Review Article

Contributions of urban periodic markets to sustainable rural development in Ghana: A rural web analysis

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ARTICLE INFO

ABSTRACT

There is a limited theoretical understanding of the importance of urban periodic markets (UPMs) for sustainable rural development in sub-Saharan Africa. This paper explores the value of UPMs to sustainable rural development by employing the rural web technique. The specific objectives are to (1) describe the characteristics of UPMs in Ghana, and (2) assess the effects of UPMs on the six indicators of sustainable rural development proposed by the rural web technique. Surveys and interviews were used to collect primary data in villages both in Ghana's more developed southern region and the less developed northern region. Our study finds that UPMs generate important socioeconomic interactions and enable cooperative marketing in both regions. UPMs shorten the food supply chains and create new types of rural-urban linkages, especially through farmers' direct participation. Farmers from across Ghana noted that UPMs create employment opportunities, and in turn, provide access to varieties of goods that are not locally produced. In northern Ghana, farmers' participation in UPMs enable cross-border trading with international buyers from Burkina Faso and Cote D'lvoire. The findings imply that the modernisation of UPMs could provide a critical pathway to achieving sustainable development objectives within rural Sub-Saharan Africa.

1. Introduction

Sustainable development remains a priority in the developing world, especially in sub-Saharan Africa where more than two-thirds of the population live in rural areas and produce food for a substantial proportion of the world's population. Various policies in developing countries seek to improve the livelihoods of the rural population, and eventually, achieve sustainable rural development (Ferris et al., 2014; Proctor, 2014; Walo, 2016).

Rural areas in developing countries face limited access to physical markets, decreasing returns for agricultural products, and weak socioeconomic linkages with urban areas (Food and Agricultural Organisation 2012). These problems are the reasons why poverty remains in rural areas in Ghana and elsewhere in sub-Saharan Africa (Fischer & Qaim, 2011; Ghana Statistical Service GSS, 2016; Houssou et al., 2018). Not only does rural poverty adversely affect the quality of life in rural areas directly, but also it exacerbates urban poverty by stimulating migration to urban areas (Rahman, 2004).

Many studies (e.g., Eff & Jensen, 2014; Karg et al., 2019; Owusu & Lund, 2004; Rambanapasi, 1997; Sabet & Azharianfar, 2017) found that periodic markets improve bottom-up development by strengthening local participation and rural-urban interactions. Periodic markets facilitate the distribution of rural products to urban areas, thereby empowering smallholder farmers to increase the commercialisation of agricultural goods in these markets and creating wealth for the rural population (Dokmeci et al., 2006; Ronsijn, 2014). About 85% of smallholder farmers in rural Ghana rely on periodic markets to improve their livelihoods (Acheampong et al., 2018; Angmor, 2012; Chagomoka et al., 2018; Karg et al., 2019; Yankson et al., 2016). The flexibility, coverage, and location of periodic markets in urban areas increase customer and trader numbers and associated activities and offer incentives for trading and value-adding (Dokmeci et al., 2006; Haggblade et al., 2010; Stifel & Minten, 2017). Periodic markets should therefore be given greater policy attention to achieve sustainable development outcomes amidst other rural development strategies. The further integration of periodic markets into rural development policies could help address rural problems in several ways. Nevertheless, there has been limited theoretical framing of the range of values these markets provide. This paper makes two important contributions to the literature on sustainable rural development. First, by drawing on the rural web technique, it explores how

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UPMs stimulate sustainable development in rural Ghana, where agriculture is linked with local resources and socio-environmental needs of society (Ghana Statistical Service GSS, 2022). Second, it provides support to development planners and rural development policymakers to reconsider UPMs as means of achieving sustainable development objectives in rural areas.

2. Periodic markets

Periodic markets occur at a definite place with agreed regular intervals, involving face-to-face interactions between farmers and wholesalers, retailers, and direct consumers. Periodic markets occur less often than daily markets. As shown in Table 1, a model for periodic markets is flea markets in Denmark and France (Petrescu & Bhatli, 2013); urban night markets in Singapore and Malaysia (Lee & Pearce, 2019; Hulme, 2018); and weekly markets in Iran, Turkey, and Belgium (Aram et al. 2019; Dokmeci et al., 2006; Ronsijn, 2014; Sabet & Azharianfar, 2017). Other model for periodic markets is farmers' markets in the United States and Australia (Elepu & Mazzocco, 2010; Freedman et al. 2016), UPMs and rural periodic markets in Ghana, Zimbabwe, Vietnam, and Guatemala (Acheampong et al., 2018; Yankson et al. 2016; Eff & Jensen, 2014; Karg et al., 2019; Masaru & Badenoch, 2013; Owusu & Lund, 2004; Rambanapasi, 1997). The markets differ, however, in their physical structures and the type of participants. The flea, urban night, farmers, and weekly markets, as well as rural periodic markets, involve primarily a neighbourhood's population. Participants in UPMs are from within and outside the market regions.

Periodic markets are a key part of many cities and may have been vital to their development. The number of periodic markets has increased in urban areas in developing countries, reflecting their capacity to function within expanding and modernising cities (Dokmeci et al., 2006). Increasing urban populations and demand for fresh farm products by urban consumers have generated several periodic markets (Ronsijn, 2014; Rozelle, Huang, & Benziger, 2003). About 74% of the periodic markets in Ghana were set up in urban areas in 2021, with more than 5000 people (Government of Ghana GoG, 2022a; Government of Ghana GoG, 2022b; GSS 2014).

The trading and consumption of rural farm products via the various models of periodic markets is increasing globally and is being considered a key mechanism for improving the sustainability of agri-food systems in rural areas (Forssell & Lankoski, 2014; Kini et al., 2020; Morshedi et al., 2017; Stifel & Minten, 2017). A significant proportion of goods traded at the UPMs is agricultural products and rural areas produce most of these products (Eff & Jensen, 2014; Ehinmowo & Ibitoye, 2010; Karg et al. 2019). Middle agents and rural farmers facilitate the distribution of farm products from villages into the UPMs (Fig. 1). In Ghana, agricultural products account for about 75% of all goods traded at the UPMs (Angmor, 2012; Owusu & Lund, 2004; Yankson et al., 2016).

UPMs attract a large pool of buyers, and they serve as import and export centres for farm products, thereby increasing the demand for those products (Fig. 1). The great demand for agricultural products at UPMs incentivises smallholder farmers to commercialise their products in those markets (Karg et al. 2019).

Table 1
A typology of periodic markets.

Type	Country
Flea markets	Denmark, Romania, France
Urban night markets	Singapore, Thailand, Indonesia, Taiwan, Malaysia, Hong Kong, Cambodia
Farmers' market	United States, Australia
Weekly markets	Iran, Turkey, Belgium
Urban periodic markets	Ghana, Ecuador, Ethiopia
Rural periodic markets	India, Zimbabwe, South Africa, Nigeria, Guatemala, Vietnam

The commercialisation of rural products at the various types of periodic markets has been explored in several ways. Acheampong et al. (2018) and Yankson et al. (2016) mentioned that rural households in Ghana commercialise their farm products at UPMs because those markets are mostly in the cities. Masaru and Natha (2013) found that the large commercialisation of rural farm products at UPMs in Vietnam was due to the proximity of the markets to the surrounding villages. Aram et al. (2019) and Dokmeci (2006) found that the rising prices of goods and services during the weekly periodic markets in Iran and Turkey, respectfully attract many smallholder farmers to sell large quantities of their produce at those markets. Gebrehiwot et al. (2018) stated that the time intervals between the UPMs in Ethiopia increased the commercialisation of farm products in those markets. Freedman et al. (2016) and Elepu and Mazzocco (2010) found that farmers' markets are the meeting place for farmers to increase the sale of fresh products and thus play a key role in the retail distribution system in developed countries.

There is a connection between the various types of periodic markets and sustainable rural development. Nevertheless, only a few studies have investigated the range of values those markets provide to rural regions. Eff and Jensen (2014) found that rural periodic markets in Mayan Guatemala contribute to rural development by increasing large-scale agricultural production: similarly reported by Madi (2004) in Nigeria and Wanmali (1980) in India. Rambanapasi (1997) found that rural periodic markets in Zimbabwe contribute to rural development by generating employment for the rural population. Rogerson (1997) studied rural periodic markets in South Africa and revealed that these markets can be a tool for rural development as they increase smallholder market participation.

The previous studies focused mainly on rural periodic markets, thereby limiting the identification of essential linkages between rural and urban areas. The study of UPMs within the context of rural and urban integration is vital because such integration creates reciprocal benefits for both rural and urban populations and sustains the operations of those markets (Sabet & Azharianfar, 2017). It should also be noted that contemporary periodic markets have moved from rural areas to urban areas due to the increasing rate of urbanisation. This paradigm shift of periodic markets in urban areas is essential for investigation because it can produce different insights into sustainable development in rural regions.

Further, none of the past studies employed a comprehensive theoretical framework to analyse the importance of UPMs, thereby limiting the role those markets play in areas such as rural territories' social, economic, environmental, and institutional characteristics. The focus of the past studies on spatial variations in terms of roles UPMs play between different regions to capture extensively how the effect of the markets varies across different locations is also lacking. This paper contributes to the literature by first, analysing the effects of periodic markets in urban areas on sustainable rural development. Second, the paper focuses on two different places, southern and northern parts of Ghana to understand the spatial variations of effects of these markets. Third, the paper employs the rural web as theoretical framework to broaden the scope of effects of UPMs on sustainable rural development.

2.1. Historical development of periodic markets in Ghana

The first periodic market was established at the north-western foot of the Manya Krobo in the Eastern part of Ghana in the early sixteenth century (Addo, 1988) with the purpose of providing varieties of agricultural products. A village that could not produce some farm products in large volumes had to depend on other villages for those products. However, villages in those days were far from one another. So, the village leaders in consultation with some of the elders established the Manya Krobo periodic market at a designated place where farmers from distant villages could commute to the market centre at least once a week to sell and purchase other goods. Over time, the periodic market begun to expand in terms of the quantity and diversity of products traded in the
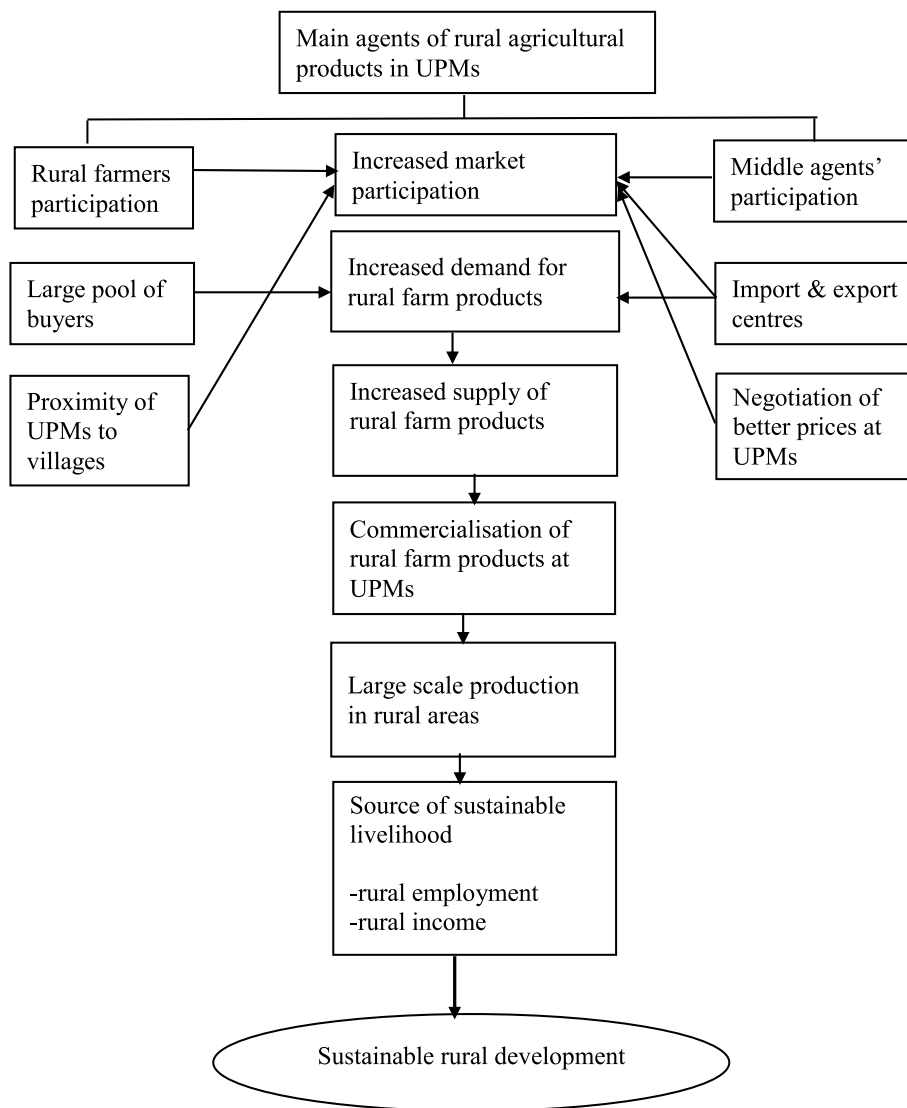
Fig. 1. Connections between UPMs and sustainable rural development.

market. Farmers shared knowledge about the growing of crops such as yam, plantain, and cocoyam from various ethnic groups during periodic markets.

Farmers in the Manya Krobo village realised that the soil was not suitable for yam, plantain and cocoyam and they moved to the southern part of Ghana where the cultivation of these crops were prominent. The migration of farmers brought about an increased distance between their original settlement and the existing periodic market. The migrant farmers, therefore, established new periodic markets at Asesewa, Akomakopa, Otrokpe, Sekesua, Bisa, Anyaboni, Apimsu, and Akuse to trade (Addo, 1988). These markets were close to the inland port projects, which facilitated the distribution of agricultural and manufactured products in those markets.

Between 1924 and 1950, periodic markets became relevant to economic development in Ghana and traditional leaders took absolute control over the establishment of these markets to raise funds to develop their villages as well as to attract people to live and farm in the villages (Addo, 1988). Traditional leaders collaborated with local councils, and they constructed roads to link villages to the periodic markets (Gordon, 1999). Gradually, periodic markets in villages moved to urban areas because of urbanisation (Ofori, 2012).

3. Research methods

As shown in Fig. 2, we selected four UPMs in the Ejisu-Juaben Municipality in the south Ghana and three UPMs in the Sissala East Municipality in the north Ghana. We chose these markets because they attract larger numbers of traders (Ghana Statistical Service GSS, 2022). These municipalities have many villages (Ghana Statistical Service GSS, 2022). UPMs in the Ejisu-Juaben Municipality are organised at Ejisu (the district capital), Juaben, Kwaso, and Boamadumase with populations of 12,898, 9085, 7427, and 5236 people, respectively (Government of Ghana GoG, 2022a). UPMs in the Sissala East Municipality are organised at Tumu (the district capital), Bugubelle, and Sakai with populations of 11,086, 6761, and 6426 people, respectively (Government of Ghana GoG, 2022b). These UPMs are set up in existing urban market spaces.

Primary data were collected from Timeabu and Korase in the Ejisu-Juaben Municipality and Kong and Kowie in the Sissala East Municipality (Fig. 2). We chose these villages based on three reasons. First, they are the nearest to the UPMs. Second, they are noted for the implementation of most pilot projects by the local council, thereby helping to ascertain the effects of those markets amidst other projects in the villages (GoG 2022; 2022b). Third, the villages produce larger volumes of agricultural products compared to the rest (GoG 2022; 2022b). The researchers classified the surveyed villages as South (Timeabu and Korase)
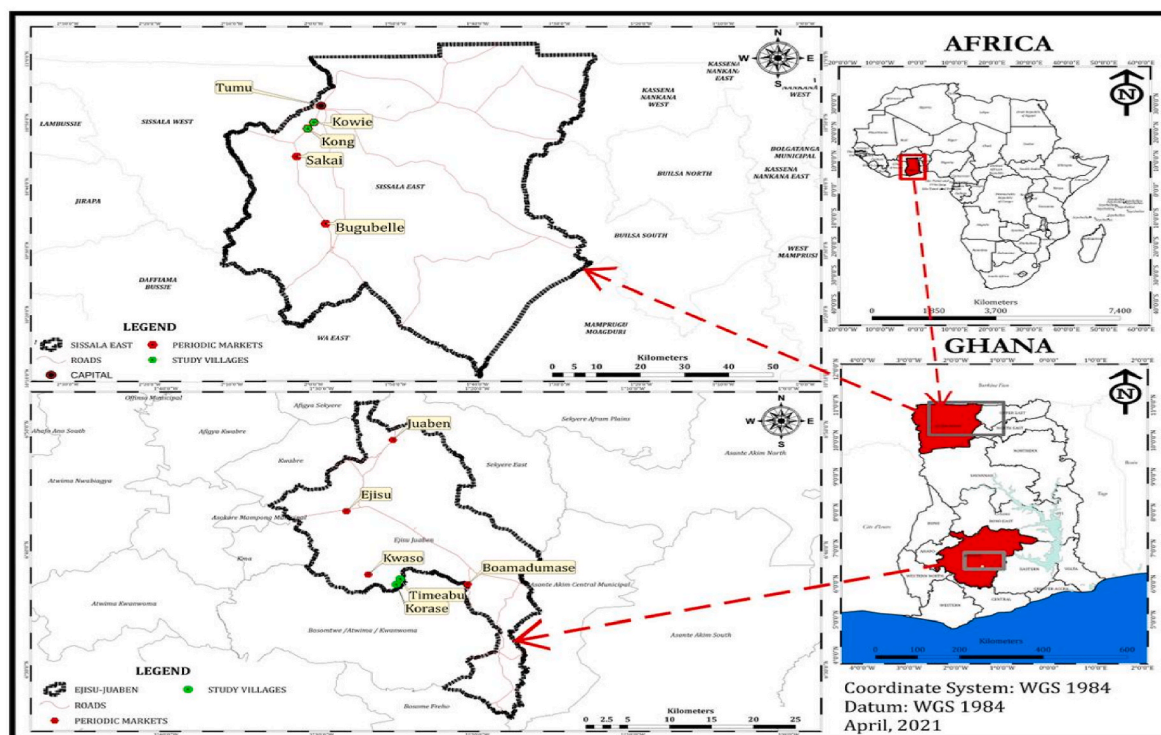
Fig. 2. Location of the surveyed areas.

and North (Kong and Kowie) to understand the spatial variations of effects of the UPMs on a more developed southern region and a less-developed northern region.

Of the total of 853 household population in the four surveyed villages, a sample of 400 was selected with 100 households from each village and roughly one in every two households chosen. We employed systematic sampling method to select 400 household heads from the sample frame. The equiprobability method was used in the selection process, where a household from the sample list was selected at random and then for every two intervals other households were chosen. Using this procedure, each participant in the population had a known and equal probability of being selected (Rea & Parker, 2014). The sample interval was obtained using the model below.

K=N/n, where n is the sample size and N, the population.

The study interviewed 40 village participants (10 from each village) using purposive sampling method, which helped to select qualified people or seek experts' opinions on effects of UPMs (Creswell, 2011). The participants comprised market and village leaders and local council representatives (locally called *assembly members*). These participants ensure the welfare of villagers by implementing projects to increase market participation. Further, the study included five heads of department, each from the Ejisu-Juaben Municipal Assembly and the Sissala East Municipal Assembly and ten project coordinators from non-governmental organisations (NGOs) in both municipalities.

A questionnaire-based survey was designed and used to collect data. The survey questions were classified into six sections, which covered effects of UPMs using six dimensions of the rural web technique. Survey questionnaire was used to cover many respondents in this research (Nardi, 2014). The questionnaire consists of both open-ended and closed-ended questions to increase response rate and to achieve uniformity of responses (Fowler, 2014). We also prepared semi-structured questions that involved a checklist of open-ended questions to collect qualitative data from respondents. Examples of questions in the questionnaire and interview guide were volumes of agricultural products sold at UPMs and daily markets in 2019. It also covered questions on social interactions and cooperative marketing during UPMs and the level

of farmers' participation in those markets. Validity of the data was achieved through three means. First, the choice of representative samples from a larger population and the gathering of data from different respondents enhance validity of research data (Nardi, 2014). Second, the combination of survey and interviews (triangulation) data from the same groups of respondents with similar responses also helps to achieve validity (Babbie, 2013). Third, an earlier reconnaissance trip to the surveyed sites helped to identify essential areas for examining the effects of the UPMs and to ensure the collection of valid data.

The questionnaires were administered through face-to-face communications using a combination of the English Language and local dialect (*Twi*). A face-to-face survey was necessary due to the lack of computer skills among rural households and unstable internet and telephone services in many villages in Ghana. The consent of participants was sought before the data collection, and they were assured of confidentiality of their responses. The data collection took place in May 2020 and ended in August 2020. The rural web technique was adopted to examine the values of UPMs in Ghana. This technique integrates traditional approaches, such as sectorial, multi-sectorial and territorial analysis of rural development, to generate a single robust and practical method to understand sustainable rural development. The technique explains a logical and precise way of collecting and analysing a large amount of data using its six dimensions presented in Table 2 (Guinjoan et al., 2016; Ploeg & Marsden, 2008; Ventura et al., 2008).

A binary logistic regression was used to examine effects of UPMs on the surveyed villages. The dependent variables are the six indicators of sustainable rural development, and the independent variable is UPMs measured around six areas as shown in Table 3 and Fig. 3. The binary logit predicts that UPMs have significant effect on the six indicators of sustainable rural development within the surveyed villages with a significance level of less than 0.05. A paired sample *t*-test was used to determine mean significant differences of effects of the UPMs.

The effect size of the paired sample *t*-test was calculated to measure the magnitude of the significant differences with the formula, $\sqrt{t^2}/t^2 + df$. Effect size of 0.10 is small; 0.30 is moderate; and 0.50 is large (Field, 2013). A Pearson moment correlation was performed to determine

Table 2
Dimensions of sustainable rural development within the context of the rural web technique.

Dimension	Description
Endogeneity	The degree to which rural economies are (a) built upon local resources; (b) organised according to local models of resource mobilisation, and (c) strengthened through the distribution and reinvestment of produced wealth within the local or regional constellation. These resources are primarily evidenced in the production of local foods driven by the ambition to provide economic and social benefits to rural areas.
Novelty production	New insights, practices, artefacts, or combinations (of resources, technological procedures, bodies of knowledge) that carry the promise that specific constellations function better.
Social capital	The norms and networks that enable people to act collectively or, more specifically, the ability of individuals, groups, organisations, or institutions to engage in networks and employ social relations for common purpose and benefit.
Governance of markets	Controlling and strengthening existing markets or constructing new ones, involving activities that encourage market participation of rural households.
Institutional Arrangements	New institutional constellations that solve coordination problems and support cooperation among rural actors.
Sustainability	Territorially based development that redefines nature by re-emphasising food production and agro-ecology and that reasserts the socio-environmental role of agriculture as a major agent in sustaining rural economies and cultures.

Source: Adapted from Marsden (2010).

significant relationships between effects of the UPMs and the six indicators of sustainable rural development.

Mixed-method research helped to broaden evidence on the scope of effects of the UPMs, with a more quantitative phase followed by a detailed qualitative phase of data collection and analysis (Creswell, 2011). The survey data were entered into the statistical package for social sciences (SPSS) software version 21 to generate descriptive and inferential statistics. The recorded interviews were transcribed in the English Language where necessary with the help of local language transcription experts. The interview data were entered into the NVivo software, analysed thematically, and presented using direct quotes.

4. Results

4.1. Effects of urban periodic markets on institutional arrangements

UPMs affect institutional arrangements through the formation of several cooperative marketing groups within the surveyed villages. About 72% of households in the South (Timeabu and Korase) and 78% in the North (Kong and Kowie) mentioned that they participate in the formation of marketing groups during the UPMs. For every family, three members in the South and five members on average in the North engage with marketing groups to assist their participation in the UPMs (Table 4).

The binary logit model shows significant positive effects of market participants ($p < 0.001$) and availability of buses ($p < 0.05$) on institutional arrangements with marginal effects of 0.188 and 0.184, respectively. Farmers who meet international or regional buyers at UPMs and have access to buses during those markets are 18.8% and 18.4% more likely to increase their engagement with cooperative marketing groups, respectively (Table 5).

Market leaders in the four surveyed villages explained why farmers form cooperative marketing groups during UPMs.

Farmers participate in cooperative marketing groups every market day so they can collectively engage a driver to transport their agricultural products to those markets at a relatively reduced cost (Interview data, 2020).

Table 3
Description of variables used in this paper.

Variable	Specific variable	Coding in the binary logic model
Dependent variable		
Endogeneity	Local food	Do not sell food crops at UPMs (No = 0)
		Sell food crops at UPMs (Yes = 1)
Novelty production	Value-added product	Do not sell value-added products at UPMs (No = 0)
		Sell value-added products at UPMs (Yes = 1)
Social capital	Social interactions	Number of interactions within villages is less than the average of 10 during UPMs (No = 0)
		Number of interactions within villages is more than the average of 10 during UPMs (No = 1)
Governance of markets	Market participation	Do not visit UPMs (No = 0)
		Visit UPMs (No = 1)
Institutional arrangements	Cooperative marketing	Do not engage with group formation during UPMs (No = 0)
		Engage in group formation during UPMs (No = 1)
Sustainability	Organic product	Do not sell organic foods at UPMs (No = 0)
		Sell organic foods at UPMs (Yes = 1)
Independent variable		
Purchasing at UPMs	Purchasing of farm and non-farm goods	Do not purchase at UPMs (No = 0)
		Purchase at UPMs (Yes = 1)
Market participants	Meeting regional or international buyers at UPMs	Do not meet regional or international buyers at UPMs (No = 0)
		Meet regional or international buyers at UPMs (No = 1)
Market frequency	Frequency of visits to UPMs	Number of times farmers visit UPMs per month
Market growth	Number of visited markets	Number of UPMs visited by a farmer per month
Market location	Distance	Number of kilometres to UPMs
Availability of buses	Availability of buses in villages during UPMs	No availability of buses during UPMs (No = 0)
		Availability of buses during UPMs (No = 1)
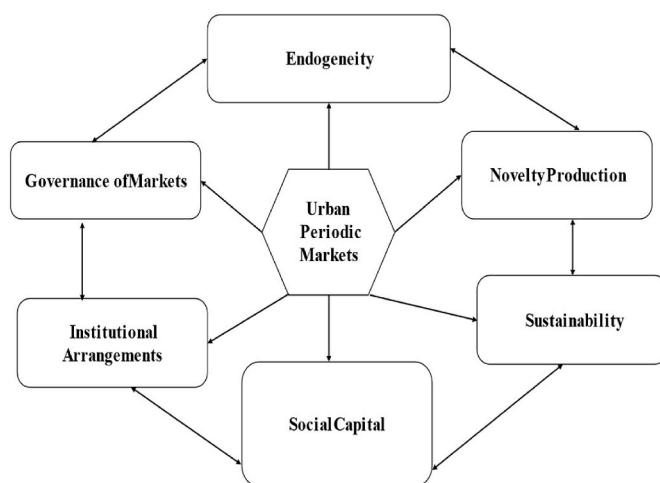
Fig. 3. Conceptualisation of effects of urban periodic markets on sustainable rural development.
Source: Adapted from Marsden (2010).

Table 4

Number of households who participate in cooperative marketing groups during urban periodic markets.

Participation	South	North	Total
Total	200	200	400
Engage with marketing groups	144 (72.0%)	156 (78.0%)	300 (75.0%)
Do not engage with marketing groups	56 (28.0%)	44(22%)	100 (25.0%)
Mean average of households who engage with marketing groups	3.02	5.01	4.02

UPMs also affect institutional arrangements through family commitment. For every family, four members in the South (Timeabu and Korase) and four members on average in the North (Kong and Kowie) support their family during the UPMs (Table 6).

The interviews found that during the UPMs most household heads engage their family members in loading and unloading farm products, selling at the markets, and their involvement in head porterage. A market leader at Korase stated that:

> We are a family of fifteen people and I receive support from at least five of them during the Kwaso and the Ejisu Periodic Markets. They assist me to gather crops from the farm and transport them to those markets. They also do head porterage to earn money to support the family (Interview data, 2020).

4.2. Effects of urban periodic markets on social capital

The average number of times households interact in exchanging goods and services within their villages during the UPMs was eight in the South (Timeabu and Korase) and eleven in the North (Kong and Kowie) (Table 7). A paired sample *t*-test with an effect size of 0.81 for the South and 0.71 for the North shows a larger significance difference ($p < 0.001$) between the number of times households interact during UPMs and non-UPMs (i.e., daily markets). The binary logit model shows a significant positive effect of market participants ($p < 0.05$) on social capital with a marginal effect of 0.205. Farmers who meet international or regional buyers at the UPMs are 21% most likely to increase their interactions within and outside their villages.

The village interviewees said that during the UPMs, farmers interact and transact with people from nearby villages and middle agents from outside their village. Leaders of village associations at Kong and Kowie said that:

> We have observed that anytime the Tumu or the Sakai Periodic Market operates, middle agents from the Techiman Regional Market

Table 6

Support from family members during urban periodic markets.

Engagement	South	North	Total
Total	200	200	400
Family support	91(45.5%)	78(39.0%)	169(42.2%)
No family support	109(54.5%)	122(61.0%)	231(57.8%)
Mean average of family involvement	4.44	4.34	4.39

Table 7

Household interactions during urban periodic markets and non-urban periodic markets.

Number of interactions	South		North	
	Urban periodic markets	Non-urban periodic markets	Urban periodic markets	Non-urban periodic markets
Total	200	200	200	200
1–5	32(16.0%)	167(83.5%)	28(14.0%)	157(78.5%)
6–10	126(63.0%)	6(3.0%)	91(45.5%)	6(3.0%)
11 & above	42(21.0%)	0(0.0%)	81(40.5%)	1(0.5%)
None	0(0.0%)	27(13.5%)	0(0.0%)	36(18.0%)
Average	8.27	2.32	11.01	2.40
t-test	28.03	–	20.41	–
Effect size	0.81	–	0.71	–
Df	399		399	
p-value	0.00[a]	–	0.00	–

[a] Statistical significance was set at a *p*-value of 0.05.

Table 5

Binary Logit of effects of urban periodic markets on the indicators of sustainable rural development.

Variable	Endogeneity		Novelty production		Market governance		Social capital		Institutional arrangements		Sustainability	
	B	Marginal effects	B	Marginal effects	B	Marginal effects	B	Marginal effects	B	Marginal effects	B	Marginal effects
Market location	0.003 (0.013)	0.009	0.004 (0.009)	0.001	0.003 (0.013)	0.001	−0.003 (0.008)	−0.001	0.004 (0.013)	0.002	0.011 (0.009)	0.015
Market frequency	0.086 (0.054)	0.145	0.105 (0.050)	0.022*	0.059 (0.053)	0.103	−0.013 (0.048)	0.003	0.066 (0.053)	0.023	−0.072 (0.074)	−0.008
Market growth	−0.034 (0.131)	−0.005	0.018 (0.120)	0.005	−0.025 (0.129)	−0.003	0.029 (0.118)	0.008	−0.016 (0.128)	0.003	0.213 (0.163)	0.308
Market participants	1.015 (0.304)	0.167***	0.656 (0.271)	0.135*	1.036 (0.301)	0.175**	0.912 (0.263)	0.205**	1.089 (0.298)	0.188***	2.533 (0.405)	0.364***
Purchasing	−0.517 (0.283)	−0.085*	−0.550 (0.251)	−0.113*	−0.370 (0.274)	0.073	0.454 (0.234)	0.975	−0.374 (0.271)	0.137	0.200 (0.293)	−0.025
Availability of buses during UPMs	1.086 (0.381)	0.179***	−0.317 (0.280)	−0.065	1.006 (0.365)	0.170**	−0.279 (0.254)	−0.063	1.069 (0.365)	0.184**	0.000 (0.313)	−0.000
Model χ²	31.762***		17.679***		29.485***		25.413***		33.009***		83.215***	
−2 log likelihood	434.950		496.997		441.808		537.591		450.604		434.950	
Nagelkerke R²	0.115		0.061		0.106		0.083		0.117		0.284	
Hosmer & Lemeshow Test	p > 0.05		p > 0.05		p > 0.05		p > 0.05		p > 0.05		p > 0.05	
Correctly predicted	76.8%		68.5%		76.0%		65.8%		75.0%		77.0%	
N	400		400		400		400		400		400	

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Model χ² represents the goodness of fit (omnibus test of model coefficient), Standard errors in parentheses.

in Ghana and the Leo Periodic Markets in Burkina Faso visit Kong and Kowie and interact with farmers (Interview data, 2020).

Similarly, the market leaders interviewed at Korase added that:

A leader of the Plantain Market Association at the Agogo Regional Market has connections with farmers in Korase. The leader visits Korase during the Ejisu or the Kwaso Periodic Market to interact with farmers. The leader provides financial support to farmers to grow plantain (Interview data, 2020).

4.3. Effects of urban periodic markets on governance of markets

Most households, including about 76% in the South (Timeabu and Korase) and 77% in the North (Kong and Kowie), participated directly in UPMs as sellers. Only a few (24%) of the households were sellers in daily markets (Table 8). The direct participation of households in the UPMs constituted 85%, within the economically active age cohort (25–54 years) in the South and 89% in the North. The average visit to the UPMs per household per month was five times in the South and two times in the North. The binary logit model found a significant positive effect of market participants ($p < 0.05$) and availability of buses ($p < 0.05$) on the governance of markets with marginal effects of 0.175 and 0.170, respectively. Farmers who meet international or regional buyers and have access to buses during the UPMs are 17.5% and 17.0% most likely to increase their participation in those markets.

An officer at the Sissala East Municipal Assembly said that:

The Tumu Periodic Market in the district capital is close to the Leo Periodic Market in Burkina Faso and the Bouake Periodic Market in Cote D'lvoire, which enables farmers to meet foreign buyers. Many farmers in Kong and Kowie visit the Tumu Periodic Market to trade in foreign currency with international buyers, exchange ideas and learn different cultures (Interview data, 2020).

It is also easier and more convenient for farmers to access the UPMs than the daily urban markets. The market leaders at Timeabu and Korase shared a similar view:

If a farmer wants to sell at the daily markets in the city, he or she must rent a store. Farmers in Timeabu and Korase do not have enough money to rent stores at the daily markets because they are expensive. During the Kwaso, Ejisu, Boamadumase, and the Juaben Periodic Markets, farmers have access to the urban markets without hiring stores, making it convenient for them to sell their farm products (Interview data, 2020).

The local council representatives interviewed at Timeabu and Korase shared a similar statement:

The Ejisu, Kwaso, Boamadumase, and Juaben Periodic Markets attract drivers to Timeabu and Korase, despite the bad roads. During the Ejisu or Kwaso Periodic Markets, for instance, we see between 20 and 30 buses in Timeabu and Korase. However, less than five buses commute to Timeabu and Korase when there are no UPMs (Interview data, 2020).

4.4. Effects of urban periodic markets on endogeneity

As shown in Fig. 4, about 70% of the total crop production in the South (Timeabu and Korase) and 75% in the North (Kong and Kowie) were sold at UPMs. Agricultural products sold by households in the South and North at the UPMs were 76% and 95%, respectively significantly larger (t-statistics = 13.168, df = 399, $p < 0.001$) than the volumes sold at the non-UPMs, with an effect size of 0.55 (Fig. 5).

As shown in Fig. 6, the quantity of food crops sold at the UPMs was substantially larger than the quantity purchased at the same markets, with 47% and 90% difference for the South and North, respectively. A paired sample t-test with an effect size of 0.51 for both South and North shows a larger significance difference (t-statistics = 11.862, df = 399, $p < 0.001$) between the volume of food crops sold and purchased at the UPMs.

The binary logit model found a significant positive effect of market participants ($p < 0.05$) and availability of buses ($p < 0.001$) on endogeneity with marginal effects of 0.167 and 0.179, respectively. Farmers who meet international or regional buyers and have access to buses during the UPMs are 16.7% and 17.9% most likely to increase the sale of agricultural products to those markets.

4.5. Effects of urban periodic markets on novelty production

About 64% of households in the South (Timeabu and Korase) and 74% in the North (Kong and Kowie) sold value-added products at UPMs (Table 9), constituting 327 tonnes and 390 tonnes, respectively (Fig. 7).

The binary logit model found a significant positive effect of market participants ($p < 0.05$) on endogeneity with a marginal effect of 0.135. Farmers who meet international or regional buyers at UPMs are 13.5% most likely to increase the sale of value-added products at those markets.
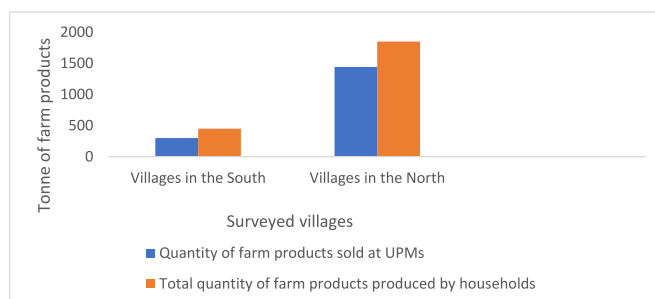
The market leaders at Korase and Timeabu mentioned that:

Farmers in Korase and Timeabu prefer to sell value-added products directly at the Kwaso, Boamadumase and the Ejisu Periodic Markets. Farmers who trade in these markets know that value-added products are largely purchased by students and caterers, especially during the reopening of schools and the enrolments of new students. They receive reasonable prices for value-added products in those markets (Interview data, 2020).

4.6. Effects of urban periodic markets on sustainability

Table 10 shows the volume of organics foods sold at UPMs and the number of households who sold those products. About 5% of households in the South (Timeabu and Korase) and 39% in the North (Kong and Kowie) sold 0.05 tonnes and 1.8 tonnes of organic foods in the UPMs in 2019, respectively.

The binary logit model found a significant positive effect of market participants ($p < 0.001$) on sustainability with a marginal effect of 0.364. Farmers who meet international or regional buyers at UPMs are 36.4% most likely to increase the sale of organic foods at those markets.

Table 8
Market participation of households.

Participation	South	North	Total
Total	200	200	400
Sellers in UPMs	151	153	304
	(75.5%)	(76.5%)	(76%)
Sellers in daily markets	49(24.5%)	47(23.5%)	96(24%)
Average visits to UPMs per household	5	2	3.5
Average distance to UPMs (Km) per household	11.5	10.6	11.1

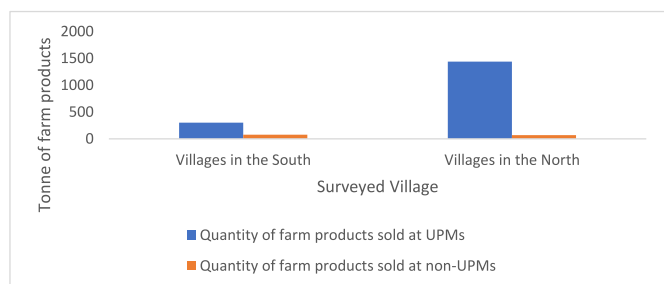**Fig. 4.** Proportion of farm products sold at urban periodic markets in 2019.

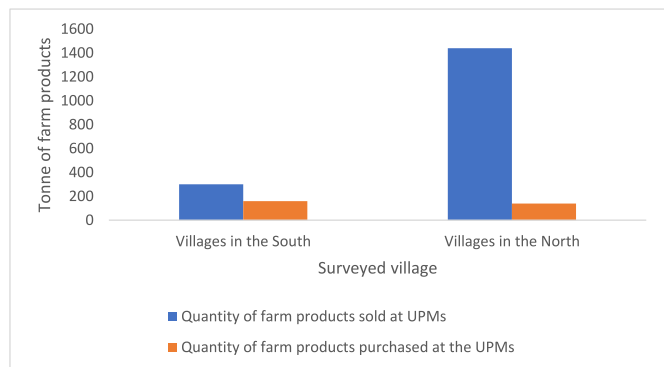**Fig. 5.** Farm products sold at urban periodic markets and non-urban periodic markets in 2019.

Fig. 6. Farm products sold and purchased at urban periodic markets in 2019.

Table 9

Number of households who sold value-added products at urban periodic markets and non-urban periodic markets.

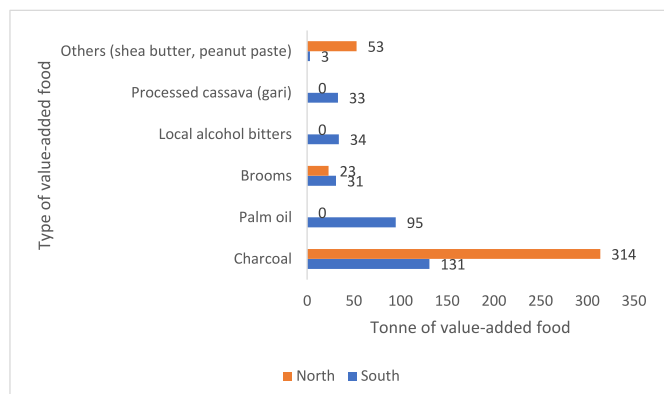| Sale	South	North	Total
Total	200	200	400
Sale in urban periodic markets	128 (64.0%)	147 (73.5%)	275 (68.8%)
Sale in non-urban periodic markets	72 (36.0%)	53 (26.5%)	125 (31.2%)
Tonnes of value-added products sold in urban periodic markets	327	390	717

Fig. 7. Volume of value-added products sold at urban periodic markets in 2019.

Table 10

Volume of organic foods sold in urban periodic markets in 2019.

Sale	Number of households who sold organic foods		Tonne of organic food sold in urban periodic markets	
	South	North	South	North
Total	200	200	0.05	1.823
Sell organic foods	9	78	0.05	1.823
Do not sell organic foods	191	122	0	0

An organic farmer who was also a market leader at Korase explained that:

> Farmers who visit the Ejisu, Kwaso, and the Juaben Periodic Markets receive information from the local council officers about the importance of organic farming and the higher prices attached to organic foods. The information encourages farmers to produce organic foods (Interview data, 2020).

A market leader at Kowie added that:

> I sell maize and soya bean at the Tumu and Bugubelle Periodic Markets. In many cases, buyers ask me whether I sell natural foods and they believe that farmers in villages produce these foods. My conversation with buyers during the Tumu and Bugubelle Periodic Markets draws my attention to inquire more about farming organic foods (Interview data, 2020).

4.7. Correlation results of effects of urban periodic markets

The effects of the UPMs on institutional arrangements (group formation) were significantly correlated ($r = 0.828$; $p < 0.05$) with the effects on social capital (frequency of farmers' interactions) (Table 11). The positive correlation indicates that when farmers form marketing groups during the UPMs, they increase their interactions with many people.

Similarly, the interviews revealed that cooperative marketing groups during the UPMs generate social interactions. Leaders of a village association at Timeabu and Korase had this to say:

> When farmers form marketing groups during the Kwaso and the Ejisu Periodic Markets, they socialise with many people, including farmers from nearby villages and share information about the prices of commodities (Interview data, 2020).

The paper found a significant relationship ($r = 0.172$; $p < 0.05$) between the effects of the UPMs on institutional arrangements and the effects on governance of markets (level of farmers' direct participation). The positive relationship suggests that setting up marketing groups during the UPMs increases farmers' direct participation in those markets.

The market leaders interviewed at Kong and Kowie explained that:

> Farmers visit the Tumu or the Sakai Periodic Markets more often whenever they participate in cooperative marketing groups, especially during the opening of those markets (Interview data, 2020).

There were significant positive relationships between the effects of the UPMs on institutional arrangements and the effects on endogeneity (volume of local food crops) ($r = 0.222$; $p < 0.05$), novelty production (volume of value-added foods) ($r = 0.146$; $p < 0.05$), and sustainability (volume of organic foods) ($r = 0.302$; $p < 0.05$). These results show that when farmers engage with marketing groups during the UPMs, they increase the volume of their local foods to those markets, including value-added and organic foods.

The paper found a positive significant relationship ($r = 0.275$; $p < 0.05$) between the effects of the UPMs on social capital and the effects on endogeneity, indicating that social interactions generated by the UPMs increase the sale of local food crops.

Table 11

Correlation between the six indicators of sustainable rural development.

Variable	Institutional arrangements	Social Capital	Governance of markets	Endogeneity	Novelty production	Sustainability
Institutional arrangements	1.000					
Social capital	0.828***	1.000				
Governance of markets	0.172**	−0.142**	1.000			
Endogeneity	0.222***	0.275***	0.210***	1.000		
Novelty production	0.146**	−0.134**	−0.021	−0.112*	1.000	
Sustainability	0.302***	0.353***	0.276***	0.441***	−0.143	1.000

Notes: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

The interviews revealed similar findings where an NGO officer in the Sissala East Municipality said this:

> The Tumu Periodic Market attracts people from several places, including middle agents from the regional areas. Middle agents who visit the Tumu Periodic Market are informed about villages in the Sissala East Municipality that supply the market with many crops. Knowing this, middle agents visit Kong and Kowie during the Tumu Periodic Market, interact with farmers, and transport large volumes of foodstuffs from these two villages to the other marketplaces (Interview data, 2020).

There was a significant positive relationship ($r = 0.210$; $p < 0.05$) between the effects of the UPMs on governance of markets and the effects on endogeneity. The positive relationship signifies that the increasing number of visits to the UPMs increases the sale of agricultural products in those markets.

Similarly, the leaders of village associations at Korase and Timeabu stated that:

> Farmers in Korase and Timeabu increase their visits to the Ejisu Periodic Market because they can sell large volumes of crops. The Ejisu Periodic Market is close to the major road linking the two large cities (Kumasi and Accra), universities and large manufacturing companies, which attract several buyers, including both private and commercial drivers who use the road (Interview data, 2020).

The market leaders interviewed at Kowie, and Kong also said that:

> Many buyers from Burkina Faso, Cote D'Ivoire, the Techiman, and Bolgatanga regional markets attend the Tumu Periodic Market. These buyers purchase large quantities of maize from farmers at the Tumu Periodic Market. Farmers in Kong and Korase increase their

visits to the Tumu Periodic Market because they know that they can sell large volumes of their crops (Interview data, 2020).

5. Discussion

The importance of UPMs in fostering social interactions has received less attention (Masaru & Badenoch, 2013). UPMs are creating the enabling institutional arrangements that increase collaboration among smallholder farmers in south and northern Ghana. The collaboration develops through family commitments and cooperative marketing. Family commitment during UPMs shows the concerns family members have for one another, which varies across their socioeconomic backgrounds. Young adult women are more engaging during UPMs through their high commitment to supporting the family to transport commodities to those markets (Owusu & Lund, 2004). Cooperative marketing provides security for farmers as they collaborate to participate in the UPMs. As such, difficulties such as the problems travelling to and from the village are minimised.

Cooperative marketing generated by UPMs increases social interactions (Fig. 8). Households form acquaintances with many people by forming marketing groups, thereby helping them to build rapport with their neighbouring villages. Accordingly, for farmers who may have little opportunity to interact, UPMs enable them to intermingle with many people within and outside their villages. Farmers' interactions during UPMs signify bridging and linking social capital as they interact with different people (Schuller, 2007). Social interactions are facilitated by cooperation among farmers during UPMs, which strengthens social ties, exemplifying bonding social capital as farmers interact among members of the same family (Milone et al., 2010).

Social interactions generated in villages by UPMs are of immense benefit to smallholder farmers. Firstly, farmers enter into an agreement
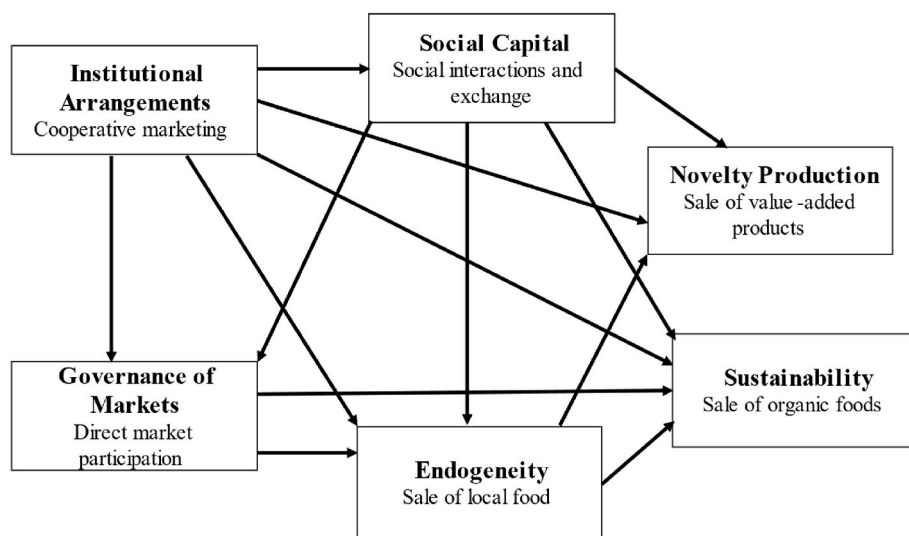

Fig. 8. Mapping the effects of urban periodic markets on sustainable rural development in Ghana.

with middle agents, which involves pre-financing farm activities of farmers. Pre-financing is common in sub-Saharan Africa, where smallholder farmers who face limited access to formal credit depend on buyers for financial assistance (Bah et al., 2003; Maertens & Velde, 2017; Tacoli, 2016; Yankson et al., 2016). Secondly, farmers reduce transport or overhead costs to UPMs through collective cost-sharing. Thirdly, farmers increase their direct participation in the UPMs which is consistent with Afukaara et al. (2019) who found that the Goaso Periodic Market has been increasing the market participation of smallholder farmers in the Brong Ahafo Region of Ghana.

The increasing direct participation of farmers in UPMs is contrary to the assertion that the market participation of smallholder farmers is low in developing countries. The lack of transportation services in villages and the strict entry restrictions into urban markets are the key contributing factors (Badu et al., 2013; Gebrehiwot et al., 2018; Houssou et al., 2018; International Fund for Agricultural Development IFAD, 2003). Daily urban markets compel farmers to rent or purchase stalls before selling at the marketplaces and considering the poor socioeconomic background of the surveyed households (Government of Ghana GoG, 2022a; Government of Ghana GoG, 2022b), the restriction prevents their direct participation in those marketplaces. During the UPMs, farmers do not rent or purchase stalls, which gives them a great opportunity to participate in the urban marketplaces. Certainly, UPMs provide open and accessible venues for poor farmers, and Masaru and Badenoch (2013) describe this flexibility of the markets as exhibiting a high level of freedom. With this flexibility, farmers attend multiple UPMs, thereby increasing their participation in those markets.

UPMs also increase market participation among smallholder farmers by providing transportation services in rural areas. Similarly, Afukaara et al. (2019) found that during the Goaso Periodic Market in Ghana, minibuses operated an average of six trips per day in the Odumase and Anwianwia villages, but the trips reduced to two when the market was closed. Very remote areas in Ghana, including Kyenkyenhenekrom and Gyasikrom in the Asunafo North Municipality and Hatorgodo in the Keta Municipality only have access to transport during the Goaso Periodic Market. UPMs, therefore, contribute to addressing the limited opportunities for smallholder farmers' access to marketplaces in developing countries.

UPMs shorten the food supply chain by connecting smallholder farmers to a large pool of consumers, including urban and international buyers. Smallholder farmers prefer to visit UPMs than trading at the farm-gate with the intention to reduce the interference of middle agents who usually negotiate lower prices with farmers (Velayudhan, 2014; Yankson et al., 2016). Urban consumers have a relatively high purchasing power, and they offer attractive prices for farm products at the UPMs (Byker et al., 2012; Elepu & Mazzocco, 2010). Farmers compare the prices of commodities for selling directly at the UPMs and negotiate better prices for their products, thereby enhancing their negotiation and bargaining skills (Yankson et al., 2016).

The shortening of the food supply chains created by the UPMs contributes to rural-urban linkages and integration as the markets attract a greater proportion of agricultural products from rural areas to feed the urban population. The cooperative marketing, social interactions and direct market participation generated by UPMs facilitate the transportation of farm products from villages to those markets, including value-added and organic foods. The larger proportion of rural farm products at the UPMs shows a high degree of endogeneity as farmers buy relatively few crops and sell more of them at those markets. High and Nemes (2007) and Bowler (1999) describe the high degree of endogeneity through the UPMs as a mechanism for increasing the commercialisation of local foods in rural areas. Similarly, Karg et al. (2019) found that 90% of households in the northern region of Ghana commercialised more than half of their farm products at UPMs. In developing countries such as Turkey, Nigeria, Guatemala, and Cameroon, smallholder farmers sell large proportions of crops directly at UPMs because of the substantial demand and attractive prices offered in these markets (Dokmeci

et al., 2006; Eff & Jensen, 2014; Ehinmowo & Ibitoye, 2010; Piabuo et al., 2020).

Urban consumers rely on rural areas to have access to groceries supplied by farmers to the UPMs. This dependency is expected as Ghana is an agrarian economy with many agricultural products produced by smallholder farmers and sold in urban areas through UPMs (Ghana Statistical Service GSS, 2022; Chagomoka et al., 2018). The dependency supports the notion that rural areas in developing countries are the centre for the consumption of agricultural products by the urban population through the sale of rural farm products at UPMs (Das, 2017; Oostindie & Broekhuizen, 2008; Ventura et al., 2008), thereby boosting large-scale production in surrounding villages. Through the incessant exchange of goods and services between rural and urban areas, UPMs bridge the rural-urban divide which is a mechanism for achieving sustainable development in rural areas.

The interdependence between rural and urban areas through UPMs in the food supply chain helps reduce perennial food insecurity, which usually plagues urban and peri-urban areas in developing countries. Chagomoka et al. (2018) examined the food supply chain systems on household food and nutrition insecurity among rural, peri-urban, and urban areas in northern Ghana. They found that households in urban areas in Ghana are more food insecure in terms of food production and consumption than those in peri-urban and rural areas. The competing land uses for infrastructure in urban areas has limited agricultural activities and food production, resulting in food insecurity (Lee-Smith, 2010). As a result, urban dwellers move to the nearby villages, such as Yobsheri-Kuraa in the northern region of Ghana, to farm during the rainy season and sell a more significant proportion of their crops to urban consumers at the Tamale and Aboubu Periodic Markets (Chagomoka et al., 2018). Similarly, in West and Central African countries, including South Africa, urban dwellers farm in rural areas and supply their produce to the periodic markets in urban areas (Kuuire et al., 2013). UPMs, therefore, increase the distribution of rural farm products to urban areas.

Rural-urban interactions generated by UPMs support the social interdependency theory that provides an essential framework to understand the mutual benefits emerging from the relations between two areas to inform practical policy decisions (Pevehouse, 2004). The interdependency between rural and urban areas through the UPMs draws attention to the integration of development plans in both areas in sub-Saharan Africa, including Ghana (Karg et al., 2019). The integration could be intensified through a balance allocation of infrastructural services such as the construction of roads to connect villages with UPMs and the maintenance of those markets to accommodate many farmers. Access to good roads indeed increases market integration by enabling smallholder farmers to transport a more significant proportion of their farm products to UPMs, the income from which can be used to intensify agriculture in rural areas. Improved rural roads also contribute to the effective operations of UPMs to serve both the urban and rural populations (Acheampong et al., 2018). By doing so, the connections between rural and urban areas through UPMs could be strengthened, thereby promoting sustainable development in rural areas.

The strengthening of rural and urban interactions through UPMs creates employment for the rural population by engaging farmers in economic activities such as selling in those markets and in turn, leads to their access to foreign currency. Similarly, Bromley (1998) reported that UPMs in South American cities were the policy of the governments to create employment for both the rural and urban areas. Urban fairs in China functioned as UPMs to reduce rural and urban unemployment, and these markets have since developed into sizeable retailing subsystems (Masaru and Natha 2013). Zamboni (2021) found that UPMs create employment for the urban and rural populations in northern Italy and Belgium. Certainly, UPMs enable poor farmers to realise the benefits of farming by converting their farm products into cash, thereby improving their financial ability to attain some necessities at the UPMs. The sale of value-added or organic products at UPMs enables

smallholder farmers to obtain a large proportion of the value of agricultural products and improve the sustainability of food systems in rural areas (Development IFAD 2013; Forssell & Lankoski, 2014; International Food for Agriculture; Gyanendra et al., 2017; Kini et al., 2020; Wiskerke & Ploeg, 2004). These potentials provided by UPMs to the rural population support farmers to reduce economic hardships or financial stress.

Farmers' direct participation in agricultural marketing, including UPMs provides more than half of the proportion of incomes earned by farmers (Ellis & Biggs, 2001; International Fund for Agricultural Development IFAD, 2011). This proportion is projected to be 34% in Africa, 51% in Asia, 60% in South Asia, and 51% in Latin America (International Fund for Agricultural Development IFAD, 2013; Reardon et al., 2007). There is a consensus in the literature that farmers' access to UPMs is a critical survival strategy that can reduce seasonal unemployment and poverty in rural areas (Haggblade et al., 2010). Ellis and Freeman (2004) suggested that the livelihoods of smallholder farmers in sub-Saharan Africa rely on their direct access to UPMs. This paper argues that in the absence of UPMs, smallholder farmers may face difficulties selling farm products, which can affect their livelihoods.

6. Conclusion and policy implications

This paper applies the dimensions of the rural web technique to examine the effects of UPMs on sustainable rural development. The paper found that UPMs contribute to social sustainability in rural areas by bridging the rural and urban divide, increasing farmers' access to and participation in urban markets, and creating cooperative marketing. UPMs contribute to economic sustainability by providing numerous sources of livelihood for rural dwellers. They contribute to environmental sustainability by creating a platform for the sale of organic foods.

UPMs generate local, regional, and international interactions between farmers and buyers. Farmers have access to information and goods from distant places at the UPMs. UPMs play a significant role in localisation and globalisation as goods traded at these markets meet the needs of people within the market districts and those from the other regions and the neighbouring countries, Burkina Faso, and Cote D'lvoire. This paper suggests that through UPMs, smallholder farmers in both the northern and southern Ghana are not left out of the activities and benefits of the globalisation of trade. We suggest that the case regions should build on the cooperative marketing groups formed in the villages to minimise the costs associated with their participation and transportation of goods at the UPMs.

We found that the benefits of UPMs are similar in the south and northern Ghana, signifying those markets are valuable regardless of the regional difference in economic development stages. However, the contributions of the UPMs were significantly larger in northern Ghana than southern Ghana and this is attributed to first, the closeness of the markets in northern Ghana to the neighbouring country such as Burkina Faso and Cote D'lvoire, which provide several benefits in those areas. The closeness of UPMs to those countries provides farmers in northern Ghana with incentives like cross-border trading with international buyers, transaction in foreign currency and the trading of new varieties of foreign commodities, not available in other types of markets, including the daily markets. Farmers in northern Ghana also learn different cultures and languages, thereby promoting knowledge sharing. Knowledge sharing at UPMs equips farmers with the necessary skills in farming and boosts their production capacity. It creates new forms of relations and local knowledge transformation within villages through a cooperative exchange of ideas and information between farmers and buyers at the UPMs (Cawley et al., 2019). Second, according to the Ghana Statistical Service GSS (2022; 2016), there is limited economic activities in the northern part of Ghana, thereby making the UPMs in those areas more relevant to farmers compared to the southern Ghana. These aforementioned factors significantly increase market participation among farmers in the northern Ghana, cooperative marketing,

commercialisation of farm products and social interactions compared to the southern Ghana.

Based on the evidence above, we suggest that the modernisation of UPMs is a critical pathway to achieving sustainable development objectives within rural Sub-Saharan Africa. The local councils in sub-Saharan Africa must consider incorporating projects that support UPMs in community development plans. Further, marketing platforms such as social media will help strengthen relationships between farmers and buyers during UPMs. Such platforms will ensure continuous operations of the UPMs even in global pandemics where social distancing protocols are observed, and there is a ban on social gatherings.

7. Limitations of the study

There are at least two limitations to this research but provide a fertile ground for further research. First, the research sampled only four villages because of limited resources. The integration of many villages would have helped to cover a wide range of villagers and issues, and this could provide a detailed picture of the effects of UPMs. Yet, though the study relied on four villages, it sampled 400 households, which represented close to half of the total household population in those villages, indicating a large sample size (Creswell, 2011; Field, 2013). Additionally, a comparison of the effects of UPMs between villages in two different sites (southern and northern parts of Ghana) provided sufficiently detailed data to understand the effects of these markets. Second, the principal aim of this research was to investigate the effects of UPMs on sustainable development in rural areas using the rural web technique. However, it should be noted that other factors such as government policies and projects and climate change could contribute to sustainable development in rural areas. These areas could be important for further research to how they affect sustainable development.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the content of this paper.

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