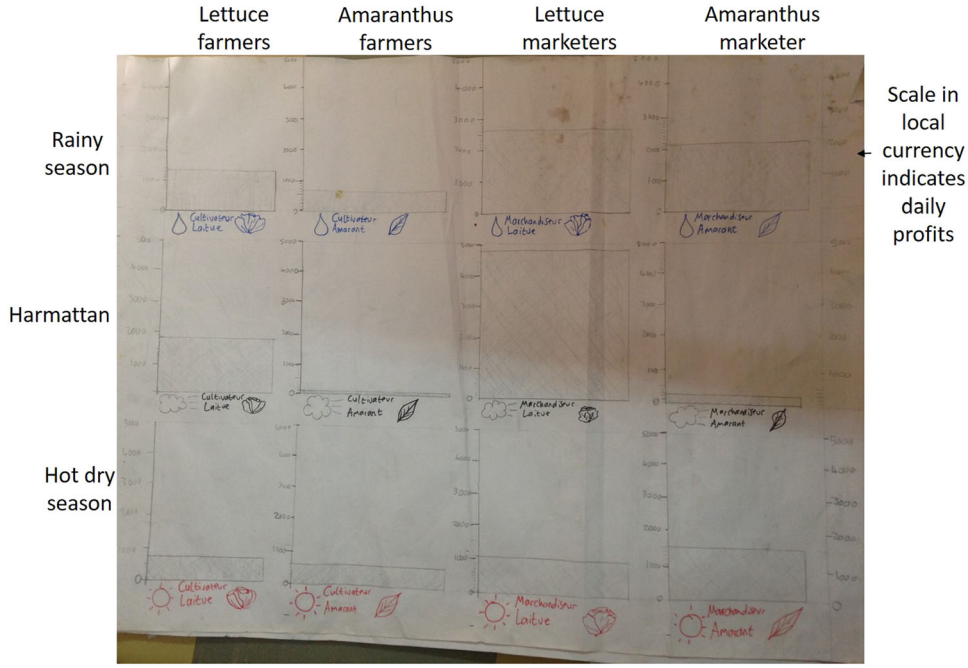

FIGURE 1 Diagram used in Ouagadougou FGDs [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 6 FGD respondents

Ouagadougou	Tamale
Five male farmers	Five male farmers
Five female marketers	Five female marketers
One male farmer, one female farmer/marketer, one female farmer and one female marketer	Three male farmers and three female marketers

FGDs ended with construction of an expenditure ranking diagram. Participants listed items they spent trading profits on, ranking how they prioritised spending on each item (Figure 2). If they considered an item important but another household member paid for it, it ranked lowly.

FGDs were conducted in local language. Alongside the facilitator, a translator simultaneously interpreted for researchers who did not understand local languages. Video and audio FGD footage was transcribed.

3 | RESULTS

3.1 | Variations in profit

This section shows how seasonality affects farmers' and marketers' profits, and gender relations of these effects. Table 7 presents results of the model used to see how seasonality, occupation and gender influence the probability that a transaction makes positive profits.

Transactions made in hot dry season are more likely to be profitable than those made in rainy season, except when a crop diversification variable is included. There is no statistically significant difference in the likelihood of transactions making positive profit between rainy and harmattan seasons. Consistently, amaranthus transactions are less likely to be profitable than lettuce transactions. Marketers are more likely to perform profitable transactions than farmers, but men are more likely to make profit than women when we control for other variables. Also, being a household head increases the probability of making a profitable transaction, as does being in Tamale, while crop diversification reduces the probability of making a profit. Using credit does not make one more likely to make a profit, though farmers gave marketers credit of up to the equivalent of 763 EUR, with a mean of 116 EUR.

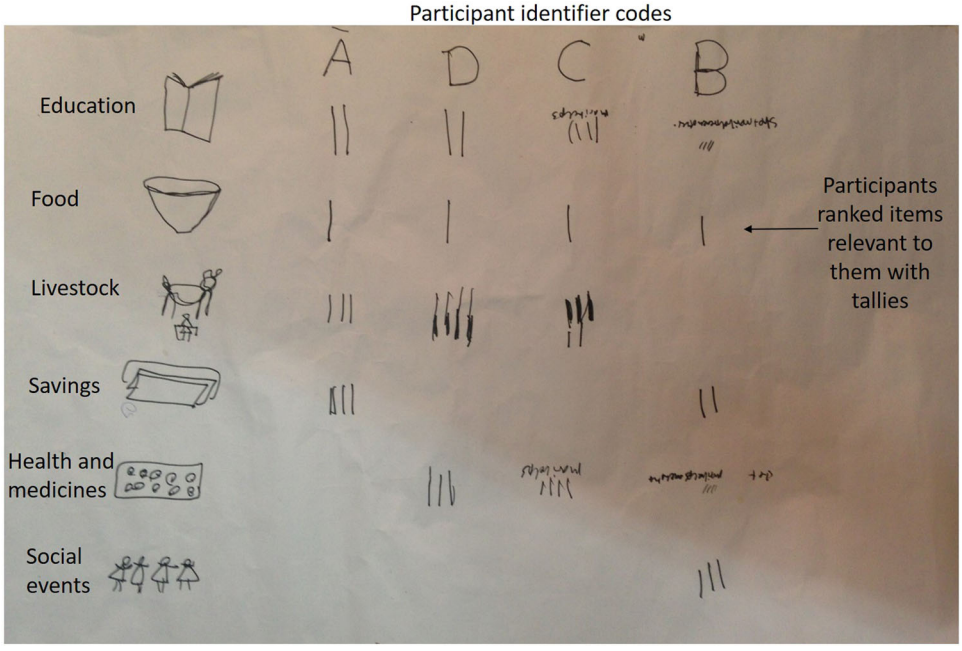

FIGURE 2 Expenditure ranking diagram, Ouagadougou [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 7 Estimates from stepwise binary probit regressions

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Hot dry season	0.074***	0.073***	0.073***	0.063***	0.059***	0.028
	(0.019)	(0.019)	(0.019)	(0.019)	(0.020)	(0.020)
Harmattan season	0.011	0.013	0.013	0.002	0.003	−0.015
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Amaranthus		−0.027*	−0.027*	−0.026*	−0.021	−0.027*
		(0.015)	(0.015)	(0.014)	(0.014)	(0.014)
Farmer			0.004	0.004	−0.064***	−0.079***
			(0.015)	(0.014)	(0.020)	(0.020)
Bamako				−0.013	0.005	−0.009
				(0.022)	(0.026)	(0.025)
Ouagadougou				−0.094***	−0.060***	−0.098***
				(0.016)	(0.019)	(0.020)
Sex (1 = woman)					−0.066**	−0.053*
					(0.029)	(0.029)
Credit					0.031	0.032
					(0.026)	(0.026)
Education (years)					−0.003	−0.003
					(0.002)	(0.002)
					0.000	0.000
					(0.001)	(0.001)
Household size					0.002	0.002
					(0.002)	(0.002)
Household head (1 if yes)					0.052**	0.051**
					(0.026)	(0.025)
Married (1 if yes)					−0.019	−0.019
					(0.016)	(0.015)
Experience					0.000	0.000
					(0.001)	(0.001)
Crop diversification						−0.022***
						(0.004)
Observations	1608	1608	1608	1608	1605	1605

*significant at 10% level ($p < 0.10$);
**significant at 5% level ($p < 0.05$);
***significant at 1% level ($p < 0.01$).

3.1.1 | Seasons and crops

When we showed FGD participants graphs of profit (e.g. Figure 1), they explained that agronomic characteristics of the two crops informed seasonal profit variations. As a temperate crop, lettuce incurs higher water bills, necessitates purchase rather than saving of seeds and has a higher failure rate. So householders purchase it rather than growing at home, and marketers capitalise on this. In the hot, dry season, both lettuce and amaranthus are difficult to irrigate and scarce, and prices rise so much that even low volume transactions are profitable. In contrast, the Harmattan and rainy seasons have differential effects on lettuce and amaranthus availability and price. Lettuce, a temperate crop, easily becomes diseased and stunted in the hot rainy season, so although prices are high, sales volumes are so low that total losses are common. The same is true for amaranthus, a tropical crop, during the cool, dry Harmattan. So only those with skills to grow and sell large volumes in difficult times outside hot dry season make profit.

> In rainy season … just people who really know how to farm lettuce (make profit). Some people can farm it and it doesn't produce well. (Male farmer, Tamale)

Producing 'quality' crops is also key to securing custom:

> It depends on good work in the field above all, which will give good quality crops, that lets you attract customers. But if you do bad work in your field, you'll harvest bad quality lettuce and then even if you call customers they won't come because you don't have quality. (Male farmer, Bamako)

Farmers' and marketers' incomes are therefore conditioned not only by the responses of crops to various conditions but also by the skill of farmers in growing them and marketers in selling them.

Farming skills aim to maximise quantity and quality and include managing soil water to lengthen the growing season; washing soil from lettuce leaves in rainy season to promote photosynthesis, and discouraging lettuce from curling in Harmattan. Marketing skills include storing leaves to minimise spoilage and building a wide enough network of skilful farmers to obtain large volumes of quality goods in the off season, while simultaneously managing these relationships so as to avoid accusations of being fickle in the season of abundance.

In 75% of transactions recorded, the responsible farmer combined lettuce or amaranthus with another crop. Though it led to lower transactional profits, by dividing the time and land of the farmer, cultivating multiple crops which perform well in different seasons is a risk-reduction strategy, enhancing resilience and guaranteeing year-round income.

3.1.2 | Occupation, gender and household position

Farmers in Bamako considered that farmers are less likely to make profits than marketers because marketers trade daily whereas many farmers cultivate only one crop at a time. Marketers make smaller investments over the course of their briefer transactions. Farmers invest larger sums into their fields and, over their crop cycles, suffer insect attack, flooding and livestock encroachment. Although their skills include timing their harvest to meet the most profitable markets; unpredictable floods, droughts and gluts can confound these plans. Unlike marketers, who buy on credit and can reject crops that seem unlikely to sell, farmers cannot change plans once they have planted. Farmers rarely default on costs: they usually pay for inputs up-front or receive them from their marketer, so they cannot default as she deducts the cost at the point of sale.

Nevertheless, men were more likely to make profit when other factors were controlled for, possibly because women have worse access to land or other farm inputs, or have acquired fewer specialist farming skills. This indicates that, in the case of marketing, a particular demographic group, women, has captured a less risky and more profitable niche occupation, reproducing it as a set of gendered skills.

> If someone has not already done marketing they don't really know how to go to the market. But if I go, I know how to cut it so it is good, and beautiful, so that it gets bought. How to sprinkle the water so it looks nice and people want to buy it and cook it. Men don't know how to do this, only how to farm. They don't know how to keep it looking attractive, all our tactics. If someone comes and they don't know the work, and their stuff is small and they go to sit in the market, they don't know how to do it, so that is why it is women's work. (Marketer, Tamale)

Transactions performed by household heads were more likely to make profit. Women in Ouagadougou emphasised that men always symbolically remained heads of non-widowed households. Also, female household heads, likely to be widows or single mothers, may have responded to pressure to earn more than women who shared household

responsibilities with a male household head. Data on intrahousehold relationships, described in the next section, suggest household heads may command preferential positions in transactions with household members.

3.2 | Social roles and relations

This section shows how people manage seasonal effects.

3.2.1 | Maintaining social relations to reduce shock

Many farmers and marketers were willing to endure losses in gluts or lean seasons to maintain relationships with certain trusted trading partners, which they would draw on in the next season if struggling to make trades.

> Farmers rarely abandon a trusted client to sell to someone offering a better price, because they are also working to preserve client relations. If, when the market is good, you sell to other people and leave your normal customers, during the bad period those temporary clients will disappear and leave you with your crops. Farmers also know that. (Marketer, Ouagadougou)

This reciprocal loyalty is essential to the market system and linked to the centrality of credit. Farmers described feeling pressurised to allow their regular customers, who buy on credit, to default, in the interests of maintaining trade avenues in subsequent seasons. Similarly, some marketers absorbed the losses incurred from spoilage in gluts, declining to 'cheat' their supplier farmers by refusing to pay for the credited goods. Alongside these long-term relationships, it is important to maintain a large contact base, to be able to sell perishable crops rapidly and flexibly at harvest time if one's regular trading partner cannot absorb produce.

3.2.2 | Trading within and for the household

These relationships were not only trade relationships, but often household, family or neighbourhood ties. Household members hardly ever acted as a firm, with marketer and farmer calculating one, shared profit pool. Yet male farmers and their marketer wives or mothers often established longstanding preferential trading relationships or conducted occasional transactions. Although trading with household members and neighbours did not give better prices, and could decrease short term profits, it engendered other financial and non-financial advantages, such as relaxed approaches to credit repayment and assistance at social events, for example weddings.

The majority of farmers and marketers shared the idea that productive roles and household responsibilities were linked, intending to use their profits for household maintenance. Across our 28 focus group participants, 16 named providing food for their family as the primary motivation for farming or trading, seven named family healthcare and four named education. There was a perception that one should 'help' household members, and in particular household heads, by making single trades with them when they lacked custom.

> It can be that, the people in the house, they can't sell all their stuff, so you have to help them and leave the outsiders for some time. When it's a glut and you're harvesting outside, you have to come back and help them. (Marketer, Tamale)

Male farmers perceived reciprocal trading relationships with their wives as advantageous, as she would spend her profits on the upkeep of their children. One said: 'If your wife harvests your goods she can't run away even if it's

plenty in the market. If the money she brings back is not plenty, at least it can be used for you and your family to survive'.

Despite this shared responsibility, there was an expectation of individual contribution towards it. For example, a female Ouagalais farmer explained that she and her husband farmed separate beds within their plot, calculating separate profits. A male farmer from Tamale considered there should be privacy between husbands and wives regarding their individual sales, even if they were each expected to support household reproduction through these productive activities. This implies relations of mutual responsibility but not necessarily trust within households, contrasting with the trust relations between some farmer–marketer business pairs.

There was one exception to the concept of linked productive and reproductive realms. Male farmers in one Tamale focus group preferred productive activities to be entirely separated from household relations, perceiving credit relations with marketers, especially those from their own households, as dangerous. One explained he preferred to avoid his wives working with him as farm helpers or marketers, in case they saw how much he earnt, and demanded 'clothes to attend parties in'. The ranking diagram these farmers produced showed they prioritised spending on personal education and technological devices, although food and health costs were close behind. They emphasised the conflictual, competitive elements of farmer–marketer relations. They described marketers making substantial profits as 'cheating'. Yet this group admitted they were the least successful on their own terms, claiming they were constantly obliged to trade with female relatives, who exploited them, forcing them to advance cheap goods on credit.

3.2.3 | Transferring and protecting gendered skills

Family and household relationships played another important role of skill transfer. Many explanations for the seasonal patterns described above emphasise the importance of developing specific farming and marketing skills, to prolong growing seasons and boost yields and profit into seasons of dearth. We encountered individuals guarding these skills to protect their occupational domain, for example a farmer who would not allow his regular marketer to help harvest his amaranthus leaves, because she tended to clumsily cut off the shoots which were required for re-sprouting into an abundant harvest the following week.

Marketing skill involved maintaining networks of contacts and locating goods and favourable prices, especially at the turnover of seasons, while concealing this from other marketers, and farmers. Tamale farmers frequently claimed that marketers used their superior knowledge to gain market advantage. A Ouagalais former marketer explained she had decided to turn to farming as she knew the workings of the market and supposed she would have an advantage as a farmer because no marketer could then outwit her.

Such occupational skills are developed tacitly, as children work alongside adult relatives and often inherit their businesses. Two-fifths of our survey sample engaged family labour to help them, and we observed that these assistants were almost always younger relations of the same gender. Women's childcare responsibilities also contributed: pre-school-age children and those who had finished a day's school were cared for in the workplace, where skills were tacitly transferred. Thus, marketing and farming expertise become gendered traits. Gendered occupational skills were seen as connected to household roles:

> Our fathers were farming and our mothers were taking (vegetables) to the market. They gave birth to us, and we were around our dad's feet, and our sisters also carried the stuff to the market. They didn't train us like (boys) taking it to the market … They didn't train us like that, even cooking … They trained us in farming … and the women's work is for the women, so work in the home and going to market. (Male farmer, Tamale)

Senior marketers proved an apparent exception. Through years of observation, they had gained farming expertise, which they conveyed to their supplier farmers. For example, some knew the optimum time to apply fertiliser and provided it on credit to their junior farmers at that moment.

The survey responses of several female farmers and marketers revealed that not only their performance but also their perception of reproductive and productive labour was inseparable. When asked about business expenditures, many women listed the cost entailed in feeding their children in the workplace, and 10 Ouagalais female farmers and marketers listed children's school costs and gifts made to colleagues at baby-naming and wedding ceremonies. While we did not count the latter in our profit calculations, these comments demonstrate that they viewed their workplace roles and profit-making imperatives as inextricable from their gendered household and social responsibilities.

The comments of focus group participants gave insight into other, discursive, mechanisms which gender farming and marketing occupations, involving shame, ridicule and humour. Female Burkinabe marketers stated in a FGD that 'Men should produce and women should be concerned with selling but if the men have to sell in the markets it's not good' and 'if men start selling the vegetables on the markets with us, we will leave it for them because that would be shame for the men, if men came here and started arranging sacks here with vegetables to sell, we would leave'. In Tamale, an executive of the farmers' association presented an imaginary portrayal of a male marketer as a ridiculous figure, saying that if a man was to carry a headpan to market as women conventionally did, people would broadcast it on the radio and tell his household members to come and watch him. This drew the intended laughter from the other female and male participants.

4 | DISCUSSION

4.1 | Seasonal performances

This paper confirms the observation of Hovorka et al. (2009) that '(urban) agriculture is embedded in ecological processes … with important gender-related implications'. Marketers and farmers do not passively experience seasonality, nor rely on external interventions to manage it. They mobilise social relations and protect and transfer their occupational skills in a system that intertwines farm, market and household. Because people aim to reduce and react to unpredictability across time, the major focus of their efforts is developing relationships of reciprocity they hope to rely on in expected and unexpected situations. The long-term relationships they develop, observed by Lyon (2000), Geertz (1978) and Trager (1981), and described by Plattner (1985) as 'equilibrating', are similar to Acheson's (1985) description of Maine's lobster markets in terms of their relation to seasonality. Acheson characterises the negotiation between lobster fishermen and dealers as an 'elaborate dance', describing the skills required to conduct transactions successfully across seasons of dearth and plenty. Richards' (1993) 'performance' similarly emphasises the importance of farmers using their agencies to respond, through the use of social relations and technical skills, to environmental change. The protagonists of this study adjust their performances in response to environmental unpredictabilities and heterogeneities. For example, if a farmer's crops fail, their regular marketer may be obliged to seek goods from a farming household member, who must then adjust the crops they allocate to other customers. Tentative plans are thus subject to constant alteration. As each actor operates within a given socially negotiated room for manoeuvre, they perform different elements of their intersectional occupational, household and gender identities. For example, the way female Ouagalais farmers attend each other's parties resonates with Richards' observations of how people maintain multiple relationships within the farming endeavour. Thus, the market is an extension of the 'stage' the farm–household actor performs upon as they respond to ecological variation (Glover, 2018).

The ability to draw on diverse strategies and resources is central to the performance's success. Long-term relationships are used alongside a wide contact base, so individuals can switch customers when necessary. This performs a similar role to the diversity of crops grown by farmers, long noted as a risk-reduction and resilience mechanism in farm systems studies (Upton, 1987): gains from one component balance losses from another, hence why many

farmers grow lettuce and amaranthus alongside other crops. This is also why spouses tend to trade with each other rather than act as a firm: having multiple businesses in a household, with different (though overlapping) contact bases, is less risky than one. Both spouses hope their trades will not fall through simultaneously. A resilient household survives as multiple members fulfil responsibilities to maintaining it, here, using cash from urban agriculture and market businesses. Literature on African urban agriculture has hitherto focused on antagonistic aspects of farmer–trader relationships (e.g. Hope et al., 2009), rather than the nuanced advantages and disadvantages that emerge when these relations are nested in household contexts. Intergenerational household heterogeneity is also important for transferring skills, as these are tacitly learnt through working with elder household members, ensuring that succeeding generations are equipped to contribute to household responsibilities across seasons (Bellwood-Howard & Alidu, 2018).

4.2 | Household and gender roles

Gender relations literature informs this understanding of the household as a heterogeneous set of interrelationships of men and women of different generations. Okali (2011) considers that neither conceptualisations of households as homogenous, nor composed of separated individuals, are useful: people's shared and divergent interests are more relevant (Okali & Keats, 2015; Whitehead & Kabeer, 2001). This understanding is central to the performance framework: Richards (1993, p. 74) notes how farm households and their structure are contingent on social negotiations such as marriage, often periodically renegotiated, but including performance of expected gender roles, for example of a husband to provide staple crops (Richards, 2018). The performance of such relations reinforces the construction of the roles people inhabit, which can be constraining and facilitating. The way this happens in the study settings is replicated across West Africa, as marketing is framed as a women's role, and women are constrained from urban farming by poor access to land, productive resources and knowledge (Hovorka et al., 2009).

Therefore, despite the tentative entrance of the 'farming as a business' discourse, the entwining of productive and reproductive roles and the mutual support of peers' businesses are still central to household survival strategies. Family members, particularly marketers, pressurise would-be individual entrepreneurs to remain in the cast of the household performance. In contexts such as Tamale, where women open-space farmers are uncommon, it is important for women to be able to retain access to household-based market routes.

This paper shows how debates over interactions of productive and reproductive labour described in the rural agriculture literature are reflected in urban settings (Slater, 2001), implying continuities between the two domains. Simultaneously, human and natural context matters (Freidberg, 2001; Hovorka et al., 2009), as the urban environment provides opportunities such as accessible markets. There is room for more work (e.g. in small towns) on how far urbanity influences the relations explored here.

More work is also needed to fully understand why marketing is more universally gendered than urban farming in West Africa, something often inadequately ascribed to 'societal norms' (Hope et al., 2009), and whether the emergence of a 'business farming' discourse is linked to the paucity of female open-space farmers in Tamale. Although farming is perceived as an acceptable female occupation in Bamako and Ouagadougou, a Ouagalais marketer suggested why some did not farm—brides with rural origins lack access to urban farmland. Differential land access may shape women's engagement in open-space farming across contexts. Women are more involved in backyard than open-space farming across Tamale and Ouagadougou.[1] Minimal access to land beyond their backyards may explain why women in Tamale rarely farm in open-spaces. Faced with this, and heavy household responsibilities, marketing is what they can turn to, and they therefore welcome construction of it as a women's role to protect their domination of it: remembering that it is more lucrative than farming. Marketing, requiring fewer immediate capital inputs, can also be more easily accessible.

These resource access factors may be part of the explanation, but are insufficient, as social relations can be invoked by men and women to access land or credit. Simultaneously, the cultural construction of these roles as

gendered deserves its own anthropological/historical study. Respondents concurred that female domination of marketing had persisted for decades. More work is required to understand how far male construction of farming as a business relates to female domination of marketing, and contemporary policy encouraging separation of productive and domestic domains.

4.3 | Skill, knowledge and power

While intergenerational skill transfer maintains the construction of farm and market roles as gendered over the longer term, individuals also manipulate their skills in the short term, in ways that consolidate the power they hold. Farmers attempted to protect practical skills. Yet the less tangible 'female' skills of the higher-earning marketers, more akin to knowledge, were arguably more valuable (Hope et al., 2009). Furthermore, senior marketers did not use their knowledge of farming techniques, such as timely agrochemical application, to farm themselves, but provided this to their supplier farmers at the right time, thereby maintaining control over them while continuing to perform a more lucrative, socially acceptable position. Hovorka (2006) suggests that such control of inter-personal power relations implies empowerment, showing urban agriculture and marketing can provide long- and short-term opportunities for individuals' strategic empowerment and status accumulation (Slater, 2001). Richards (1993) contrasted the dynamism of such 'performance' with what he perceived as the more static idea of Indigenous Knowledge. Yet these examples show how the two interact (Orlove et al., 2010): farmers' and marketers' spontaneous decisions and actions, a part of the performance, build on their skills and knowledge to react to less predictable aspects of the situation. Furthermore, this 'indigenous management skill' (Stone, 2004) is developed through social interaction, as individuals aim to maintain or consolidate power.

5 | CONCLUSION

This article has combined issues and methods conventionally associated with different academic disciplines to provide a full, contextually grounded understanding of informal agricultural markets. To formulate relevant policy to support people acting in such markets, decision makers must understand the logics informing livelihood strategies. It is already understood that African informal market actors are rarely profit maximisers. But there has hitherto been insufficient analysis of how seasonality informs the social workings of informal agricultural markets.

This article addressed four objectives.

Firstly, it showed that transactional profits fluctuate significantly across seasons, in different ways for different crops. High prices alone do not lead to higher likelihood of making profits: only those who are skilled at producing and selling vegetables can trade enough in seasons of dearth to make consistent profits.

Secondly, it showed that, although transactions performed by men are more likely to be profitable when other factors are held constant, transactions performed by marketers—an entirely female occupation—are more likely to be profitable. Marketing was constructed as a female occupation through the intergenerational reproduction of gendered roles and skill.

Thirdly, it showed that farmers and marketers aim to smooth the likelihood of making profitable transactions across seasons by forging and mobilising multiple social relations. They moderate profit-making in some seasons to be able to draw on reciprocal trading relationships in other seasons, often invoking kin and neighbourhood relationships. They encourage other household members to trade with them by invoking peers' responsibilities to assist household reproduction. This is a performance of their intersectional identities as gendered market actors and household members. 'Performance' in this context comprises technical and social responses to predictable and unpredictable changes in environmental and social conditions, and entails inhabiting different roles and drawing on different relationships in different situations. The inseparability and diversity of farms, households and markets is

therefore a source of resilience. An ideology of agriculture as a business is emerging but contrasts with this dominant successful mode of performance.

Fourthly, the article can now suggest ways actors can be supported to make consistently profitable transactions across seasons. If non-business relationships, household embeddedness and gendered skill transfer are sources of resilience, it is worth supporting community structures that businesses are embedded in, rather than promoting the notion of 'agriculture as a business' to the extent that it undermines community and household support structures. Indeed, Ghana's PFJ's overall aim of agricultural professionalisation has been criticised for excluding women, and undermining the types of actors encountered in the course of this research, who may not be aiming to professionalise, but to continue farming and marketing seasonally or part-time within a diverse, resilient livelihood strategy. A professionalisation discourse may even be associated with construction of farming as an exclusive male domain. Most market actors are already highly skilled and can obtain working amounts of interest-free credit. So, technical upskilling may be less helpful, and loans would only be competitive if interest-free or greater than could be obtained from an existing contact.[2] Appropriate complementary/alternative interventions include general safety nets which support the households within which men and women trade. Interventions like free healthcare, child benefit and school feeding programmes would alleviate reproductive household pressures on people such as our respondents. General infrastructural support, such as electrification and refrigeration in markets, decent roads, and municipal or cooperatively owned storage facilities, would also help people manage better across seasons (Gaye & Touré, 2009).

Such interventions could be combined with further research on the origin of gendered marketing roles and how these relations manifest in smaller towns. This would contribute to understanding and supporting rather than supplanting the extant environmentally and socially situated performances of women and men involved in small-scale urban vegetable farming and marketing.

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ENDNOTES

[1] The 2013–2014 data set reported in Bellwood-Howard et al. (2018) showed that, in Tamale, 71% of backyard and 85% of open-space farmers were male, while in Ouagadougou, it was 29% of backyard and 52% of open-space farmers.

[2] Over 116 EUR.

DATA AVAILABILITY STATEMENT

Data are available from the corresponding author on request.

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