APSTRACT

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Applied Studies In Agribusiness And Commerce

http://www.apstract.net

Vol. 18. Number 1. 2024

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Contents

APSTRACT Applied Studies In Agribusiness And Commerce Vol. 18. Number 1. 2024

Applied Studies in Agribusiness and Commerce

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Official Periodical of the International MBA Network
in Agribusiness and Commerce AGRIMBA

Vol. 18. Number 1. 2024

APPLIED STUDIES IN AGRIBUSINESS AND COMMERCE
Official Periodical of the International MBA Network in Agribusiness and Commerce:
APSTRACT®
©AGRIMBA
Editor in Chief: Dr. Johan van Ophem, Wageningen University, The Netherlands
Editorial office: University of Debrecen, Faculty of Economics and Business,
APSTRACT Ed.office Debrecen, Böszörményi út 138. H–4032
Phone/Fax: (36-52) 526-935

Executive publisher: Univesity o f Debrecen, Faculty of Economics and Business, Hungary

HU-ISSN 1789-221X – Electronic Version: ISSN 1789-7874

Home Page: http://www.apstract.net • E-mail: editor-apstract@agr.unideb.hu

Contents

Applied Studies in Agribusiness and Commerce – APSTRACT
University of Debrecen, Faculty of Economics and Business, Debrecen
SCIENTIFIC PAPERS
DOI: 10.19041/APSTRACT/2024/1/1

DECENT WORK AND COFFEE SECTOR: ARE THE COFFEE ESTATES IN KENYA COMPLYING WITH DECENT WORK IN PRODUCTION AND PRIMARY PROCESSING?

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Abstract: *Coffee plays a big role in Kenya. It contributes to 30 percent of agricultural jobs and country's exports. However, casual workers within coffee estates still get challenging employment conditions including long working hours, unfair wages, limited social capacity, and lack of collective bargaining that results in poor living standards and job insecurity. And also, no research shows compliance with decent work in the Kenyan coffee sector. This study sought to provide new literature about decent work compliance in production and primary processing within Coffee estates in Kiambu county. Snowballing sampling method was used to collect data among 385 casual workers from EAAGADS, Fairview, Maakiou, and Magumu coffee estates. Descriptive statistics and inductive logic were used to generate decent work indices from statistical indicators explaining each decent work pillar. Decent work indices 0.41and 0.44 show the low compliance of social dialogue and safety at workplace dimensions respectively. Results, also show the effort has been done under productive employment and social protection dimension as shown by indices of 0.65 and 0.51 respectively. Moreover, there is a need for ILO inspection to ensure whether there is a promotion of decent work practices within coffee production to promote the living standards of coffee casual workers and also the stimulation of sustainable development of the County as well as the Country.*

Keywords: *decent work, coffee, production, processing, estates*
(JEL code: J28, J33)

INTRODUCTION

Decent refers to the opportunities for both men and women workers to get full and productive employment conditions, workplace equality, job security, social protection, and human social dialogue (International Labour Organization [ILO],2019). It ensures the development of the human being in the global economy through the rapid transformation of work. It takes into account all categories of employees involved in every value chain in a given economy and it is an important strategy to fight against poverty, hunger and also promotes good health and economic wellbeing (Ali, 2013). Decent work combines philosophical, legal, economic, sociological and psychological perspectives (Di-Fabio & Maree, 2016).

Physiological perspective is associated with the self-esteem and how it is affected by community culture aspects. Decent work legally focuses on the system of law that governs labour to have an access to new job opportunities and also in the achieving of policies that strengthen the employment conditions. In terms of economics, it focuses on the right of labour by ensuring a favourable environment that create work enjoyment. Sociological perceptive refers to different changes in decent work concept over time. Lastly, psychological perspective looks at decent work in terms of job satisfaction in terms of workers' expectation and work quality, the intrinsic quality of work in terms of good health and economic well-being of workers, and desirability of work that implies the characteristics that improve workers' situation assessment and their contribution (Zammitti et al., 2021).

In Kenya, the compliance of decent work is determined by various factors including work and wages, compensation, holidays, work security, participation in family responsibilities,

maternity and work, employment injury benefits, social security, fair and equal treatment at workplace, and the situation of child and forced labour (Ahmad, 2021). In this country, the prediction of wages follows the labour institution act 2007. This acts that the employee's salary equals the minimum wage that provide the consistent decent life with human dignity. In Kenyan agriculture, the minimum wages vary according to the knowledge, skills and practices that an employee has (Gok,2013). Decent work contributes to the poverty reduction by addressing the nature and quantity of employment opportunities. Decent work comprises an integrated approach to the development and economic growth that ensure the generation of employment opportunities, representation and social protection of all workers (ILO,2007).

Coffee production tend to be a labour intensive due to the type of activities that are performed manually. This leads to the inclusion of short-term and casual workers from plantation to harvesting (Mureithi, 2008). During the harvesting and processing of ripe coffee beans, workers may be required to work extra hours to maintain the quality (ILO,2018). Several different health risks involved in coffee production and primary processing including injuries from sharp tolls and repetitive movements, exposure to harmful chemicals including pesticides, illness from coffee dust, and consequences caused by human exposure to sun and heat (Verité fair labour, 2019). In Kenya, coffee sector employs about 30 percent of the agricultural labour force (ICO, 2019). These workers still get the deficit of decent work which is shown by various indicators including lack of decent wages and work hours, risky working conditions for workers. These working conditions lead to various health problems that occur due to the use of pesticides, the risks of being attacked by reptiles such as snakes during production practices. Workers also lack self-protection due to a lack of protective kits such as masks, gloves, and other first-aid kits (Mureithi, 2008).

Child labour is one of the major problems in majority of coffee estates, where children work alongside their parents to supplement their families' income. They also help their elder family members and parents to achieve their production quotas as per estate requirements. Children are even more vulnerable to the risks faced by adult individuals because they are in most cases involved in picking and sorting cherries, pruning trees, weeding, and fertilizing. The estimates data from Oxfam shows that one-third of coffee harvesters in Kenyan coffee are under 15 years old which accounts for 26 percent of the total coffee labour force. Child labour is mostly increasing in commercial estates that use quota requirements for their workers which have led to the increased inclusion of children to help their parents or other mature family members meet their quotas (Verité fair labour, 2019). Casual labour in both estates and smallholder farms is one of the vulnerable groups. According to ILO, over 20 percent of estates labour is on a casual basis due to reasons like unpredictable happening during harvesting and means of avoiding labour laws that require benefits for full-time workers. Women in coffee production are concentrated in lower-skilled tasks including fieldwork, harvesting, and primary processing activities yet they work for more hours than their male counterparts (Verité fair labour, 2019).

Kiambu county produce 22% of the total coffee in Kenya (Agriculture and Food Authority, 2020). The coffee estates in this county still experience the deficit of decent work compliance especially among casual workers who perform their duties in coffee production and primary processing. Majority of these workers get challenges that are associated with lack of decent wages and work time, lack of compensation in terms of overwork, lack of protective kits, and lack of freedom for collective bargaining which contribute to poor livelihoods and job insecurity (Mureithi, 2008). The literature shows the situation of decent work in Kenyan coffee production but there is still a gap on evidence of how Kenyan coffee estates comply with decent work. This study aimed to provide the contribution on the existing literature by measuring decent work compliance within coffee estates in Kiambu County of Kenya

EMPIRICAL STUDIES ON DECENT WORK MEASUREMENT

According to Anker et al. (2002); Ghai (2002) and Burchell et al. (2014), the choice of indicators to be used during the measurement of decent work depends on the availability of data and sample size available. The analysis of decent work depends on living standards measurement study -integrated survey on agriculture (LSMS-ISA) dataset which is made up of either individual or household level data that are derived from the set of questions that refer to the employment for which indicators can be defined (Habtamu et al., 2016). Job and Mary (2017), in their research about Gender and decent work in the cassava value chain specifically on its production and on-farm processing, the OLS model was used to analyze how both male and female gender participate in the production and on-farm processing of cassava in the study area. That research found that social-economic factors including experience, number of years, education background, extension contact, access to credit, and farm income influence the participation opportunities of both women and men.

Muthui (2019), did his research by comparing the status of decent work among Kenyan smallholder piggery producers. The researcher subjected the main five indices to Principal Component Analysis (PCA) in the evaluation of decent work status and assessment of the data suitability for factor analysis. The research found that both economic and human development has contributed to decent work. The study used PCA to overcome the issue of multiple levels of simultaneous measurements which refer to a common problem in decent work. The approach of Duffy et al. (2017), was considered by using psychological results of work to develop a decent work scale ranging from a 15-factor scale and 5 sub-sectors that correspond to 5 components of decent work. The study implicates that, apart from the decent indicators provided by ILO, the nature of various Agri-enterprises influences the adoption of different indicators' approaches to be used. Kouamé (2017), constructed decent work index based on entropy and inertia approaches that allowed orthogonal axis computation to measure statistical dimensions. The normalization method was used to obtain the decent work indices ranging from 0 to1. This range allowed the researcher to classified calculated indices into high and low decent work compliance.

MATERIALS AND METHODS

Research Area

The study was carried in Kiambu county, one of the counties that highly grow coffee in Kenya. Coffee estates in this county lead in hiring casual workers where each estate employs between 100 and 500 casual workers (CIDP, 2018).

Sample size determination

Research selected 385 respondents that were proportionately distributed in four coffee estates that are EAAGADS, Mackiou, Fairview and Magumu. The sample size was determined based on the formula adopted by Kothari (2004). This formula is suitable when there is unknown exact number of population size (Al-Subaihi, 2003).

$$n=\frac{z^2 pq}{e^2} \quad (1).$$

Where n stands for the sample size, z is the z-value at the confidence level of 95 percent (z=1.96). P which is equal to 0.5 means the probability of the targeted population meets study characteristics that were measured. Q refers to the probability of the targeted population that does not meet the characteristics measured by the study and it is computed as 1-p (1-0.5=0.5), e is the accepted error at 95% confidence interval.

Sampling Procedure

Multistage sampling procedure was used in this study where 3 sub-counties (Kiambu, Ruiru, and Juja) were purposively selected based on high rate of coffee production and availability of active coffee estates. The study randomly selected EAAGADS, Fairview, Magumu, and Maakiou coffee estates and lastly, the Snowball sampling method was used to reach the respondents in each selected estate. This method was suitable for this research due to sensitive questions that were being addressed to casual labourers that should have been caused by biased information due to fear of losing their jobs if the researcher employed the other method. Thereafter, Primary data was collected by using personally administered questionnaires to the selected casual workers in each coffee estate.

Analytical Framework

The research used proxy measures of ratified conventions of international labour organizations. This method grouped statistical indicators and legal frameworks that are based on major elements of decent work to measure decent work compliance within coffee estates in Kiambu. According to Bescond et al (2003), and ILO (2013), the main indicators that were used were based on four main dimensions (pillars) of decent work. The research considered inductive logic to generate the individual decent work index on each pillar (dimension). Adequate earnings and productive employment dimension were indicated by four main indicators that are Decent Wage which referred to the employees with a monthly salary that is above the minimum basic wages in the agricultural sector of Kenya, and professional training which showed the number of employees who get professional training about their work, decent workhour which explained the number of employees who work not more than 48 hours per week and overtime compensation as the indicator of the employees who get payment in case of overwork.

Safety in the workplace dimension was explained by six indicators that are free kits which show the employees who get protective kits while working at zero cost, first aid skills which shows the employees who have first aid skills in case of emergency at the workplace, sexual harassment which indicated the number of employees with sexual harassment problem, forced labour to show the employees who were forced to do some kind of jobs, discrimination was used to indicate the employees who experience the discrimination at workplace based on different factors and equal working opportunities were used to indicate employees who get working opportunities equally. The third pillar of decent work is social protection which was determined by three main indicators that are participating in family responsibilities where this indicator was showing the employees whose work schedules allow them to engage in other family responsibilities, non-financial benefits indicated the number who get other work benefits apart from the wage and free medical indicator was considered to show the employees who get free medical care in case of work injuries. Lastly, the researcher employed three indicators to show the decent work indices based on the social dialogue dimension. The considered indicators are agreement where was showing the employees with a formal work agreement, participation in decision making which showed employees who can participate in decision making about their salaries and other working conditions, and notification before the end of the agreement.

A respondent with a positive answer on mentioned indicators as per ILO standards was coded as 1 while employees with negative answers were coded as 0. After grouping all indicators under their dimension, the researcher weighted those indicators equally since there was no superiority assumption between them. A researcher calculated the index under each decent work dimension by using the arithmetic mean of each indicator score. The process generated individual indices of each employee which were ranging between 1 and 4 and these indices were normalized to get the DWI under each pillar.

$$\text{Normalization DWI}=\left[\frac{Actual\ Value-Minimum\ Value}{Maximum\ value-Minimum\ Value}\right] \quad (2)$$

Equation 2 was used to determine compliance with decent work within coffee estates of Kiambu County. The average DWI was calculated to show the current situation in the study area. The DWI which is above 0.5 was considered a sign of high decent work compliance while the DWI which was below or equal to 0.5 was considered a sign of low decent work compliance

RESULTS AND DISCUSSIONS

Decent Work Practices in Relation to International Labour Organization (ILO) Standards Performed by Coffee Estates in Kiambu County

Table 1 present the current situation within the study area for the achievement of decent work practices as per ILO standards. On the practices that are related to productive employment, results showed that respondents equivalent to 85% had decent wages, 78% had decent working hours, and 59.5% got work training. But on the other side, there was a low achievement of compensation in the case of overwork where only 37.1% of respondents got compensation for overworked hours. Contrary to the research about decent work compliance in Coté d'Ivoire, where respondents equivalent to 36% had a decent wage, 57.52% had decent working hours and 8.5% got professional training (Kouamé, 2017). Under the safety at work pillar, results showed that 92.7% of respondents did not experience forced labour, 99.2% did not experience sexual harassment, 87.3% did not experience discrimination in the workplace, and 89.9% experienced equal working opportunities between men and women casual workers. The respondents who claimed the deficit of equal working opportunities reported that men get hard and complicated tasks compared to women. There was a low achievement on other safety at workplace practices where only 20% of respondents had access to free protective kits and 43.9% did not have first aid skills in case of emergency. The respondents reported that the discrimination was based on the tribe and local language which was different from the majority of people in Kiambu.

On decent work practices under the social dialogue pillar, results showed that 61.3% of respondents had work schedules that allowed them to take on other family responsibilities, 60.8% were able to access free medical care in case of work injury or other work sicknesses, and only 27% of respondents were able to get non-financial benefits apart from medical and other facilities mentioned above. The majority of respondents reported that they got non-financial benefits in terms of free accommodation, cooking woods, day care for respondents' children, Christmas party, and milk for those who work within estates that have livestock sections. Results showed that in terms of social dialogue, 58.7% of respondents get a notification before the end of their work, 53.2% experienced freedom for participating in the decision-making process about their work, and 23.9% had formal work agreements. This low rate of giving formal agreements depends on how coffee is a seasonal crop, which means that coffee estates' managers refuse to give formal agreements to the workers to avoid extra costs in case of low peak season. On the other side, the majority of respondents who had formal agreements were between one to three months agreements. This study showed the achievement of decent work practices more than other studies done in different areas of the planet. According to Oppong (2019), in his study about decent work and working poor in Ghana, 22.97% of respondents were able to get a decent salary, 76.08% got decent working hours, and only 4.14% accessed free medical care. In Coté d'Ivoire, 7.99% of the study respondents had a formal contract and 3.14% of respondents accessed the free medical service (Kouamé, 2017).

Table 1. Decent work practices in relation to ILO Standards

Practices	Outcomes	Frequency (%)
Decent wages	Employees with wages above minimum basic wages	85
	Employees with wages below the minimum basic wages	15
Decent working hours	Employees with decent working hours per week	78.2
	Employees who work overtime hours per week	21.8
Overtime compensation	Employees who get compensation in case of overtime work	37.1
	Employees who do not get compensation in case of overtime work	62.9
Training	Employees who get training	59.5
	Employees who do not get training	40.5
Work agreement	Employees with a formal agreement	23.9
	Employees without a formal agreement	76.1
Forced labour rate	Employees under forced labour	7.3
	Employees not under forced labour	92.7
Notification before the end of the agreement	Employees who get a notification before the end of the agreement	58.7
	Employees who do not get the notification before the end of the agreement	41.3
Participation in family responsibilities	Employees whose schedules allow them to take on other family responsibilities	61.3
	Employees whose schedules do not allow them to take on other family responsibilities	38.7
Sexual harassment	Employees who face sexual harassment	0.8
	Employees who do not face sexual harassment	99.2
Discrimination	Employees who experience discrimination at work	12.7
	Employees who do not experience discrimination at work	87.3
Equal working opportunities	Employees who get equal working opportunities	89.9
	Employees who do not get equal working opportunities	10.1
Freedom for participation	Employees who get the freedom to participate in decision-making about their work activities	53.2
	Employees who do not get the freedom to participate in decision-making about their work activities	46.8
Non-financial benefits	Employees who get non-financial benefits	27.0
	Employees who do not get non-financial benefits	73.0

Protective kits	Employees who get free protectives kits while working	20.0
	Employees who do not get free protectives kits while working	80.0
Fast Aids skills	Employees who have fast aids skills in terms of emergency	43.9
	Employees who do not have fast aids skills in terms of emergency	56.1
Medical care	Employees who get free medical care in case of work injury	60.8
	Employees who do not get free medical care in case of work injury	39.2

Source: Primary data collection, 2022

The compliance with decent work practices by Coffee Estates in Kiambu County

Table 2 presents the Decent Work Indices (DWIs) based on each pillar of decent work. DWI1 which equals 0.65 shows that there is improvement in the adequate earnings and productive employment dimension. This index proves the achievement with the productive employment indicators at a good rate. The majority of employees within coffee estates in Kiambu County get a decent wage, decent working hours, and training respectively. But on the other side, the majority of employees are still experiencing zero compensation in case of overtime work which contributes to the reduction of DWI1. The compliance with this dimension is because of coffee estates that are under collective bargaining agreement (CBA) where there is a fixed minimum basic wage for unskilled employees who work within them. CBA also states the decent working hours that employees should not exceed per week. Employees get professional training as a way of reducing the waste of coffee but not for being professional. Despite being a member of CBA, some employees still get challenges due to the department in which they are working. Some employees still do not get what CBA expects them to get. And the reason behind this is that supervision from both CBA and ILO is not consistent

The decent work index based on safety at workplace dimension (DWI2) which is equal to 0.44 proves the low compliance with the safety indicators. Casual workers within coffee estates in Kiambu County still get a deficit in terms of safety at workplace indicators. The majority of employees which is over 80 percent do not get protective kits while working and above 60 percent do not have first aid skills in terms of emergency. Estates highly complied with other security indicators including no sexual harassment at 99.2 %, no forced labour at 92.7%, equal working opportunities at 89.9%, and zero discrimination at 87.3%. According to Nizami (2013), compliance with safety in the workplace in the IT sector was very low and was also associated with negative effects due to the work pressure that exists in that sector to meet deadlines. This failure of compliance with safety at the workplace is connected to the low compliance of productive employment where workers often experience longer working hours. 54% of respondents in that research reported that they were admitted to the hospital due to work-related health problems that increased their stress levels. Workers reported that the nature of their work increased the chance of getting diseases including eyestrain, backache, stiff neck, depression, heart disease, and hypertension. The low compliance with safety at the workplace among casual workers was been also found in India. Casual workers are always forced to work under unhealthy as well as dangerous conditions. The statistics showed that 45.9% of respondents reported that their jobs affect health conditions. Workers also reported the harassment at workplace and the majority of these problems are found in rural areas where agricultural practices take place (Breeta & Amit, 2020). This shows that safety at work is the most sensitive pillar since it directly affects the workers' healthy. Literature shows that compliance with safety in the workplace in the IT sector was very low and also associated with negative effects due to the work pressure that exists in that sector to meet deadlines. This failure of compliance with safety at the workplace is connected to the low compliance of productive employment where workers often experience longer working hours. 54% of respondents in that research reported that they were admitted to the hospital due to work-related health problems that increased their stress levels. Workers reported that the nature of their work increased the chance of getting diseases including eyestrain, backache, stiff neck, depression, heart disease, and hypertension Nizami, 2013). The low compliance with safety at the workplace among casual workers was been also found in India. Casual workers are always forced to work under unhealthy as well as dangerous conditions. The statistics showed that 45.9% of respondents reported that their jobs affect health conditions. Workers also reported the harassment at workplace and the majority of these problems are found in rural areas where agricultural practices take place (Breeta & Amit, 2020). This shows that safety at work is the most sensitive pillar since it directly affects the workers' healthy.

A decent work index based on social protection (DWI3) which is equal to 0.51 shows medium compliance with social protection. The estates comply with social protection indicators including the schedules that allow employees to take on other family responsibilities at 61.3 %, and employees who get free medical care in case of work injury at 60.8 %. The coffee estates still have low compliance with social protection indicators which is in terms of non-financial benefits at the rate of 27%. The literature shows that majority of casual workers in developing countries experience a deficit in terms of complying with social protection. This is because of how these workers are excluded from labour legislations (ILO,2021). This implies the loss of their income in case of work injury that ends into chronic poverty, stagnating yields and acute vulnerability in many rural parts of Africa (Stephen, 2009)

Lastly, the decent work index based on social protection (DWI4) which is equal to 0.41 shows the low compliance with social dialogue. The majority of casual workers within selected coffee estates of Kiambu County still get a deficit in terms of getting formal work agreements. This is because coffee is a seasonal crop which means that if estates make

formal agreements with casuals would increase the cost on the estates' side. Due to the lack of formal work agreements, employees also do not get the freedom to participate in making decisions about their wages and working conditions. This also results in the end of jobs without notification, where employees report to the workplace and find that there is no work. Social dialogue plays a significant role towards the livelihoods change of the employees. In Kenya, the collective negotiations within General Wage Council resulted into the increase of minimum wages at 18% in 2017. Also, it allowed casual tea and flower pickers to rise 23% of their wages (Otieno,2018).

Table 2. Decent work indices based on decent work pillars in Kiambu county

Variable	Observation	Mean	Std. Dev.	Min	Max
DWI1	385	0.65	0.292	0	1
DWI2	385	0.44	0.209	0	1
DWI3	385	0.51	0.314	0	1
DWI4	385	0.41	0.362	0	1

Source: Primary data collection, 2022

CONCLUSIONS AND RECOMMENDATIONS

Despite the various work literature on the analysis of decent work in agriculture, no study has looked at decent work compliance among individual casual workers. This shortfall in literature contributes to the limitation of designing specific policies that can help improve the quality of employment conditions and reach the ILO's decent work standards. The study proposed a new approach to assessing decent work compliance based on each pillar dimension. This is a different approach compared to the existing ones where decent work is determined in general without separating dimensions. The reason why the research proposed this method is to show how different coffee estates comply with each dimension of decent work. This helps to show where coffee estates are still behind so that improvement can be done. The study used the approach of the arithmetic mean of each indicator score to construct an individual decent work index based on four decent work dimensions. Since decent work covers different indicators measured under each dimension, categorical variables were weighted to obtain indices. The research also grouped individuals into those with high compliance with decent work and those with low compliance with decent work.

The results show that the average compliance of decent work is still very low specifically under social dialogue and safety at a workplace with indices equivalent to 0.41 and 0.44 respectively. The coffee estates tried to put the effort into the other two dimensions but also the compliance with social protection is still low at the index of 0.51. There is an improvement in adequate earnings and productive employment at 0.65. All these indices show that more efforts are still needed in coffee production and primary processing to ensure decent work practices among casual workers as a way of improving their livelihoods. The study suggests that ILO inspectors and other policy designers should ensure that casual labourers are getting what ILO standards and labour market laws and regulations expect them to get. Consistent supervision is needed to confirm whether there is a promotion of decent work practices within coffee production and primary processing in Kiambu County, Kenya. This will promote the living standards of coffee casual workers and also stimulate sustainable development of the County as well as the Country. Estate owners and managers should note that job creation is not sufficient without looking at the quality of these jobs. This implies that policy measures should be considered to ensure the quality of available jobs.

ACKNOWLEDGEMENTS

The authors sincerely acknowledge the MCF-RUFORUM in its TAGdev project at Egerton University for providing financial support to the corresponding author. Authors also thank enumerators, and respondents for active cooperation during data collection.

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Applied Studies in Agribusiness and Commerce – APSTRACT
University of Debrecen, Faculty of Economics and Business, Debrecen
SCIENTIFIC PAPERS
DOI: 10.19041/APSTRACT/2024/1/2

A POTENTIAL USE OF A LANDSCAPE INTEGRATED MANAGEMENT TOOL TO MEASURE THE PROGRESS TOWARDS SUSTAINABILITY: A TRIAL APPLICATION AT THE GRAPE-PRODUCING COMPANY HÉTSZŐLŐ –TOKAJ REGION – DEBRECEN - HUNGARY

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Abstract: *Sustainable integrated management at the landscape scale is increasingly becoming paramount for the private and public sectors, as these sectors recognize the high relevance of promoting integrated and collaborative governance in their operating areas and territories. There has been no attempt to apply this approach in the current sustainability reporting frameworks. This paper aims to run a trustful assessment at the Hétszőlő viticulture company to make sustainability claims. This paper applies a new way of reporting sustainability by selecting and assessing suitable indicators within the Ecosystem, Human well-being, and Production pillars depending on the landscape context and conditions, followed by a performance metric selection, prioritization process, and sustainability claiming. Our results portray that out of 21 indicators, including core and landscape-dependent indicators, nine were determined as applicable; likewise, concerning metrics selection, five performance metrics were defined as required, two were recommended, and one was optional. The company's top prioritized indicators are ecosystem restoration (1.06 % of restored areas nationwide), household income (0.3 % nationwide = < $2.5/day), and health and nutrition (<2.5 % = 42500 children). It is ultimately given some claims that actions must be taken in these prioritized metrics and make positive progress toward sustainability.*

Keywords: *integrated landscape management; sustainability claim; performance metrics, core indicator, landscape–dependent indicator*
(JEL code: Q01, Q57)

INTRODUCTION

Over the last decades, much has been done for initiatives related to landscape-integrated management approaches, leading to a controversial debate in international world parties. In that context, a collision between demand for agricultural land and environmental protection goals has arisen. As the saying goes, we face a "perfect storm" as we struggle to feed a burgeoning population on a diminishing land supply, water, nutrients, and biodiversity. (JEFFREY SAYER et al.,2012). Likewise, much has been done for companies and governments to tackle a broad range of alarming issues that currently affect our Landscape, from implementing sectorial programs and initiatives to complex tools that have already been released and others in the construction process. However, on the one hand, these entities lack a recognized method of calculating and communicating the environmental, social, economic, and governance benefits of their actions; consequently, a handprint

approach could be extended to a more holistic sustainability approach through which trade-offs between different impact categories and compromises between the beneficial impacts on various dimensions of sustainability could be identified and avoided in the sustainable value creation process for individuals, organizations, and governments (GRONMAN et al., 2018). On the other hand, an Integrated Landscape Initiative can provide a constructive platform to convene stakeholders in a way that brings a broad set of perspectives and interests to address landscape management challenges in effect; this means the involvement of a large number and diversity of stakeholders in design and implementation, including both internal stakeholders from the Landscape itself and external stakeholders from the public, private, and civil society sectors.(ESTRADA-CARMONA et al., 2014). One concerning trend is that some key stakeholders—particularly those from the private business sector—often appeared to be missing from integrated landscape initiatives (ILIs). This absence is not entirely apparent, but the view is that multi-stakeholder processes may entail a cost and risk for private business (i.e., submitting to a decision-making process with an uncertain outcome) with little financial upside. Regardless of the reason, this participation gap may inhibit the effectiveness of the Integrated Landscape Initiative in addressing weak market linkages. The absence of powerful actors as stakeholders in integrated landscape initiatives also poses a risk that gains achieved through careful multi-stakeholder negotiation could be derailed by significant decisions made outside of such processes. (MILDER et al.,2014). This study aims to try the applicability of a landscape-integrated management tool by assessing its three pillars and indicators in a viticulture company named Hétszőlő to drive improvements towards sustainability and make the right investment decisions and improvements in their operation area. These three fundamental pillars are Ecosystem, Human Well-Being, and Production, including a previous prioritization of the leading applicable indicators in its landscape operation.

MATERIALS AND METHODS

Study area

The trial tool was run within a region called Tokaj situated 250 km east of Budapest, specifically in the grape and wine-producing company Hétszőlő, which owns 49 ha of viticulture estate. the distribution of crops in the estate is grapes as the main crop, apples, and plums. The estate is surrounded by forests in the north, east, and west but in the south, a picturesque settlement of the Tokaj region can be seen.

Data collection

Data collection was done by using a standard sustainability assessment framework template and garnering primary and secondary information sources. Therefore, five to six in-person interviews were needed, and core indicators data were collected by using the Google search engine. Pillars, goals, indicators, and performance metrics primarily form the structure of the trial tool. Eight big goals represent the desired sustainability outcomes within each pillar, and 20 indicators stand for the conditions and processes within the Landscape, which indicate performance related to the goals. These indicators were defined according to their ability to measure sustainability performance and are classified as follows: Core indicators, landscape-dependant indicators, and optional indicators Lastly, Performance metrics define quantitative and qualitative measures of the status or trends of each indicator, for which 31 performance metrics were included in our work.

Table 1. Standard Sustainability Assessment Framework

Pillar	Goal	Indicator	Indicator type	Parameter
1. Ecosystems	1.1. Preserve and recover natural ecosystems.	1.1.1 Natural Ecosystem Protection	Core	1.1.1.1 Total Area (ha) and percentage (%) of each natural ecosystem type under protection
		1.1.2. Natural Ecosystem conversion	Core	1.2.1.1. Total Area (ha) and percentage (%) of area of natural ecosystems in the Landscape that has been recently converted
		1.1.3. Natural ecosystem degradation	Core	
		1.1.4. Ecosystem restoration	Landscape dependent	1.1.4.1. Total Area (ha) under Restoration, disaggregated by ecosystem type and restoration type
	1.2. Protect and rebuild biodiversity.	1.2.1. Threat to species	Core	1.2.1.1. Changes in threats to threatened species 1.2.1.2. Changes in threats to populations of indicator species or other species identified as important in the Landscape

1. Ecosystems	1.2. Protect and rebuild biodiversity.	1.2.2. Biodiversity habitat degradation	Landscape dependent	1.2.3.1 Area (ha) and percentage (%) of area of natural ecosystem that are degraded within areas identified as important for biodiversity.
		1.2.3. Restoration of ecosystems in areas identified as important for biodiversity.	Landscape dependent	1.2.3.1. area (ha) and percentage (%) of land under Restoration within areas identified as important for biodiversity
		1.2.4. Biodiversity habitat protection	optional	1.2.4.1. area (ha) and percentage (%) of areas identified as important for the biodiversity that is designated and managed for long-term protection
	1.3. Maintain and enhance ecosystem services.	1.3.1. Water quantity	Landscape dependent	1.3.1.1. Seasonal water quantity or flow rate of key water bodies (mm/month)
		1.3.2. Water Quality	Landscape dependent	1.3.2.1. Total suspended solids in key water bodies(average(mg/l) 1.3.2.2. Biochemical oxygen demand and chemical oxygen demand (mg/l) or nutrients (nitrogen and phosphorus(load/volume) in key water bodies(required) 1.3.2.3. diversity of aquatic macroinvertebrates in key water bodies (biological monitoring water party or another index when appropriate) 1.3.2.4. concentration of metal or other toxins(load/volume) in key water bodies(required)
		1.3.3. Soil Health	Landscape dependent	1.3.3.1. Average soil erosion rate (t/ha/yr) 1.3.3.2. Soil health (average % Soil Organic Carbon [SOC]) at a representative sample of production sites across the Landscape
2. Human well-being	2.1. Improve the standard of living, especially for vulnerable and/or marginalized groups	2.1.1 Household income and assets	Core	2.1.1.1. percentage of poverty
		2.1.2. health and nutrition	Core	Percentage (%) of children that are undernourished.
		2.1.3. Access to Education	Core	2.1.3.1. Percentage (%) of school-aged children
		2.1.4. Water, Sanitation, and Hygiene	Landscape dependent	2.1.4.1. Percentage (%) pf households without a safely managed sanitation facility exclusive to the household
	2.2. Respect, protect and fulfill human rights	2.2.1. Child labor	Landscape dependent	2.2.1.1. Estimated number of child laborers in economic activities of interest
		2.2.2. Forced labor	Landscape dependent	2.2.2.1. Estimated number of forced laborers in economic activities of interest
		2.2.3. Worker's rights	Landscape dependent	2.2.3.1 Assessor - defined metrics based on identified enabling conditions(required)
3. Production	3.1. Promote transparency, participation, inclusion, and coordination in land-use policy, planning, and management.	3.1.1. Agricultural, agroforestry and tree plantation productivity	Landscape dependent	3.1.1.1. Average crop Productivity(yield/ha) disaggregated by crop
		3.1.2. Input use efficiency in agricultural, agroforestry & tree production systems	Landscape dependent	3.1.2.1. Fertilizer use efficiency (quantity of product produced per unit of nitrogen, phosphorus, and/or potassium (NPK) use.
		3.1.3. Adoption of sustainable land management practices	optional	3.1.3.1. Land area(ha) under major crop, livestock, and/or plantation forestry production that utilizes integrated pest management and percentage (%) of total production area that this represents.

Source: Own Work

RESULTS AND DISCUSSION

Table 2. Standard Sustainability Assessment Framework

Pillar	Goal	Indicator	Parameter	Final result
1. Ecosystems	1.1. Preserve and recover natural ecosystems.	1.1.1 Natural ecosystem protection	1.1.1.1 Total Area (ha) and percentage (%) of each natural ecosystem type under the protection	2022: 2105100 Nationwide
		1.1.2. Natural Ecosystem conversion	1.2.1.1. Total Area (ha) and percentage (%) of the area of natural ecosystems in the Landscape that has been recently converted	2010 -2022: 111726.4 Nationwide
		1.1.4. Ecosystem restoration	1.1.4.1. Total Area (ha) under Restoration, disaggregated by ecosystem type and restoration type	2016 -2022: 92057 Nationwide
	1.2. Protect and rebuild biodiversity.	1.2.3. Restoration of ecosystems in areas identified as important for biodiversity.	1.2.3.1. area (ha) and percentage (%) of land under Restoration within areas identified as important for biodiversity	2022: 2 ha Over the last 20 year
	1.3. Maintain and enhance ecosystem services.	1.3.1. Water quantity	1.3.1.1. Seasonal water quantity or flow rate of key water bodies(mm/month)	Max: 1000 mm/year Min: 277mm/year
2. Human well-being	2.1. Improve the standard of living, especially for vulnerable and/or marginalized groups	2.1.1 Household Income and Assets	2.1.1.1. percentage of poverty	Percentage (%) of poverty at $ 2.15 a day: 0.3 % Nationwide
		2.1.2. health and nutrition	2.1.2.1. percentage (%) of undernourished children.	2019: <2.5 % 42500 children Nationwide
		2.1.3. Access to Education	2.1.3.1. Percentage (%) of school-aged children	2011: 2.7 % 24,053 children not attending school nationwide
	2.2. Respect, protect and fulfill human rights	2.2.1 Child labor	2.2.1.1. Estimated number of child laborers in economic activities of interest	0 Local level
		2.2.2. Forced labor	2.2.2.1. Estimated number of forced laborers in economic activities of interest	0 Local level
3. Production	3.1. Promote transparency, participation, inclusion, and coordination in land-use policy, planning, and management.	3.1.1. Agricultural, agroforestry, and tree plantation productivity	3.1.1.1. Average crop Productivity(yield/ha) disaggregated by crop	2022: 5 Local level
		3.1.2. Input use efficiency in agricultural, agroforestry, and tree production systems	3.1.2.1. Fertilizer use efficiency (quantity of product produced per unit of nitrogen, phosphorus, and/or potassium (NPK) use.	2022: 0.11 Local level
		3.1.3. Adoption of sustainable land management practices	3.1.3.1. Land area(ha) under major crop production that utilizes integrated pest management and percentage (%) of total production area	2022: 49 Local level

Source: Own Work

Ecosystem

In Table 2 above, based on our findings, it can be stated that the indicator can be categorized as optimum since the country has to date protected areas and one nationally protected area at the local level. The fundaments of this result can be attributed to the progressive Hungarian legislation since Hungary hosts 46 habitat types of Annex I (out of which 13 are forest habitats) and 142 species of Annex II (47 of them depend on forests) under the Habitats Directive. Hungary has 18 priority habitat

types (6 of them are forests) and 16 priority species (7 living in forests). Hungary hosts regular populations of 74 bird species (33 depend on forests) listed in Annex I of the Birds Directive, while 48 migratory species (46 occur in forests) are also qualifying features of Special Protection Areas.

This suggests that more action must be considered when dealing with green areas within the grape-producing company's production area. Protect small woods and green areas and boost biodiversity shelter. On one hand, it is important to compare that integrated landscape initiatives coincided positively with the extent of conservation motivation worldwide; in other words, it is reliable to say that nearly 90 % of conservation initiatives took place in Latino America (N. ESTRADA-CARMONA, et al., 2014), 51 % was considered as important in Europe (M. GARCÍA- MARTÍN et al., 2016) and finally 80 % of surveyed initiatives considered as high importance in Africa (C. MILDER – ABIGAIL et al., 2014). This ultimately suggests that either private or public organizations were involved in conservation activities and therefore, the tendency to increase its performance is positive in the long run.

High levels of degradation and deforestation affect the country and the entire subnational level; therefore, the condition is potentially critical. If we compare data from 2000 to 2020, Hungary experienced a net change of 84.6Kha (4.1%) in tree cover. From 2001 to 2021, Hungary lost 228Kha of tree cover, equivalent to an 11% decrease since 2000.

Overall, agricultural use is responsible for around 80 % of deforestation worldwide; concerning developing countries (HOSONUMA, N. et al. 2012). The effects of deforestation have been alarming but natural or artificial forest recovery has been scarce. Action is needed considerably; the country must make more efforts to restore, control, and protect the ecosystems and remaining forests.

Although ecosystem conversion can be related to ecosystem degradation, some credible reports indicate that at least 65 % of institutions (public and private) in 23 countries in Latino America had focused on reducing natural land degradation (N. ESTRADA-CARMONA, et al., 2014). In contrast, 80 % of the initiatives in Africa were running in 33 countries (C. MILDER – ABIGAIL et al., 2014). However, in Europe 21 countries reported the value was quite similar as stated above. Nevertheless, it is important to highlight that the Global Reporting Initiative considers in its agriculture and aquaculture sector this important indicator (Topic) defining it as the conversion of forests through deforestation and the conversion of other ecosystems, such as grasslands, woodlands, or savannas. Deforestation occurs when primary and secondary forests are cleared, often by burning (Consolidated set of the GRI Standards, 2022)

The ecosystem restoration tasks have been made but not at the right intensity of efforts needed. Information was widely spread and not centralized, too much random information could deplete the creditability of the results, and therefore the condition is critical. More transparent and efficient investments are needed to recover the devastated ecosystems. In addition, restoration initiatives involving public and private institutions are quite alike as in the previous indicators mentioned before. This before mentioned information can be corroborated by the fact that the mid-term review of the EU Biodiversity Strategy (EUROPEAN COMMISSION, 2015) states that no significant overall progress was made, the same is true for the Aichi targets (15%) (RSPB, 2016). There is a general opinion of the failure of reaching Aichi targets in the required time frame (LEADLEY et al., 2014; TITTENSOR et al., 2014; CORTINA-SEGARRA et al.,2016; TOLVANEN and ARONSON, 2016; TEH et al., 2017). Despite probable non-compliance, the targets should not be given up (SIMBERLOFF and VITULE, 2014; TOLVANEN and ARONSON, 2016; RUETE et al., 2018). We demonstrated that a remarkable amount of effort is still needed to meet the 15% target. Different approaches to estimating restorable surfaces result in different percentages of restored area; however, they only expand from 1.06% to 5.29%, far from the 15%. In the most permissive version of estimation, when the restorable surface is only based on a semi-natural degraded area estimated by the MÉTA database (describing only 19% of Hungary) instead of the total of L2–4 levels of area (with or without urban and cropland), more than 84,000 ha have to be restored (TÖROK et al. 2019).

The level of reforestation and Restoration with forest or agroforestry species and green cover crops is low; therefore, the condition is critical, and actions are urgently needed. Repopulation tree species are recommended to be planted in the given areas of the company.

It is essential to underline that some sustainability reporting frameworks, such as the Carbon Disclosure Project (CDP) Guidance, include biodiversity as a crucial content element to make credible claims and inform investors, donors, and states about reliable and viable investment possibilities (CDP Climate Change Reporting Guidance, 2023).

The indicator has a positive value of water quantity despite being a rain-fed irrigation system, therefore, the condition is optimum. In effect, this value does not contrast with the climatic condition report given by the Ministry of Agriculture which states that the average annual precipitation is 640 mm, while the average annual temperature is 11.2°C. As aforementioned, the CDP Guidance encourages transparency among companies and cities, enabling organizations to benchmark, measure and manage their environmental risks, and brand reputation and lower their costs through reporting water performance metrics (CDP Climate Change Reporting Guidance, 2023) and it is included as well in the integrated landscapes initiatives in Europe, Latino America, and Africa.

Human well-being

Based on our findings, the poverty indicator was on a base of $ 2.15 income per day and is below the poverty line in Hungary, for which 0.03 percent of the total population is under this condition. This is equivalent to 291300 people struggling with low income nationwide. Moreover, it is essential to mention that some sustainability reporting frameworks, such as the Global Reporting Initiative (GRI) include living income and living wage as an indicators to measure poverty. In contrast, other frameworks do not prioritize it or assess it as an indirect metric (Consolidated set of the GRI Standards, 2022).

According to our findings, the health and nutrition indicator and its categorization as potentially critical as a significant sector of the vulnerable population is under the condition of undernourishment; in other words, 42,500 people lack access to adequate health and nutrition, and more efforts and devoted endeavors are needed to bridge the gap. In addition, making some references to the inclusion of this topic in sustainability reports, the Global Reporting initiative includes this indicator as a priority in its agricultural sector reporting format, defining it as a food security topic (Consolidated set of GRI Standards, 2022). Others only incorporate metrics associated with human rights and food safety (Sustainability Accounting Standard. Food and beverage sector, 2018).

Based on our findings, it can be stated that the indicator related to access to education is categorized as optimum given that a small sector of primary school students is not attending school; in other words, 24,053 school-aged primary students are affected by this problem. It is remarkable to mention that most of the reporting initiatives consider this topic as separate due to its inclination to the private sector and not integrated as a whole to boost progress towards sustainability. One critical sustainability framework is the GRI 404: Training and Education 2016, which only includes three leading employee-based indicators such as average hours of training per year per employee, Programs for upgrading employee skills and transition assistance programs, and Percentage of employees receiving regular performance and career development reviews (Consolidated set of GRI Standards, 2022). This suggests that the Tokaj Hétszőlő company should consider aspects like this; therefore, it could outstand the crowd by supporting educational training at the local level in the Tokaj region.

Based on our findings, it can be stated that the indicator has a positive performance value equivalent to 100 %, which means an excellent contribution to national child labor regulation enforcement. The company is committed to avoiding involving infants and has strict control over them. It is important to highlight that the Global Initiative Standard considers an essential topic in its agricultural sector reporting format and the national sustainable development goals reporting for countries.

Production

Based on our findings, the indicator's value suggests that the company should keep implementing good agricultural practices, particularly organic fertilizer management, to keep at the state-of-the-art level and move forward to touting more inclusive and sustainable market competitiveness. However, it is essential to underscore that 5 Mt/ha is a value close to the national average grape production in Hungary, which is 7 Mt/ha. The variation could be explained by the volcanic rock of the Zemplén Hills and the diversity of the tuffs overlying them, resulting in a production area that is extremely varied in terms of geology. In some places, there are even three distinct types of tuff fragments. On the other hand, Plant protection organic products are pretty well implemented, and organic matter application on crop fields is well managed. A more efficient pest management system is also required. Despite making remarkable efforts in the organic production process, companies' sustainability reporting frameworks do not include this important indicator in their integrated approach. Considering that the Sustainable Development Goals reporting processes are progressing in this topic is only essential.

Based on our findings, it can be seen that the value 0.11 for fertilizer use efficiency indicates an increase in 0.11 kg of the yield of the harvested area per unit of organic fertilizer applied. This means that an even more progressive organic matter application process is needed to keep the quality of the production system and products. However, despite making remarkable efforts in the organic production process, companies' sustainability reporting frameworks do not include this critical indicator as part of their integrated approach. Considering that the Sustainable Development Goals reporting processes are progressing in this topic is only essential.

Based on our findings, it can be seen that the indicator value, despite having the main grape crop, intensification of significant alternative crops needed, such as more apple and plum trees and other cover crops to be incorporated in the viticulture estate. However, it is also essential to mention that the Tokaj Hétszőlő company manage efficiently its solid waste by connecting it to third-party recycling entities of the country.

CONCLUSIONS

Based on our results, this sustainability measuring tool with a landscape-integrated approach turned out to be a ground-breaking and innovative tool for measuring progress towards sustainability, which also can become a potential online measurement system for companies and public sectors and ultimately any organization interested in measuring their credible impact towards sustainability. However, it is important to highlight that global standards such as the International Integrated Reporting Framework (IR), the Carbon Disclosure Project (CDP), the Sustainable Accounting Standard Board (SARB), and the Task Force on Climate-related Financial Disclosures do not integrate a landscape integrated approach as it should be since their assessment frameworks are primarily private sector- led designs and financial metrics based- indicators are dominant.

The assessment results show that out of 21 indicators, including core and landscape dependent indicators in total 9 were determined as applicable, three were inconclusive, and 3 were defined as not applicable; likewise, out of 9 indicators defined as appropriate, 5 were described as required, two were recommended and 1 optional.

On the one hand, our results indicate that a potentially sensitive identified area is the main water body surrounding the estate; this means some investment activities to protect the water body need to be implemented. On the other hand, although Natural ecosystem protection is being run by the government, which means that the viticulture estate must join to the national efforts and expand the success of nationwide activities, it is essential to keep the water quantity by protecting water bodies and implementing an action plan in surrounding areas near these water bodies itself.

Furthermore, an increase in investment efficiency must be yielded by preparing an ecosystem restoration action plan

considering areas identified as important for biodiversity to reduce soil depletion and boost hydric natural regulation; therefore, the investment in this point must be included in the annual management plan and cooperation with local governmental institution also should be enhanced.

The management action plan must consider additional economic, technological, and social benefits for workers to boost the quality of life of harvesters and other annexed employees in the company. In addition, this action plan should include some parameters such as health and nutrition for workers and the worker's children to ensure a good quality and performance at work and school. It is ultimately essential to maintain a good quality of the grape-based products by using organic products as usual. This will help the viticulture estate achieve success and improve the quality of wine production even more.

Our two central core ecosystem pillar's prioritized results indicate that our metric related to total area (ha) and percentage (%) of each ecosystem type under protection is optimum with just one protected area at the local level (0.11 % of the total); thus, it was identified by setting a green color to it.

Natural ecosystem conversion is defined as high or critical since the country lost about 111,726.4 ha over the last 20 years; therefore, it is identified by setting a red color to it.

When defining our dependent indicators results in the ecosystem pillar, on the one hand, the total area (ha) under Restoration, disaggregated by ecosystem type and restoration type, is outlined and indicates that only a share (1.06%) of the total restorable area is restored. On the other hand, at the local level, the area (ha) and percentage (%) of land under Restoration within areas identified as necessary for biodiversity is also low since the company has only planted roughly 2 ha over the last 20 years. Therefore, both the local and national levels were defined in red. Water quantity was described as green in color.

Concerning our Human well-being pillar metrics such as percentage of poverty (Nationwide, 0.3%), percentage (%) of children that are undernourished (Nationwide, <2.5), percentage (%) of school-aged children (Nationwide, 2.7%), child labor(at local level, 0%), forced labor(local level, 0%), all in all, they were defined as red(critical), yellow(close to critical), green(No critical) and green respectively.

Regarding our production pillar indicator results, the metric average crop productivity (yield/ha) disaggregated by crop was 5Mt/ha; therefore, it is defined as green. Likewise, Our metric fertilizer use efficiency (quantity of product produced per unit of nitrogen, phosphorus, and potassium (NPK) use was 0.36, thus defined as green. Lastly, our metric, Land area(ha) under major crop that utilizes integrated pest management, and percentage (%) of total production area that this represents was 100 %.

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Applied Studies in Agribusiness and Commerce – APSTRACT
University of Debrecen, Faculty of Economics and Business, Debrecen
SCIENTIFIC PAPERS
DOI: 10.19041/APSTRACT/2024/1/3

IMPACT OF INFORMATION SYSTEMS IN THE SUPPLY CHAIN: A SYSTEMATIC LITERATURE REVIEW

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Abstract: *Information system (IS) has in many ways impacted supply chain management (SCM), from accumulating. organizing, and assessing data to optimizing the whole operation. With the help of technological advancement and efficient data control, companies can move forward with amending the SCM according to what customers expect. The present study has predominantly focused on how the IS helps the managers and the entire workforce to give their best effort to make SCM successful which accordingly can control the productivity, revenue and data throughout business operations. This systematic literature review is based on an analysis of over 250 articles published in peer-reviewed journals over the last four years to reach out to the learning areas aligned with the topic of how IS aids SCM in different sectors. In general, the findings point out that the integration of information technology into their supply chains provides a competitive advantage. In addition, the study indicates that technology enhances supply chain management's information accessibility, insight, agility, cooperation, and client loyalty. On the other hand, software's could improve supply chain efficiency, but using new technology comes with risk. Unwilling partners and suppliers, poor planning and preparation, communication difficulties, customer issues, complaints, and awkward encounters are among the common complications.*

Keywords: *Information system (IS), supply chain (SC), supply chain management (SCM), Systematic Literature Review (SLR)*
(JEL code: M10)

INTRODUCTION

An information management system is one of the major elements that help to enhance the supply chain system and improve the performance of the organisation (DEHGANI and NAVIMIPOUR, 2019). The employees and managers can maintain key information in a format which can be accessible. This helps them to create a strong plan so that they can achieve the targets of the organisation. However, sharing the company data with the help of an information system helps the management and staff to develop better relationships and maximise the profit of the organisation. As discussed by (FATORACHIAN and KAZEMI, 2021), information systems and technology developments need to be integrated and aligned so that it can help employees enhance their company culture. Focusing on this strategy can help the company's management increase the efficiency of their workforce. It also gives the opportunity to drive down the cost of operations so that they do not have to face any kind of challenges. The application of the information system in the supply chain also help the organisation to satisfy customer requirements (GHADGE et al. 2020), it increases the opportunity to manage the cyber risk system of the firm.

(HAGHNEGAHDAR et al. 2022) argued that there are several types of information technology that help enhance supply chain management: Internet of Things (IoT), cloud-based services, cognitive computing, big data, etc.; it is still insignificant for managing the technical systems so that the working methods of the company can be enhanced. According to (RANA et al. 2022) employees and managers should learn the techniques of the information system so that they can handle their regular operations and enhance the overall performance of the firm. They also stated that employees and managers should learn the techniques of the information system so that they can handle their regular operations and enhance the overall performance of the firm. Information is essential to the efficient operation of the supply chain because it serves as the basis on which managers determine how to go forwards with operations and also how the supply chain will complete them (RANA et al. 2022). As opined by (SCALA and LIND-

SAY, 2021) without knowledge of these factors, management is unable to determine the public's preferences, the amount of inventory at hand, or the most efficient time to produce or provide more items.

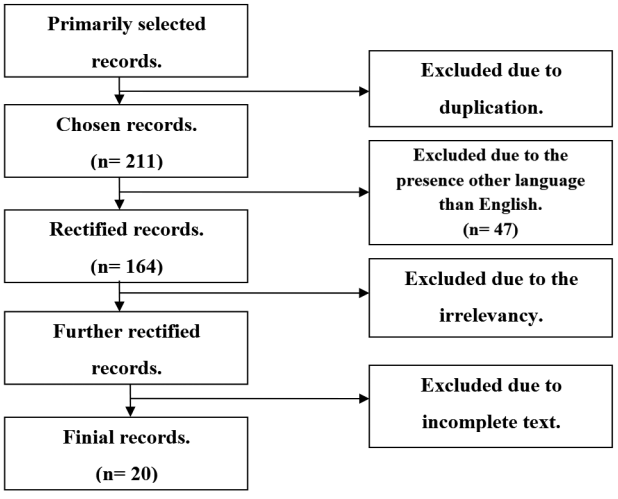
The main aim of this research is to analyse the impact of the information system in the supply chain and highlight the issues which have affected the organisation. Hence, the purpose of the study is to examine the role and effects of information systems in the supply chain, to discuss the advantages of information systems which are creating a positive impact on the supply chain practices and to determine the supply chain challenges that the information technology system has brought about.

MATERIALS AND METHODS

This research followed a three stage approach methodology for the literature review. In the first stage, papers of various researchers are gathered, secondly, efficient frameworks are being made based on the papers and lastly, the research will be discussed and properly elucidated depending on the topic.

Applying PRISMA tool, may be used to conduct the review and provide the desired results (ALVARL and GRIFFITHS, 2021). The application of the PRISMA flowchart (Figure 1) explains both the total number of records used and the number of records necessary for accurate analysis, (AGERON et al. 2020).

Figure 1. The PRISMA Flowchart



Source: Author's own work

Twenty papers were compared to the references in this article to establish the learning areas of the research. An overview of the procedures to be applied in observational research is also included in the secondary analysis. The approach of the sustainable strategy of the Information management system and its impacts on supply chain management have been extensively elucidated in the present studies that have been made publicly available and are sufficient to understand the results while greatly reducing the risk of bias. As per (AGERON et al. 2020), numerous studies have also concentrated on quantitative research in order to provide a thorough understanding of the effect of information systems on the supply chain.

Quantitative studies have more influence than qualitative research because experimenting with officials and considering their observations will be more likely imperative elements for the current topic.

The criteria for inclusion encourage disagreement and offer direction throughout data collection and screening, which helps in debating the research population in a trustworthy and objective manner. The ability to evaluate how a decision impacts external validity is helpful. (LONG et al. 2020), one method of exclusion criteria that aids the researcher in completing the screening process is to use an effective workflow, summarise the justifications for the study's exclusion, and include a systematic review. The study's conclusion was reached using both approaches. The researcher was able to find and gather significant and pertinent papers because of the keywords utilised in this work. Additional factors and theoretical research were employed to further the goals and objectives of the study. The application of the inclusion criterion can be done by clinical and demographic means, allowing for a clear reason.

The articles were chosen by the following steps:

1- Using keywords 263 articles were identified through database searching between 2019-2023.
2- The search results across different data sources were merged, thereby removing multiple entries in the process. After duplicates were removed there were 211 articles remaining.
3- Then the articles were read based on pre-determined inclusion and exclusion criteria. Irrelevant articles were also removed based on scanning the titles and abstract of articles. Through this process 75 articles were rejected
4- The articles that were chosen were reviewed sensibly in order to examine the research methods, theories and content. Hence, 69 articles were rejected.
5- Finally, 22 articles were retained for the entire review.
6- It was noticed that it was possible that some publications have not been considered due to their failure to address the keywords searched for in their titles or abstracts, hence several highly relevant articles were manually added by conducting an additional search (SCHALTEGGER, 2002).

A well-liked method for addressing the quality evaluation of cooperative and constructive intervention is the Critical Appraisal Skills Program (CASP) see table 1. The entire chart, which itself is applicable to systematic reviews, randomised controlled trials, and economic assessments, was built on the assessment checklist. According to (LONG et al. 2020), using the CASP instrument correctly is essential to avoid distorting the evaluation's results. The researcher can fully understand the process thanks to the chart that shows the results. This has proven the effectiveness of the treatments in addition to enhancing teaching and learning. The researcher may also draw judgements in order to satisfy the requirements of this article. Its properties, which are reliant on the subsequent synthesis, may

determine how it is understood. A unique approach that could organise the full explanation has been studied using the findings of the quality evaluation based on the synthesis of the evidence.

The use of the PRISMA tool clarifies the researchers' methods for spotting public data. It was vital to know how many studies were chosen and rejected in order to get the information that was required and pertinent to the problem. This method also makes it simpler to delete undesirable content from the page and draw noble conclusions.

RESULTS AND DISCUSSION

(KOIVISTO and HAMARI, 2019) suggest that information has enhanced the way companies are trying to inculcate success into their operations by accessing knowledge. Every business requires to be exposed towards the most accurate and correct information so as to ensure that overall market power can be gathered. It is immensely important to understand that in the present world, every organisation works within the data-heavy dimension and thus, requires a proper information system so that articulated objectives associated with business goals can be achieved in an effective manner. In this regard, (RAINER and PRINCE 2021) add that information system are a dignified collection of different information resources that are used in order to gather, precisely process, collectively store and separate information for the usage of companies in order to gain competitive advantage. Organisations and different companies are found to employ distinctive information systems in order to work and communicate with their suppliers and customers, perform important business-oriented operations, manage the company and last but not the least maintain and roll out marketing campaigns. This does suggest the extensive manner through which the overall requirement of information systems is required by businesses.

Additionally, (NAIM and ALQAHTANI, 2021) suggest that the applications of distinctive information systems are transaction processing systems (TPS), office automation systems (OAS), knowledge work systems (KWS), management information systems (MIS) and decision support systems (DSS), and executive support systems (ESS). In this regard, it is important to suggest that TPS is the information system that is used by businesses at the operational level while KWS and OAS are found to operate significantly on the knowledge level. However, it is important to suggest that DSS and MIS are found to operate right at the managerial level whereas, ESS is for the strategic level. (ENNY and NI LUH, 2021) suggest that all of these applications that are associated with information systems are structured or designed in such a manner so that every minute details at the organisational level can be easily achieved with the help of the mentioned applications all together. In other words, it can be suggested that all the mentioned applications of information systems are beneficial today implemented organisations because it's not only induces proper and precise innovation into different business activities with the help of its research and development dimension but also in a bus smooth automation by reducing the overall steps that are required to complete any allocated and complicated task. Moreover, the applications also ensure to keep completely safe software, data storage, hardware, and networking systems are completely up to date (ENNY and NI LUH, 2021). Thus, these are some of the important applications of the information system along with its benefits for which different businesses imply them to their work procedures in a significant manner. According to (FU et al. 2022) findings, to enhance the power of Information Management in SCM within firms, the operational processes must be conducted in a unified structure. Exploratory analysis has compelled a few researchers to eliminate observed variables and intersect them with a common link. Out of 10 potential research data, 3 studies may be fully devoted to finding the indicated factors within the topic. On the other side, confirmatory analysis has delivered the result regarding the approach of implications of various strategies in order to scale up the financial performance of the firms. As per the views of (SCHNIEDERJANS et al. 2020), many firms have invested in technology and software designs to make improvements in organisational culture by accelerating team performance along with tuning up their future abilities to address problems within the business process. Few researchers have focused on implementing strategies in the process of supply chain management with the aid of information management along with proving a point that the competitions are consistent among various strategies not among the firms (ABBAS, 2020). Competitive advantage and conceived challenges among strategies have impacted organisms' operational and revenue performances. The list below presents the top five advantages of employing management of the supply network with technology.

Better Information Access

Supply chain-based technology offers insight into customer behaviour in addition to network-wide data on crucial supply chain demands, operations, and interruptions.

Enhanced insight

Businesses may quickly make better judgements by utilising the supply chain technology's decision-support capabilities, (SONI et al. 2022). It is also made simple to analyse data, develop conclusions, and form opinions.

Greater agility

Technology in the supply chain improves agility, enabling executives to handle issues more quickly and formulate preventative solutions (FÜZESI et al. 2020).

Greater Cooperation

Successful supply chains must include technology and processes that encourage, monitor, and assess engagement between individuals, groups, and organisations because they ensure a continual stream of data, analysis, and choices.

An increase in client loyalty

Supply chain technology is essential for omnichannel consumer success and loyalty given the challenges they face. (KUMAR and TING, 2019), mentioned that retailers need visibility, precision, and agility to make sure they have the proper items in their stores and can fulfil online purchases. This is not possible without supply chain technology.

With the aid of the methodologies utilised in this part, it is made clear how information systems impact the supply chain and what has to be done to stop issues from being brought on by such systems, (AMMAR et al. 2019). The study found that an information management system is one of the key elements that enhance the effectiveness of the organisation's performance.

(WINARTO 2021) makes sure to suggest that the overall benefits of different applications evident in the information systems are found to immensely support companies with all complicated and knowledge-based tasks. Significantly, the help of applications ensures that all allocated tasks can be completed within a short time frame and all the business-related goals can be. Therefore, these are all the applications of information systems.

The improvement of supply chain processes may be considerably aided by software. However, there is usually some risk involved when adopting new technology, especially if it challenges the cultural norms and organisational practises that are currently in place. According to (BERDIK et al. 2020), frequent data integration problems include the lack of a plan, digitising records, automating procedures, managing the growing volume, safeguarding access to information, reducing information silos, connecting with legacy systems, and removing low-quality data.

Typical problems with supply chain software implementation
- When putting new software into use, the following problems commonly occur:
- Partners and suppliers are unwilling to compromise.
- New processes and resources are proving to be difficult for employees to adapt to, (HELO and HAO, 2019)
- Poor practice and preparation in terms of training.
- Communication issues on both the internal and external levels, (REJEB et al. 2019)
- Consumer problems, grievances, and negative encounters.

DISCUSSION, IMPLEMENTATION AND ANALYSIS

This study has provided a combined-method proposal to assess the responsibilities of supply chain management in firms' operational and economic healthy by particularly concentrating on the manufacturing and production of different parts of the country. The analysis framework majorly sheds light on the areas of how the information system has impacted SCM from starting a process to delivering the outcome to the end-users. The researchers have also discussed that the firms oftentimes implement different strategies of sustainable management programmes which are aligned to reach the business aim and objectives effectively.

According to (FATORACHIAN and KAZEMI 2021), the analysis of the impacts of IS on SCM has primarily focused on the constructive areas that showed the financial improvement of the organisations due to the information system's agility. On the contrary, the consequent part of the study also focused on cynical areas by discussing the low significance of information management in SCM. However, gathered samples have significantly concluded that the financial performances of supply chain management have enormously improved by decreasing all the complexities within the operational processes such as hazards of collecting raw materials, high logistics costs and more. On the other side, the researchers have similarly stated the positive results of IS impacts on supply chain technology. Straightforward application of IS has helped organisations to enhance the performances of the workers as well as make the management team more efficient. Decision-making and problem-solving skills are therefore enhanced by the company professionals, as information management with real time data helps the employees to work on the constructive analysis of process execution. As per the views of (GURTU and JOHNY 2019) blockchain technology has also played an essential role in making fast changes in various sectors worldwide and simultaneously omitting intermediaries to make supply chain management more relevant to rapid business growth.

Contribution and significance of information system implementation

The implementation of new technologies improves the overall performance of a supply chain. The main goal of this study is to examine the possible impact of the technological revolution. The use of technologies is found to enhance the overall usage of significant knowledge into the operations of a company to simplify any complicated procedures (FATORACHIAN et al. 2021). Blockchain technology improves transparency and visibility by eliminating the drawbacks of belief matters in a supply network. The blockchain model is built on the combination of three theories: the technology acceptance theory, the networked readiness theory, and the self-determination theory. The adoption of blockchain technology in the distribution network and the outcomes indicate that supply management experts comprehend blockchain technology adoption to be effortless, enabling them to generate the highest advantages for increasing the performance of the supply chain (KAMBLE et al. 2019). The information system focuses on contributing to supply chain management through deep analysis. The contribution in the internal supply domain is to introduce supply chain adjustment concepts and analyse information technology usage, whose involvement may improve the performance of the supply chain.

Results using the CASP tool

Table 1. Results of Systematic Literature review

Serial No.	Authors	Findings	Aims	Sample	Methods	CASP
1	(KOIVISTO and HAMARI 2019)	Barriers in the integration of technology and supply chain	Understanding the functions of constructive intervention	Employees	Qualitative approach through interviews	5
2	(RAINER and PRINCE, 2021)	Autonomy is designed through collaborative interevent.	Develop the means of implementing information system within the supply chain	The administrator	Mix integration has been Incorporated along with experimental design	4
3	(NAIM and ALQAHTANI, 2021)	Information systems' function in managing customer relationships	Understanding cooperation in technological implementation	Employers	Grounded approach with the usage of interviews.	6
4	(ENNY and NI LUH, 2021)	Information Management Practices at an Online Transportation Service	Role of collaboration in developing the performance of supply chain	Employees	Interviews were carried out	5
5	(WINARTO, 2021)	Supply chain is enhanced through constructive intervention.	Highlighting the vitality of collaborative practices.	Employees	Qualitative interviews and secondary literature.	7
6	(HUO et al. 2023)	Constructive interventions put an impact on the supply chain.	Introduction in the field of supply chain	Teachers as well as learners in higher education.	Systematic data extraction using descriptive design.	7
7	(SONI et al. 2022)	Understanding inclusive technology	Advanced technology is necessary for inclusivity	Entrepreneurs and staff	Systematic literature review was utilised.	5
8	(KUMAR and TING, 2019)	Agile Supply Chain for Clothing are driven by RFID & Analytics.	Understanding engagement of Agile Supply Chain for Clothing industry	Employers along with employee	Survey and mixed methods	5
9	(BERDIK et al. 2021)	ICT acts as an effective tool in enhancing supply chain.	Implications of the constructivist approach in implementing modern technologies with company's distribution chains	Employees	Quantitative survey.	6
10	(HELO and HAO, 2019)	Blended technological advancements is the most suitable component in increasing the efficiency of supply chain.	Highlighting the necessary combinations of information technology into supply chain of an organisation	Employees of various companies	Exploratory approach has been used with triangulation method	8
11	(REJEB et al. 2019)	Technology has been found to be useful for meeting the requirements of supply chain	Identifying the choice for imparting technology system	Employers	Open ended questionnaire.	8
12	(AMMAR et al. 2019)	The nature of the supply chain is changing in terms of instructional methods.	Understanding the ways that pairing educated reacts to Group-based flipped learning (GBFL)	Aspiring professionals	Interviews were conducted	9
13	(CHRISTOPHER et al. 2021)	New insights to the field of IS through the utilisation of conceptions of AI	To understand the various characteristics of AI studied within the context of IS.	Entrepreneurs and staff	Systematic literature review was utilised.	7
14	(ASAMOAH et al. 2020)	Provide initial verification of the effectiveness of the IT artefact in explaining the level of SC performance of firms.	How IOS use impacts an organization's SCM capabilities and SC performance.	Employees of various companies	Questionnaires and using partial least squares structural equation	8
15	(FATORACHIAN and KAZEMI, 2020)	Industry 4.0 can allow for a holistic approach towards SCM and lead to performance improvements through enabling extensive integration and connectivity	Potential impact of Industry 4.0 and its associated technological advances on Supply Chain performance	Previous literature	Systematic literature review was utilised.	6
16	(ALZOUBI and YANAMANDRA, 2020)	Redesigning their supply chains towards agility by using information sharing as a key aspect	Determining the mediating role of Information Sharing Strategy (ISS) on Agile Supply Chain (ASC) practices for achieving Supply Chain Performance (SCP)	Employees of various companies	Systematic literature review and questionnaires	5

Serial No.	Authors	Findings	Aims	Sample	Methods	CASP
17	(MIGUEL et al. 2020)	A strong accumulated effect on efficiency and, ultimately, on the supply chain results	Overview of aspects and implications of the relationships between Information and Digital Technologies (IDT) of Industry 4.0 and Lean Supply Chain Management (LSCM)	Previous literature	Systematic literature review was utilised.	7
18	(BAAH et al. 2022)	Information sharing positively and significantly influenced supply chain visibility, collaboration, agility and performance	Assesses the critical role of information sharing in supply chains through emphasizing its effect on supply chain visibility	Employees of various companies	Survey research design, a quantitative approach and partial least square structural equation modeling (PLS-SEM)	5
19	(ASAMOAH et al. 2020)	The effect of SCM capabilities on supply chain performance was very strong and even larger than the effect of IOS use on supply chain performance	How IOS use impacts an organization's supply chain management (SCM) capabilities and supply chain performance	Employees of various companies	Questionnaires and using partial least squares structural equation	6
20	(CHEGE et al. 2019)	IT innovation influences SME performance and that the entrepreneur plays a role in the relationship between IT innovation and firm performance	Examines the association between technology innovation and firm performance	Managers of SMEs	Quantitative research design and a semi-structured questionnaire	8

Source: Author's own work

Constructive and collaborative application for developing information systems and its advantages

Firms have implemented a number of information technologies, such as electronic data exchange, manufacturer-managed supplies, and stakeholder engagement, to facilitate clear interaction and strategic planning with supplier partners. Information systems enable organizations to maintain operations in a coordinated and cohesive way in order to achieve a competitive advantage (ALI et al. 2022). For better supply chain performance, some mechanisms are investigated, including the information system's external consumption of its globally connected collaborators. This has really been advantageous. Another mechanism includes the enhancement of the information system's overall organisational management systems in supply chain operations. To manage resources efficiently and successfully, these implementations and their use should be associated with the firm's supply chain management. The research on IT management has primarily concentrated on different aspects of the orientation between information management strategy and corporate strategy (ZEKHNINI et al. 2021). To control the supply chain system, organisations have to introduce a process management strategy and suitable supply chain management practices. Moreover, different supply chain strategies necessitate the use of adequate information technology.

To save the environment, it is essential to completely remove certain causes or driving obstacles. New technological progress, improved customer perception, and regulatory assistance are all required for the impactful adoption of environmentally friendly supply procedures. Several blockchain-based modelling tools, including as a multi-chain framework, a descriptive statistical model, and a brick restriction model, are incorporated into the complete blockchain-based supply chain performance evaluation framework from an e-commerce production chain viewpoint (LIU et al. 2020). Numerous core techniques and algorithms, such as information alignment, key generation, and data encryption, are also being developed. The information system also secures personal data in a supply chain system and prevents any type of information leakage in the industry. New systems are implemented in the supply chain industries for better productivity as well.

Problems that are found due to this constructive and collaborative application

There are several factors that have an influence on supply chain technology and digital transformation, such as cost and competitiveness, supply forecasting and planning, talent shortages, and more. Due to the stringent guidelines needed to maintain the accuracy of data obtained and the transfer of information throughout supply chains, it could be challenging to create and use important information efficiently. As per (TYAGI et al. 2021), even while contemporary organisations possess access to information, telecommunication, and technology that makes it feasible to gather and store large volumes of data, some of these enterprises may not be properly utilising the creation of information systems that facilitate better decision-making using this plethora of data. If data is not transferred both horizontally and vertically across the value chain to inform decisions about inventory, customer service, transportation, and other concerns, it is essentially meaningless to collect and keep data. If it is delivered in a timely, precise, and controlled manner, information appears to have the potential to be a fatal weapon.

Limitations and Recommendations

The study has stated that various published journals about information system impact on supply chain management have discussed about the efficiency of internal and external factors of the organisations, from heading to a new journey to delivering products in the hands of consumers. However, analysing the research pacers, it can be stated that few journals have lacked in addressing the impacts transparently by which few journals discuss sustainable management strategies. Assessing different papers which are conducted by accumulating data from different audiences, approaches and discussions has led to making different perspectives about a certain topic. Another flaw has been noticed here in surveying the data from different parts of the world. Every country has its own rules and guidelines about every sector which is somewhere missing in a few papers while conducting the research. Thirdly, as the researchers are more into finding the data which provides the impacts of Information System on SCM, they somewhere missed out on enlightening how the technology and software system has helped the distribution network to attain the business goal within time.

Recommendation 1

Companies are required to form a supply chain council-The council's job is to provide guidance and connect the supply chain strategy to the main objectives of the business. Consequently, when supply chain technology is introduced, the council will help to dissolve organisational barriers.

Recommendation 2

Reviews must be produced regularly- To guarantee effectiveness and compliance, the organisation must assess its policies and processes. Operations will become simpler, bottlenecks in the supply chain will be avoided, and the likelihood of fraud and theft will be decreased.

CONCLUSION

The performance of the organisation and the supply chain may be enhanced with the help of an information management system. Supply chain management (SCM) may benefit from information technology since it enables a shorter time to value, greater sales, and more production. However, the implementation of information technology poses several concerns as well. One of the most common information management issues is the lack of planning. Other common issues include the digitisation of records, automation of processes, management of the expanding volume, protection of information access, elimination of information silos, integration with legacy systems, and erasure of low-quality data. The results of the CASP instrument were utilised to evaluate the effectiveness of cooperative and supportive interventions.

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Applied Studies in Agribusiness and Commerce – APSTRACT
University of Debrecen, Faculty of Economics and Business, Debrecen
SCIENTIFIC PAPERS
DOI: 10.19041/APSTRACT/2024/1/4

SOCIOECONOMIC DETERMINANTS OF THE INTENSITY OF MUSHROOM COMMERCIALISATION IN GREATER ACCRA REGION, GHANA

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Abstract: *Fungi, such as mushrooms, have the unique ability to decompose and convert obstinate organic substances into protein, thereby improving nutrition, increasing food security, fostering sustainable agricultural production, and generating income for farmers. Since the 1990s, the Ghanaian government, through the Mushroom Unit of the Food Research Institute of Ghana, has promoted the cultivation and commercialisation of oyster mushrooms in Ghana as an additional source of income for the urban poor. This study used a cross-sectional survey design, questionnaires, and validated structured interview schedule instruments to collect data from 153 mushroom farmers in the Ga East and Adentan Municipalities of the Greater Accra Region to determine the intensity, degree, characterisation, and factors that influence the intensity of oyster mushrooms. The crop commercialisation index, frequency, mean, standard deviation, two-stage least squares regression, and ordinary least squares regression were used to analyse the data. The results showed a low intensity (GHC 10202.20) but a high degree (75%) of oyster mushroom commercialisation in the study area. The vast majority of oyster mushroom farmers (95%) were highly commercialised, selling more than half of their oyster mushroom output. Except for age, farmers' level of formal education, land ownership, and production volume of oyster mushrooms all positively influenced the intensity of oyster mushroom commercialisation. The Food Research Institute, the Ministry of Food and Agriculture, and development organisations should step up efforts to increase oyster mushroom production and attract educated, young, and unemployed people to oyster mushroom ventures.*

Keywords: *Oyster mushroom commercialisation, Crop Commercialisation Index, intensity of oyster mushroom commercialisation, two-stage least square regression*
(JEL code: Q11)

INTRODUCTION

Ghana is an agrarian economy that highly promotes large-scale, commercial agricultural production as a top priority for the country's development (Abu, 2015). The agricultural industry of Ghana accounts for 15.3% of GDP as of the second quarter of 2019 and employs 44.7% of the country's workforce (Mzali, 2020). The agricultural sector of Ghana is dominated by the crop subsector, which comprises major cash crops such as cocoa, oil palm, rubber, and citrus. Also, maize, cassava, plantains, yam, cocoyam, rice, sorghum, and millet are the principal food crops, accounting for 3.40 million hectares (Mha) of total cultivated land (Adjei-Nsiah, 2012). However, the onset of climate change and its negative impact threaten the yield of traditional crops (maize, cassava, plantains, yam, cocoyam, rice, sorghum, and millet), jeopardising the sustainable livelihoods of the majority of Ghanaians whose livelihoods rely on the aforementioned crops (Antwi-Agyei, 2012). Mushrooms (Oyster) have been identified as an agribusiness enterprise with a high potential for livelihood in Ghana (Obodai, 2000).

Mushrooms are neither plant nor animal foods, but edible mushrooms are classified as vegetables (Fortune Business Insight, 2020; Harvard School of Public Health, 2020). A mushroom is a fungus' fleshy, spore-bearing fruiting body that grows above ground, on soil, or on its food source. It is considered a cash crop globally that contributes significantly to food security and the quality of human health due to its known medicinal, nutritional, and economic value (Zhang et al., 2014). Mushrooms are a good source of protein, amino

acids, and vitamins that are important nutrients for healthy human growth (Kortei et al., 2018a).

The global mushroom industry is comprised primarily of edible, medicinal, and wild varieties. Since 1978, the global production of cultivated edible mushrooms has expanded by more than 30 fold. In 2020, the global mushroom market was worth 14.5 million metric tonnes. The global mushroom market is expected to increase from 15.25 million tonnes in 2021 to 24.05 million tonnes in 2028 (Fortune Business Insight, 2020). China is the leading producer of edible, cultivated mushrooms. Lentinus edodes is currently the most widely produced edible mushroom, accounting for around 22% of the global supply. Lentinula and four other genera (Pleurotus, Auricularia, Agaricus, and Flammulina) comprise 85 percent of the world's cultivated edible mushroom supply. On average, consumers consume approximately 5 kilogrammes of mushrooms each year (Royse et al., 2017). Governments in many countries are investing in the production of high-quality varieties of edible fungi for both consumption and export due to the growing demand for food with low cholesterol and fat content for healthy human growth (Fortune Business Insight, 2020).

In Ghana, mushroom cultivation is a promising agribusiness venture and a good source of nutrients for healthy human development, as it is high in protein, amino acids, and vitamins. The mushroom commonly grown in Ghana in general and the Greater Accra region in particular is the Pleurotus oystreatus (oyster mushroom). This is because oyster mushrooms have a high nutritional value, a simple method of cultivation, and a tasty nature cherished by most Ghanaians (Kortei et al., 2018). The economic importance of mushrooms necessitated the establishment of the National Mushroom Development Project (NMDP) in Ghana in 1990 to promote the commercialisation of mushrooms in Ghana, which, through research, could systematically establish and encourage the intensive production, use, and export of mushrooms (Obodai, 2000). This initiative is consistent with Ghana's Food and Agriculture Sector Development Policy (FASDEP), which seeks to promote smallholder farmers' commercialisation (Martey et al., 2012).

In addition to the government's effort, other local and foreign development partners have been implementing a series of programmes to boost the commercial production of mushrooms in the country (Kubi, 2010). For example, in 2016, the Business Sector Advocacy Challenge (BUSAC) sponsored a skill development programme to equip the members of the Mushroom Growers and Exporters Association of Ghana (MUGREAG) with mushroom production, costing, marketing, and financial management skills (BUSAC Report, 2019). Again, in 2019, the European Union (EU) launched a four-year agricultural project (2019–2022) in the Nkoranza North District of the Bono East Region to help boost local economic growth and development, focusing on the production of mushrooms for job creation. The project entails the construction of a modern agribusiness incubation centre, a spawn laboratory, and commercial mushroom production villages (Adu-Gyamerah, 2019). Furthermore, ActionAid Ghana introduced a mushroom production training programme in two municipalities in the Greater Accra Region of Ghana to improve the informal sector's growth (Lomotey, 2019).

Despite the huge investments in Ghana's mushroom industry, small-scale mushroom producers in the country are predominantly subsistence-oriented (Shem, 2018; Adu-Gyamerah, 2019), with a low average annual production of 758 tonnes (687.65 metric ns) (Mu hroom-PO-Ghana, 20, 2017). According to Trigde (2021), a total of 28,470 metric tonnes and 28,690 metric tonnes of oyster mushrooms were imported into the country in 2018 and 2019, respectively, which corresponded to $78,460 and $64,520. This implies that the majority of local demand is met by imports, confirming Obodai et al.'s (2015) assertion that demand for mushrooms in Ghana surpasses supply. Given the current state of Ghana's mushroom industry, it is imperative to improve the commercialisation of mushroom production in Ghana, particularly in the Greater Accra Region, to meet demand.

The Greater Accra Region is the best place to gauge oyster mushroom commercialisation because it is the origin of mushroom production in Ghana (Obodai, 2000). It also serves as the home to major government institutions like the Food Research Institute (FRI), which is in charge of promoting mushroom production and development in Ghana. The region further contains the majority of the country's middle-class residents, who are the largest consumers of mushroom products, and constitutes a favourable source of market for mushrooms (Weatherspoon & Reardon, 2003).

Unfortunately, research on agricultural commercialisation in Ghana has focused mainly on the major staple crops (cassava, maize, rice, and groundnut) and a few cash crops, including cocoa and pineapple, but little or no work has been done to explore the determinants of mushroom commercialisation, conforming to the claim by Zhou (2013) that empirical studies on agricultural commercialisation have concentrated only on the staple crops and livestock. The intensity of oyster mushroom commercialisation and the factors influencing it, however, have received little scholarly attention. Against this backdrop, the question that arises is: What is the intensity of oyster mushroom commercialisation in the Greater Accra region of Ghana? The paper specifically addresses the research questions listed below: 1) What is the intensity of oyster mushroom commercialisation in the Greater Accra Region? 2) Are there degrees or variations in the intensity of oyster mushroom commercialisation? 3) What factors significantly influence the intensity of oyster mushroom commercialisation in the region?

THEORETICAL FRAMEWORK

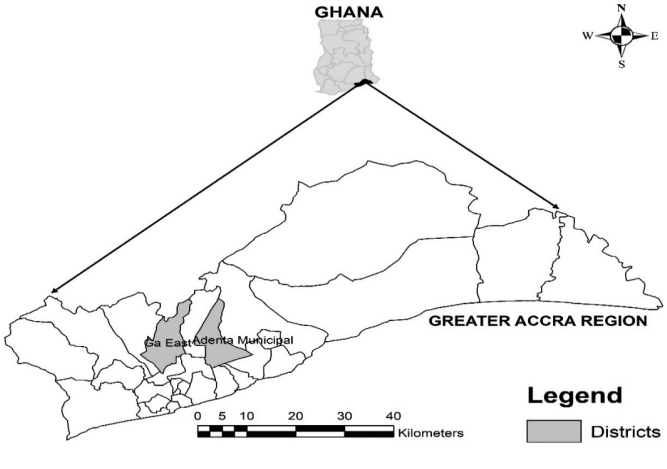
The current study is based on the trade theory proposed by David Ricardo (Maneschi, 1992). According to the theory, farmers produce goods for which they have a high comparative advantage and exchange them for goods for which they have a lesser comparative advantage (Siziba et al., 2011). However, the trade theory is unable to identify the specific determinants of agricultural commercialisation, which gave rise to numerous theoretical models. One of the models is the non-separable household agricultural commercialisation behaviour model posited by Barret (Barrett, 2008; Boughton et al., 2011). Barrett (2008) developed a non-separable household agricultural commercialisation behaviour model that assumes

that a farm household must choose between being a buyer, net seller, or autarchic to maximise utility. The model is shown in a simplified way as a function of five outside factors: A, G, W, P, and Z. These factors stand for private asset stock, public asset stock, household-specific characteristics, commodity price, and transaction costs, in that order (Abu, 2015). In other words, a farmer's comparative advantage in producing and commercialising a particular agricultural commodity is influenced by the variables mentioned above. The intensity of commercialisation, that is, the amount of output sold on the market, is influenced by several household and farm-related characteristics, market-related variables, and public asset variables (Baisa, 2009).

MATERIALS AND METHODS

This research was conducted in the Greater Accra Region, specifically in Ga East and Adentan municipalities, which are hubs of mushroom production in the region. The Ga East Municipal Assembly, with Abokobi as its capital, is located in the northern part of the region. The Akwapim South District borders it on the north, the Ga West Municipal on the west, the La Kwantanang Municipal on the east, and the Accra Metropolitan on the south. The Adentan Municipality is positioned at latitude 5° 43 north and longitude 0° 09 west, 10 kilometres northeast of Accra. The Ashaiman Municipal Assembly and Kpong Akatamanso District Assembly border the municipality's east and north; La Nkwantanang Municipal Assembly borders it on the west and south; and the municipality has a total land area of 928.4 square kilometers. Greater Accra was selected for the study because it is the origin of the mushroom commercialisation campaign in Ghana. It also houses the headquarters of the Mushroom Growers and Exporters Association of Ghana, which has a substantial number of mushroom farmers who were used for this study. The two municipalities were also chosen because they harbour the majority of the registered mushroom producers in the region, and they have been the location for most mushroom training programmes, thereby having the majority of trained mushroom producers. Moreover, the mushroom farmers in these areas are small-scale farmers.

Figure 1. Study area



The study used a cross-sectional survey design. The population of the study comprised all mushroom producers who produced and sold oyster mushrooms in the Ga East and Adentan municipalities of the Greater Region in the 2020 production year and were registered with the Mushroom Growers and Exporters Association of Ghana (MUGREAG) Greater Accra chapter. A sampling frame of 210 (135 and 75 mushroom farmers, respectively, from Adentan and Ga East Municipalities) oyster mushroom producers was developed from the records of the MUGREAG. A census of all the mushroom producers was taken. The farmers were located and surveyed with the help of the executives of the MUGREAG-Accra Chapter. However, an accessible population of 153 was used for the survey due to the non-availability of some of the farmers during the data collection period owing to the COVID-19 restrictions.

The data was collected using a structured, content-validated interview schedule and questionnaire. The researchers performed face-to-face interviews with 127 mushroom farmers and phone interviews with 12 mushroom farmers. Some of the farmers (17 in number) also completed questionnaires via email. The response rates for face-to-face, phone interviews, and email were 100%, 100%, and 82%, respectively. The overall response rate from the target population was 72.9 percent (153 responses), which was good for analysis following Baruch (1999), who recommended a minimum response rate of 60 percent for analysis to proceed.

Various indicators, such as the household commercialisation index, crop commercialisation index, and volume or value of output sold, have been used internationally to assess smallholder agricultural commercialisation (Poulton, 2018).

Using the value and volume of oyster mushrooms sold, the researchers measured the degree of mushroom commercialisation in this study based on the farmers' activities in the 12 months preceding the survey. The researchers considered all mushrooms sold by the producers during that period since all the smallholder mushroom producers in the study sold at least some of their harvest. This allowed the researchers to calculate the intensity of oyster mushroom commercialisation—rather than simply identifying commercialised and non-commercialised producers—as the monetary value of the volume of mushrooms sold during the last 12 months before the survey period (Saha et al., 2021). However, because the intensity of oyster mushroom commercialisation could not be calculated in the absence of a mean price, the researchers imputed price data for each farmer. The average value of oyster mushrooms sold was used as a proxy for the intensity of oyster mushroom commercialisation. This method of estimating the intensity of agricultural commercialisation is widely used (Baisa, 2009; Saha et al., 2021) because it is a reliable indicator of commercialisation, as the increase in the average value of sales of the same commodity over time indicates the increase in commercialisation of the commodity. The method is also less data-demanding than the CC1 and is less susceptible to distress sales (Poulton, 2018).

The researchers also computed the degree of oyster mushroom commercialisation using the Crop Commercialisation Index (CCI) to indicate the proportion of oyster mushroom output supplied to the market (Leavy et al., 2008; Poulton, 2018; Qaim

et al., 2020). The CCI is determined by dividing the ration of the total annual quantity of the crop sold by the total output of the crop as a percentage. A CCI value above 50% indicates a high degree of commercialisation, while a CCI value of 100% signifies full commercialisation. Farmers with a CCI of 50% are considered to be shifting production goals from consumption-focused to commercialisation-oriented, while farmers with 100% commercialisation value produce solely for the market (Gebremedhin & Jaleta, 2010; Gevereh et al., 1999). The commercialisation index is shown in equation 1:

$$CCI_{Produce} = \left[\frac{The\ gross\ value\ of\ produce\ sold\ fpyearn}{The\ gross\ value\ of\ produce\ fpyearn} \right] * 100 \quad (1)$$

This study determined the effect of socioeconomic, sociodemographic, and institutional factors on the intensity of mushroom commercialisation in the Ga East and Adentan Municipalities in the Greater Accra region of Ghana. The researchers assumed that there is an issue of endogeneity within the data, possibly from the correlation between one of the independent variables (value of oyster mushroom output sold) and the error term of the dependent variable (intensity of oyster mushroom commercialisation). To confirm or otherwise, the researchers used the two-stage least squares (2SLS) regression model to test this assumption.

In analysing the influence of socioeconomic, demographic, and institutional factors on the intensity of mushroom commercialisation, the intensity of mushroom commercialisation was modelled based on the mean value of mushroom sales per annum. However, the researchers were concerned that the model might have an endogeneity problem. Then, to deal with the possible breach of the third classical assumption of the OLS model, which specifies that the error term must not correlate with each regressor variable, we used the 2SLS regression model as an option (Bannor et al., 2022). The regression used in the model is the intensity of mushroom commercialisation (the value of mushrooms sold), measured as the mean income earned from mushroom sales. The exogenous variables, also known as regressors, were those that were categorised under sociodemographic, farm, and institutional characteristics (see Table 1). The value of the mushroom output was considered an endogenous variable, as revealed by Gebreselassie and Sharp (2007), who found that the value of the output of crop production is highly likely to correlate with the error term when the value of sales of the crop is used as a dependent variable in the modelling of the intensity of agricultural commercialisation. The assumed endogenous variable is justified by the fact that the output of the crop marketed is determined, along with many other factors, by the total crop output. Because the decision on how much crop to sell proceeds with the decision on how much crop to produce, the quantity of crop marketed is unlikely to affect the quantity produced at a given period. Notwithstanding, the portion of crop marketed in the past year (t-1) heavily influences the quantity produced in the present year (t) (Gebreselassie & Sharp, 2007). This implies that the causal association in time "t" runs from total output to the proportion of the output marketed, rather than the other way around. However, there is a strong probability of an opposite association at time t-1 (Gebreselassie & Sharp, 2007). As a result, the authors hypothesised that the cause of endogeneity could be attributable to a potential bidirectional causality between the value of oyster mushrooms produced and the intensity of mushroom commercialisation. Second, unobserved farmers' sociodemographic and institutional factors and heterogeneities may be the source of endogeneity, potentially impacting the value of oyster mushroom output sold. Consequently, to account for endogeneity, we used three instruments to determine the value of oyster mushroom output and its impact on commercialisation intensity. The instruments for the supposed endogenous variable were identified as farmers' annual income, price, and hired labor. It is noteworthy that the price of produce in the previous year and hired labour can positively influence the value of production (Gebreselassie & Sharp, 2007), while annual income can also positively influence the level of production (Baisa, 2009).

We modelled 2SLS regression as follows:

$$P = D0 + D1S + u \quad (2)$$

where P is the intensity of mushroom commercialisation, u is an estimated error term that contains a variable correlated with S; D0 and D1 are assumed to have consistent estimates when u and S are correlated, and S is the endogenous variable as a result. New variables designated as instrument variables are consequently needed.

Assume an unobservable variable M satisfies the assumptions:

1 M and U are uncorrelated, thus,
$Cov(M,U) = 0$

2 M and S are correlated, thus,
$Cov(M, S) \neq 0$

M is therefore a variable used to control S. It should be noted that the primary step in the 2SLS regression analysis is to compute the reduced version of Equation 2 using OLS to obtain P̂. After that, additional estimating is done using the first stage's estimates, and these estimates are known as 2SLS (Bannor et al., 2022). However, the 2SLS results (Table 3) showed that there was no issue of endogeneity in the variables. The researchers, therefore, employed the Ordinary Least Square (OLS) model to determine the socioeconomic, demographic and institutional factors that influence the intensity of oyster mushroom commercialisation in the study area.

OLS linear multiple regression model was used to estimate the effect of using sociodemographic characteristics of farmers, farm characteristics and institutional factors on the intensity of mushroom commercialisation. Because the dependent variable, the intensity of oyster mushroom commercialisation, is a continuous variable and is measured on the ratio level, the OLS regression model was appropriate for the estimation (Cohen et al., 2014). The OLS regression uses a minimum of two independent variables to predict the dependent variable. It further quantifies the magnitude of the relationship between these vari-

ables (Hutcheson, 2011). According to Williams et al. (2013), the OLS multiple linear regression requires a continuous dependent variable, multiple independent variables, and data that is normally distributed, free of autocorrelation and multicollinearity, homoscedastic, and most importantly, parametric. For this study, the OLS multiple regression is specified as:

$$Y= f(\beta, X, \varepsilon) \quad (3)$$

This is further expanded in equation (3) as

$$Yi = \beta 0 + \beta 1\ X1 + \beta 2\ X2 + \ldots + \beta 15\ X15 + \varepsilon i \quad (4)$$

The independent variables of 2SLS and OLS regression models have been specified in Table 1.

RESULTS AND DISCUSSION

This section presents the socio-economic characteristics of the mushroom farmers, the intensity and degree of mushroom commercialisation, categorisation of oyster mushroom commercialisation and the determinants of the intensity of oyster mushroom commercialisation.

About 68% of the mushroom producers were male, with a mean age of 38.37 years. The mean age of the farmers was 48.37 years. This implies that the farmers were young. Most (81.7%) of the mushroom producers were married with a household size of 1 to 5 people. The mean number of years of education for the farmers was 4.5 years. This implies that all the farmers were formally educated and can manage mushroom farms since mushroom farming is a science and art that requires the ability to access and interpret information (Martey, 2014). The average quantity of mushrooms produced was 717kg, with more than half (54.9%) of farmers producing between 101 kg and 500 kg of oyster mushrooms. Averagely, the mushroom farmers sold 514.80kg of mushrooms, with more than half (56.86%) selling between 101kg and 500kg of oyster mushrooms.

The average land size used for mushroom production was 0.49 acres, but the majority of the mushroom producers (86.9%) produced oyster mushrooms on land spaces of 0.9 acres and below. This confirms that mushroom production does not require a large amount of land for cultivation as compared to staple foods like maize or cassava. The mean years of mushroom production experience by the farmers were about 5 years (4.56 years). The mean price per kg of fresh oyster mushroom was GHC 20.00. The majority of the farmers (94.8%) hired between 1 and 5 people on their mushroom farms.

The majority of the mushroom producers (65%) owned land, while most of the farmers (84%) did not have access to credit, and more than 50% of them (57%) did not have access to extension services. Close to half (45.8%) of the producers had an annual income in the range of GHS 1,000.00 and GHS 10,000.00, while very few of them (1.3%) had an annual income above GHC 50,000.

Socioeconomic characteristics of surveyed farmers

Table 1. Description of variables used in the 2SLS and OLS Models

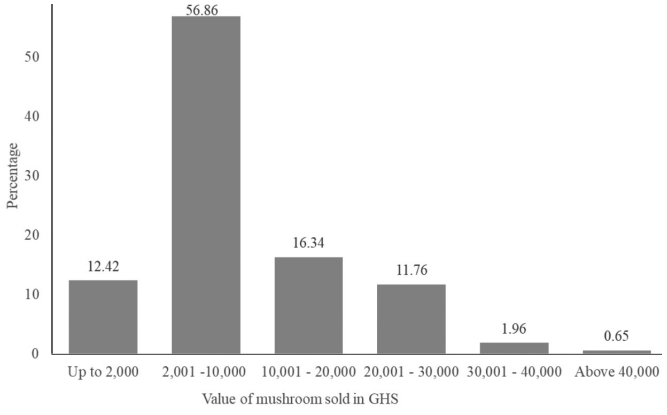
Variable	Description	Type	Measurement	Expected relationship
Dependent variable				
Intensity of mushroom commercialisation	Income earned from mushroom sold	Ratio	GHC 20/1kg of fresh mushroom	
Endogenous	/			
Value of mushroom produced	Total value of mushroom produced	ratio	GHC 20/1kg of fresh mushroom	+
Instruments				
Annual income	Farmers' annual income		GHC	+
Hired labor	People paid to work on the mushroom farm		Number	+
Price	Last price per kg of fresh mushroom	Ratio	GHC	+
Independent variables				
Socio-demographic factors				
Age	Age of farmers.	Ratio	Years	+/-
Hired labour	Number of people hired on the farm	Ratio	Number of people	+

Variable	Description	Type	Measurement	Expected relationship
Independent variables				
Educational level	Education level of farmers	Ratio	Years	+
Annual income	farmers annual income	Ratio	GHC	+
Marital status	Farmers' state of being married or not	Nominal	1 if married, and 0 if not married	+
Household size	Number of people in the farmers' household	Ratio	Number	+/-
Land ownership	State of having a legal entitlement to land	Nominal	1 if owns land, and 0 if does not own a land	+
Farm characteristics				
Value of mushroom produced	Total value of mushroom produced	Ratio	GHC 20/1kg (2020 price) of fresh mushroom	+
Price	Last years' price per kg of fresh mushroom in GHS	Ratio	GHC	+
Farming experience	Number of years of supplying mushroom to the market	Ratio	Number of years	+/-
Institutional factors				
Access to extension	Contact with extension agents	Nominal	1, has contact, 0 otherwise	+
Member of FBO	Member of a Farmer-based organization	Nominal	1 member, 0 otherwise	+
Credit access	Farmers' access to credit facility	Nominal	1, has access, 0 otherwise	+

Source: Authors' Construct, 2020

The intensity of oyster mushroom commercialisation

Figure 2. Value of oyster mushrooms sold in 2020



Mean = GHC 10202.29, SD = 9440.50

The result in Figure 2 shows that close to 60% of the mushroom farmers sold mushroom worth between GHC 2,020.00 and GHC 10,000.00. This is below the commercialisation threshold (GHC 300,000.00—equivalent to 15000 kg or 15 metric tonnes per annum estimated from the study. The mean value of mushroom sold in the 2020 production year was GHC 10,202.29. The result implies that all the surveyed mushroom farmers sold below the commercial level, and are therefore described as low commercial producers.

The degree of oyster mushroom commercialisation

Table 2. Degree of oyster mushroom commercialisation in the Greater Accra Region

Variables for comptuting the degree of oyster mushroom commercialisation	Mean	Std. Dev.
Average quantity of oyster mushroom sold (kg)	514.80	488.33
Average quantity of mushroom harvested per capita (kg)	717.00	713.76163
Total value of oyster mushroom sold (GHS)	10202.29	9440.50
Value of mushroom produced (GHS)	14179.12	13642.02
Intensity mushroom of commercialisation	75.123	15.89

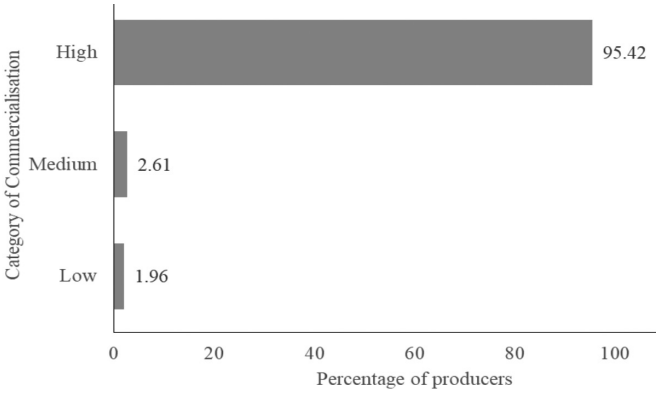
Source: Field Data, 2020

The result in Table 2 shows that, on average, 75% of oyster mushrooms produced were sold, while the rest (25%) were consumed. This indicates that mushroom farmers in the study

area are highly commercial. The most commercialised mushroom producer sold all (100%) of the mushrooms harvested, whereas the least commercialised mushroom producer sold only 6.67% of the mushrooms harvested. The result shows a high commercialisation index for oyster mushroom production and implies that mushrooms are produced as a cash crop in the study area. This indicates that the mushroom producers in the region are highly commercial, on average. The result agrees with Martey et al. (2012), who reported a high commercialisation index of 75% among cassava farmers in the Effutu Municipality. The World Bank (2007) indicates that farmers who sell more than 50 percent of their output are more market-oriented. Such market-orientedness is key to driving economic transformation and is important for fostering innovation and competitiveness (Kabiti et al., 2016). The result of the study implies that oyster mushroom production is a potential driving force for the economic development of Ghana and must be given more institutional support.

Characterisation of the intensity of mushroom commercialisation

Figure 3. Characterisation of the intensity of oyster mushroom commercialisation by producers



Low commercialisation = 25% and below,
Medium commercialisation = 26% - 50% and H
igh commercialisation = 51% and above (Baisa, 2009).

The mushroom producers were grouped into high, medium, and low commercial producers based on their commercialisation indices. According to Baisa (2009), farmers who market 25 percent or less of their crops are considered low commercial farmers; those who market between 26 percent and 50 percent are considered medium commercial farmers; and those who market more than 50 percent are considered high commercial farmers. Based on this categorization, the study revealed that about 2% of the mushroom producers were low commercial farmers, 3% medium, and about 95% high commercial mushroom producers, as displayed in Figure 3.

The distribution of mushroom commercialisation intensity is similar to Abu's (2015) findings that farmers in the Upper West region comprised 7.8 percent of low commercial farmers, 27.58 percent of medium commercial farmers, and 64.78 percent of high commercial farmers. The result also mimics Martey et al. (2012), who observed that the proportion of cassava sold by farmers in the Effutu Municipality ranged from 81% to 100%, indicating that most of the cassava farmers in the municipality were highly commercial. The results of the study confirm that crop commercialisation in Ghana is not uniformly low, medium, or high, and the majority of farmers participating in the output market are highly commercial, selling more than half of their produce.

The degree of oyster mushroom commercialisation

Table 3. Degree of oyster mushroom commercialisation in the Greater Accra Region

2SLS regression			
Variable	**Coefficient**	**Std error.**	**p-value**
Sociodemographic characteristics			
Sex	-7.997696	456.4476	0.986
Marital status	981.6477	691.7067	0.156
Age	-41.45001*	20.72701	0.046
Educational level	183.7063*	90.01438	0.041
Household size	-75.86139	144.536	0.600
Land ownership	1102.361*	456.0471	0.016
Farm characteristics			
Value of crop produced	0.6740399*	.0292015	0.000
Farming experience	-123.9998	115.257	0.282
Land size	-114.2715	710.1842	0.872
Institutional characteristics			
Access to extension	416.8426	435.6726	0.339
Member of FBO	-630.1563	941.5945	0.503
Constant	-207.7686	1832.618	0.910
Wald chi2(11)	638.54		
Prob > chi2	0.0000		
R-squared	0.9262		
Endogeneous variable	Value of mushroom produced		
Endogeneity test			
Ho: variables are exogenous			
No. of Observation	153		
Durbin (score) chi2(1)	0.06864 (p = 0.7933)		
Wu-Hausman F(1,144)	0.062836(p = 0.8024)		
Validity test of instruments			
Sargan (score) chi2(2)	0.2.34781(p = 0.3092)		
Basmann chi2(2)	0.2.16622(p = 0.3385)		

**p<0.05*

Source: Field Data, 2020

The 2SLS regression model shows that all the residuals were statistically insignificant (Durbin (score) chi2(1) test (0.06864 (p = 0.7933), Wu-Hausman F (1,144) test (0.062836 (p = 0.8024)). The instruments also did not correspond with the disturbance term, as the Sargan (score) chi2(2) was statistically insignificant (0.2.34781, p = 0.3092) (Table 3). Hence, we failed to reject the null hypothesis, which stated that the value of the oyster mushroom produced is not exogenous, and, therefore, proceeded with OLS regression (Anderson, 2018; Qaim et al., 2020). According to the results of the OLS regression, the independent variables together explained 92% (R-square = 0.92) of the variance in the intensity of mushroom commercialisation. The statistical significance level for the F statistic value of 117.95 was 1%. This suggests that the independent variables jointly explain the intensity of oyster mushroom commercialisation and that the linear model is fit for the data.

Table 4. Factors predicting the intensity of oyster mushroom commercialisation

Variable	Coefficient	Std error.	p-value
Sociodemographic characteristics			
Sex	10.26012	476.2892	0.983
Marital status	1109.186	730.0354	0.131
Age	-39.71751*	21.91402	0.072
Educational level	187.4811**	93.54359	0.047
Household size	-59.52011	152.7324	0.697
Land ownership	1249.249**	487.4574	0.011
Annual farmer income	231.2777	224.7343	0.305
Farm characteristics			
Value of crop produced	.6664862***	0.0194137	0.000
Farming experience	-141.0085	121.0437	0.246
Land size	-204.3461	715.6101	0.776
Hired labour	30.32684	181.9995	0.868
Price	136.1953	119.607	0.257
Institutional characteristics			
Access to extension	461.6571	453.7839	0.311
Access to credit	704.3018	590.595	0.235
Member of FBO	-371.7992	1009.025	0.713
Constant	-4213.801	3498.817	0.231
F(15, 137)	117.95***		
Prob > chi2	0.0000		
R-squared	0.9281		
Adj R-squared	0.9203		

**p<0.1; **p<0.05 and ***p<0.001*

Source: Field Data, 2020

Four (4) out of the fifteen independent variables significantly influenced the intensity of mushroom commercialisation: age, educational level, land ownership, and value of crop sold (quantity of mushrooms produced), as presented in Table 4.

The age of mushroom producers influenced the intensity of oyster mushroom commercialisation negatively at a statistical significance of 10%. This indicates that the younger the mushroom farmer, the higher the intensity of mushroom commercialisation, and young people who enter oyster mushroom production can increase their intensity of commercialisation by GHS 39.72. The findings are in line with those of Abu (2015) and Mariyono (2019), who found a negative relationship between farmers' age and the degree of commercialisation. However, the study's findings contradict those of Akinlade et al. (2016), who found a positive relationship between farmers' age and commercialisation, suggesting that older farmers are more likely than younger farmers to commercialise their outputs. Young farmers are more dynamic, open to new ideas, may have a better understanding of commercialisation issues, and view mushroom farming as a business, in contrast to the majority of older farmers who view farming as a way of life rather than a business and who may be less concerned with farming for profit (Randela et al., 2008). Young farmers may be more inclined than older farmers to experiment with, embrace, and implement agricultural technology, such as the use of ICT, to maximise access to market information and boost commercialisation (Lwanga, 2015). Additionally, young farmers may be reasonably diligent and own assets such as savings that can be used to improve production in order to generate market surplus (Yeboah et al., 2020). Young oyster mushroom growers may profit from business acumen, energy, and a willingness to utilise technology to boost mushroom commercialisation's intensity.

The level of formal education had a positive association with the intensity of mushroom commercialisation at a 5% statistical significance level. According to the result of the study, for every additional year of formal education, oyster mushroom farmers can increase the intensity of oyster mushroom commercialisation by GHS 187.48. The result confirms Martey (2014) and Abu (2015), who found a positive association between farmers' level of formal education and the degree of commercialisation. The level of formal education of farmers plays a significant role in commercialisation (Akinlade et al., 2016). According to Ofori (1973), formal education provides farmers with improved production and management skills that can be used to maximise profit. Additionally, formal education improves farmers' access to and interpretation of information, which allows them to make informed crop production and marketing decisions to maximise profit and increase commercialisation (Heierli & Gass, 2001). Based on the findings of the study, it can be said that mushroom farmers who are highly formally educated increase the intensity of oyster mushroom commercialisation to maximise profit. Formally educated farmers are, therefore, encouraged to go into mushroom production.

The findings of the study further revealed a positive association between land ownership and the intensity of oyster mushroom commercialisation at a statistically significant

level of 5%. According to the study, farmers' ownership of land increases the intensity of mushroom commercialisation by GHC 1249.249. The findings are consistent with those of Gebreselassie and Sharp (2007), who found a positive relationship between land ownership and the degree of commercialisation. Land ownership in this study refers to the right and control farmers have over the decision and use of land for producing mushrooms. For farm families to invest in their property, they must have a clear expectation that sacrifices, investments of labour, capital, and materials, and the benefits that result from those investments will pay off in the future (Lawry, 2015). One way to ensure this, according to Lawry, is through land certification or titling. Land certification, or titling, ensures the security of land tenure and property rights. Consequently, there appears to be a positive relationship between land ownership, farm productivity, and commercialisation (Lawry, 2015). For example, Lawry et al. (2017) found that secure land tenure leads to increased productivity and farm income. Farmers who certified and obtained legal titles to their lands recorded significant increases in their productivity, from 50 to 100% in Europe and around 10% in Africa (Lawry, 2015). Based on the findings of the study, mushroom farmers' ownership of land increases the intensity of oyster mushroom commercialisation.

At a 1% statistical significance level, the volume of oyster mushroom production (in monetary terms) showed a positive association with the intensity of commercialisation. According to the research, a GHS 1 increase in the value of mushroom output results in a GHS 0.67 increase in commercialisation intensity. The value of output influences the degree of commercialisation (Abu, 2015; Gebreselassie & Sharp, 2007). The result of the study supports the findings of Omiti et al. (2009) and Barrett (2008) that surplus production serves as a motivator for farmers to increase commercialisation. Based on the study, increasing oyster mushroom production can lead to the increased commercialisation of oyster mushrooms.

CONCLUSION

Mushroom cultivation is a non-traditional farming enterprise that is being promoted in Ghana due to its proven economic, medicinal, and nutritional value. The increased demand for oyster mushrooms in Ghana, particularly in the Greater Accra region, justifies the need for commercialisation. Commercialising mushrooms provides a means of generating income and reducing poverty while also improving food security. The mushroom commercialisation index showed that during the 2020 production season, all producers sold 75% of oyster mushrooms. This indicates that oyster mushroom is grown as a cash crop in the region, although the intensity of commercialisation (GHC 10202.29) was low. In terms of farmer characterization, the study found that the majority (94%) of the mushroom producers in the region were highly commercialised. Age, educational level, land ownership, and volume of output were significant determinants of the intensity of mushroom commercialisation. We recommend that stakeholders such as the Food Research Institute and the Ministry of Food and Agriculture of Ghana increase their efforts to improve oyster mushroom production to enhance the intensity of commercialisation. We also recommend that stakeholders in the mushroom industry launch programmes to attract young, educated people, especially recent graduates who are not formally unemployed, into oyster mushroom production. This will increase the supply and maximise producers' profits.

Acknowledgement

We are grateful to the members of the Greater Accra Regional Mushroom Growers and Exporters Association of Ghana (MUGREAG) for providing data for this research work. We are highly indebted to the Chairperson of MUGREAG for organizing the mushroom farmers for the study. We also express our gratitude to Mrs Matilda Dzormeku, Head of the Mushroom Unit, Food Research Institute, for assisting the researchers to reach and interact with MUGREAG.

Data Availability

The data used for the study can be provided upon request from the corresponding author.

Consent

All participants provided written informed consent before participation in this study.

Conflicts of Interest

All the authors declare that they have no conflicts of interest in this study.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Applied Studies in Agribusiness and Commerce – APSTRACT
University of Debrecen, Faculty of Economics and Business, Debrecen
SCIENTIFIC PAPERS
DOI: 10.19041/APSTRACT/2024/1/5

THE INVISIBLE HANDS IN THE PRODUCTION OF GHANA'S PREMIUM COCOA: WOMEN AS KEY CONTRIBUTORS

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Abstract: *So often, what women do, especially in relation to productive work, is ignored by various researchers. This study tries to bring to light the extent to which women are contributing to the production of Ghana's premium cocoa, which is an envy all over the world. Cross-sectional data from 400 women cocoa farmers in Mampong and Tepa Cocoa Districts in the Ashanti Region of Ghana was taken. Data were collected through the use of structured questionnaires. Descriptive and inferential statistics such as percentages, means, standard deviations, frequencies, and multiple linear regression were used for the data analysis. Findings from the study showed that women cocoa farmers play an enormous role in the production of cocoa. They play roles in both the pre-harvest stage and the post-harvest stage. The results show that women in partnership with their spouses play a more active role in cocoa production than women who are sole owners. Marital status, farming experience, and educational level are the key factors influencing women's production roles. Again, marital status and pre-planting and harvesting activities influence women farmers' access to resources, privilege, power, and control. Women farmers in partnership with their spouses face the challenge of support from their husbands, while women operating as sole owners face the challenge of high labour costs. Results prove that women cocoa farmers must be massively supported by key stakeholders in the cocoa value chain in order to make them count.*

Keywords: *Cocoa Farmers, Invisible Hands, Premium, Productive Roles, Women*
(JEL code: Q16)

INTRODUCTION

The agricultural industry is the primary source of income for eighty percent of Ghana's rural population, making it the country's most important economic driver (Nyanteng and Seini, 2000). Ghana's cocoa industry is the country's primary cash crop and the country's second greatest source of foreign exchange earnings, behind gold. The sector is the backbone of Ghana's agriculture industry and serves as our primary cash crop (Huellen and Abubakar, 2021). When one thinks of cocoa, Ghana is the first country that springs to mind more than any other (Kolavalli and Vigneri, 2011).

According to Gyasi (2013), cocoa has been one of Ghana's primary exports for a long time. However, the cocoa industry in Ghana has not been an unqualified triumph up to this point. Ghana went from being one of the main producers of cocoa in the world to seeing a significant drop in production in the 1960s and 1970s, and the industry came perilously close to being completely wiped out in the early 1980s. After the implementation of reforms that affected the entire economy in the middle of the 1980s, output began to gradually improve, and the 1990s were the beginning of a rebound that resulted in production almost doubling between 2001 and 2003 (Vigneri and Kolavalli, 2017).

These highs and lows reveal some valuable lessons. In Ghana, various governments have relied on cocoa as a source of tax money. In doing so, Ghana's history provides a consistent illustration of a strategy practiced by many other African nations: taxing the nation's main export industry to support public expenditures. Cocoa has been used as a source of public revenue in Ghana by various administrations, including the colonial one (Kurantin and Osei-Hwedie, 2022; Gyasi, 2013; Arhinful, D.K., 2003). Revenue collection by the state have had a variety of consequences on output, depending on factors such as worldwide prices, marketing expenses, explicit taxes levied on the industry, and macroeconomic situations such as inflation, overvaluation of exchange rates, and inelasticity of cocoa supplies (Nash, 2005). It is abundantly evident that, in order to keep production incentives in place, there must be effective macroeconomic management, notably of inflation and currency rates. This is true regardless of the degree of extraction (Auty et al., 1998). The second issue is the requirement

that Ghana's cocoa price policy should arrive at a marketing arrangement that does not result in the extinction of the golden goose that lays the golden eggs (Roling et al., 2004).

Cocoa is often referred to as a "male crop" (Farnworth et al., 2013; Solidaridad, 2009). Although it is widely assumed that men predominate in this industry, women's contributions are frequently overlooked in favour of labour, and these individuals are rarely compensated for their efforts. There are three distinct categories of women involved in the cocoa industry: wives of cocoa farmers; women who own farmlands; and employees who are paid for their labour (Solidaridad, 2009). Women in Ghana contribute a significant portion of the labour to the country's cocoa industry. According to research conducted by Farnworth et al., (2013), female agricultural labour participation rates in Sub-Saharan Africa are the highest on average in the globe. Ghana's agricultural sector, which includes the cocoa industry, is primarily staffed by female workers (52% of the total workforce). Again, in the country of Ghana, the contributions that women make to the cocoa industry are enormous. They are involved in many aspects of the cocoa industry, including the preparation of land, the establishment of nurseries, planting, weeding, fermentation, drying, and sorting of cocoa beans (Barrientos, 2013; Solidaridad, 2009). Sadly, women in the cocoa industry who perform important roles are sometimes given little or no acknowledgement for their contributions. In some situations, their contributions are underestimated, and women are confined to the position of unpaid family labour or labour on an as-needed basis (Barrientos, 2013). Their male contemporaries and husbands view women as nothing more than a source of labour, and in most cocoa-producing regions, men marry more often in order to increase the amount of labour available on their plantations. A lot of research on agriculture in sub-Saharan Africa (Phiri et al, 2022; Mamun-Ur Rashid and Mustafa Emad, 2018; Ayodele et al., 2016; Kumase et al., 2010) has found that women are at a disadvantage compared to men when it comes to access to land, extension services, technologies, inputs, and market control of revenues.

In addition, a number of studies have come to the conclusion (typically couched in terms of gender) that the gender of cocoa farmers is an important factor that needs to be taken into consideration when doing research (Boserup, Tan, and Toulmin, 2013; Sall et al., 2000; Djoudi et al., 2016). The issue of gender inequality has been brought to light by both domestic and international non-governmental organisations. Many research on cocoa have small sample sizes or a low percentage of female respondents, which makes it challenging to draw clear conclusions about how gender differences may affect individual or family outcomes (Renzulli, Aldrich, and Moody, 2000; Pinquart and Sorensen, 2003; Oppenheimer, 2003). This is one of the reasons why it is difficult to draw firm conclusions about how gender differences which may affect outcomes for households (Oppenheimer, 2003). In the nations studied by Teal and Vigneri (2004), women made up 34% of our total respondents. This figure includes both women who live in families headed by men (20% of respondents) and women who self-reported being in charge of their own households (14% of respondents).

The several studies conducted to investigate the production of Ghana's cocoa often do not focus on the part that women play in the cocoa producing process (Nelson et al., 2013; Agbenyo, Jiang, and Ntim-Amo, 2022; Asara, 2015; Awudzi et al., 2022; Okoffo et al., 2016). Due to the fact that cocoa is considered to be a "male crop," a study such as this must receive the necessary attention in order to bridge the gap between research involving women. Even though most people think that men are more common in the business world, women often do work that goes unnoticed (Farnworth et al., 2013; Solidaridad, 2009).

In spite of the significant contributions that women have made to the cocoa industry in Ghana, they have received very little acknowledgment for their efforts (Barrientos, 2013; McCarthy, 2018). The failure to identify and recognize the crucial role that women play in the cocoa business has contributed significantly to the economic disparity that exists between women and their male counterparts in the sector (Black et al., 2019). The unequal distribution of power and prestige that results from the gendered division of labour is a universal phenomenon (Hartsock, 2017). Since males are responsible for the distribution of commodities and services as well as the management of rituals, their actions are the ones that are watched over the most carefully. This is because men have more influence over society. In the majority of societies, men have more opportunities to hold positions of public authority and influence than women do (Eagly et al., 2020). Despite the fact that women may often exercise great power in home settings and other nonpublic realms, their influence is constrained by the nature of these settings and domains. As long as the private sphere is based on its position in the public sphere, the final position of the domestic lady in the social order is contingent on the positions that her male relatives have in the market (Eckert and McConnell-Ginet, 2013; Gauthier, 2017). And the manner in which these men spend the money that they earn in the market is directly proportional to her capacity to wield power and influence in the private sphere.

During both the pre-harvest and harvest stages of the cocoa production process, women play an extremely important role. When the cocoa plant is young, it is typically women who are in charge of weeding the cocoa farms. As part of the harvesting process, women are also responsible for picking and carrying pods, removing the placenta during pod-breaking, fermenting, drying, and sorting cocoa beans (Barrientos, 2013). Once more, statutory and customary regulations have made it difficult for women to get access to property and other assets. Inheritance rights are not provided to men and women on an equal basis by the laws (Sophia, 2016). In addition, farmer support programmes, such as the provision of inputs, among other things, tend to focus more on male cocoa farmers than on female cocoa farmers (Amfo and Ali, 2020). Their contributions have received less attention in the existing body of research than their roles in household-related activities, and the care of subsistence crops in agriculture like maize, millet, guinea corn, cassava, yam, plantain, legumes, and vegetables (Farnworth et al., 2013; Raney et al., 2011; Duncan, 2004). As a result, there are enormous gender discrepancies in the cocoa industry.

This research focuses on the unique roles played by women in the cocoa production process in order to bridge this gap. The study specifically addressed the following objectives: assessed and compared the productive roles in cocoa production between women in partnership with their husbands and women with their personal cocoa farms, examined the relationship between the socio-economic characteristics of women cocoa farmers and their productive roles, investigated the effect of the productive role of women in cocoa farming on their access to resources and privilege, power, and control, and analysed the challenges that women face in cocoa production in the Ashanti region of Ghana.

MATERIALS AND METHODS

The Mampong cocoa district is found within the Mampong Municipal Assembly, which is one of the forty-three (43) administrative districts in the Ashanti region. The Mampong Municipality is found between longitudes 00' 05W and 10' 30W and latitudes 60' 55N and 70' 30N. It has a land area of 2,345 km2. The municipality was previously part of the Sekyere West District but officially became a stand-alone municipality in 2007. The capital of the Mampong Municipality is Mampong, which is about 57km from Kumasi, the regional capital of the Ashanti region. The municipality is bounded to the south by Sekyere South District, to the east by Sekyere Central District, and to the north by Ejura Sekyedumase Municipal. The major towns in the municipality include Mampong, Asaam, Dadease, Krobo, Bosomkyekye, Yonso, Kofiase, Adidwan, Nkwanta, and Apaah. The majority (61%) of the settlements within the municipality are rural, while a minority (39%) of the settlements are urban. Agriculture is the major source of livelihood for the inhabitants. It employs about 67.3% of the entire municipality's work force. The next important sources of livelihood for the inhabitants are the service sector, commerce, production/manufacturing sector, and other income-generating activities employing 12.1%, 8.5%, 8.9%, and 3.2%, respectively (MoFEP, 2021).

According to the 2021 Population and Housing Census, the population status of the Mampong Municipality is 116,632, out of which 59,667 are females and 56,965 are males (GSS, 2021). Agriculturally, the municipality has a bimodal rainfall pattern and a mean annual rainfall of between 800mm and 1500 mm, which is fairly distributed. Dissemination of agricultural information among farmers in the municipality is mostly through contact farmer groups, individual farmer contacts, home and farm visits, and method demonstration. Maize, cassava, plantains, cocoyam, yam, cocoa, oil palm, mango, cashew, and citrus are the major crops grown in the municipality. Also, the municipality can boast of livestock production, including sheep, goats, cattle, poultry, and pigs.

The Tepa Cocoa District is located within the Ahafo Ano North Municipality of the Ashanti region of Ghana. Ahafo Ano North Municipality is one of the forty-three administrative districts in the Ashanti region. Until November 2007, the municipality was part of the Ahafo Ano District Council. Tepa serves as the capital town of the municipality. The municipality is bounded to the north by Tano North Municipal and Tano South Municipal, to the south by Atwima Mponua District, to the west by Asutifi South District, and to the east by Ahafo Ano South East District. The municipality lies at latitudes 6° 47' N and 7° 02' N and longitudes 2° 26' W and 2° 04' W. It has a land area of 593.7 km2. The municipality has a total population of 92,742, out of which the males are 46,753 and the females are 45,989 (GSS, 2021). Betiako, Anyinasuso, Asuhyiae, Akwasiase, Manfo, and Mabang are among the major towns in the municipality. Farming is the main source of livelihood for the people in the municipality, as about 83% of the total labour force relies on farming either directly or indirectly.

Alharahsheh and Pius (2020) asserted that research philosophy directs the adoption of an appropriate research design, methodology, and specific data collection techniques in a research exercise. Examples of research philosophies include positivism, interpretivism, pragmatism, and transformative thinking (Creswell & Creswell 2017). Each of these philosophies follows a unique approach to guiding a research study. For instance, positivism philosophy tackles a research study from a quantitative perspective, interpretivism philosophy tackles a research study from a qualitative perspective, transformative philosophy looks at a research study from both a political and social perspective, and finally, pragmatism philosophy combines the positions of both positivism and interpretivism (Creswell & Creswell, 2017).

The present study utilised purely the positivism philosophy, implying that the study took a quantitative approach, thus making inferences based on numerical values or data. The adoption of the positivism philosophy offered the researcher the chance to adopt an appropriate research design that is capable of ensuring the design of appropriate data collection and analysis tools. According to Peniel (2015), research design refers to the specific plan, structure, and strategy for undertaking a research exercise. It gives an overview of how research should be undertaken. There are different research designs, including quantitative, quantitative, and mixed-method research designs (Park and Park, 2016). A quantitative research design was used. This therefore means that quantitative data were obtained and analysed using different quantitative tools for the study. Quantitative design is defined as a technique that aims at understanding a particular phenomenon through the use of mathematical and/or statistical means (Park and Park, 2016). Quantitative research mostly deals with numerical data. That is, it is more associated with numbers. Lewis et al. (2009) opined that quantitative study enhances the precision of factor measurement as opposed to qualitative research design.

Population refers to the various units of interest from which a sample is usually selected (Babbie, 2007). The population of this study included all women cocoa farmers within the Mampong and Tepa cocoa districts. Sample size refers to the actual number of units or individuals selected from within a specified population. It is often impossible to gather information from the actual population, mainly due to time and resource constraints, among other factors; hence, it is appropriate and acceptable to select a part of the population to represent the entire population. For this study, the sample

size was obtained using Cochran's sample size determination formula since the total number of women in cocoa farming in the two districts is not known. The calculation of the sample size is given as follows:

$$n = \frac{Z^2 pq}{e^2}$$

where;
n = the sample size;
z = desired confidence level;
p = maximum variability;
q = 1-p and
e = desired level of precision (95%)

$$n = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2} = 385 \text{ farmers}$$

This gives the minimum sample size of 385, but rounded off to a total of 400 women cocoa farmers for the study, of which 200 are women farmers in partnership with their husbands or some other person in cocoa production, and another 200 are women who are sole owners of their cocoa farm.

Sampling refers to the process of selecting individuals from within the population (Turner, 2020). The current study adopted the multi-stage sampling method. Thus, at the first stage, a simple random sampling technique was used to select two cocoa districts, Mampong and Tepa. A simple random sample was again employed to select two operational areas from each of the two cocoa districts selected. Again, a simple random sampling technique was used to select one community from each of the four operational areas. Finally, a snowball sampling technique was further used to select respondents from within the selected communities. This sampling method was used because the researcher wanted to interview only women cocoa farmers who are either farming in partnership with their husbands or who own farms by themselves.

The study utilised two main data sources, namely primary and secondary data sources. Whereas the primary data were obtained from the field through a well-designed questionnaire, the secondary data were gathered mainly through the district's Cocoa Health and Extension Division (CHED) of COCOBOD as well as the review of relevant literature, including books, journal articles, and the internet. The secondary data were used to support the analysed primary data.

The tools used to collect data are essential to every research project (Hamilton and Finley, 2019). A structured questionnaire was employed as the data-gathering tool for this investigation. To increase the accuracy of the data, the respondents self-administered the questionnaire. The questionnaire was divided into two sections. The respondents' socio-economic backgrounds were covered in the first section, and questions especially aimed at addressing the various research goals were covered in the second section. Most of the questions had closed-ended responses.

A brief outline of the project was prepared by the researcher. A letter of introduction was also prepared and presented to the district cocoa officers of the two cocoa districts, Mampong and Tepa. The district extension coordinators of the two districts then scheduled meetings with the women cocoa farmers. At the community level, the chief farmers of the various cooperatives facilitated community entry for the researcher. The researcher conducted the research through surveys. The researcher then explained to the respondents the importance of their responses to the study and requested that they be honest in their answers. The researcher used snowball sampling; the chief farmers were asked to lead the researcher to women farmers in the cooperatives who either did the farming with their husbands or owned the farms themselves. This method of sampling was used in order to facilitate easy identification of the population. After the respondents answered the questionnaire, the data was collected and tallied for analysis.

Table 1. Variables used for the Production roles for multiple and multivariate regression

Variable	Measurement	Symbol	Expected outcome	Source
Engagement in production activities (y)	Dependent variable (Continuous; 1=Never, 2= Sometimes, 3 = Always)	EPA		
Socio-economic characteristics				
Age (x1)	Years, natural logarithm	Fage	+/-	Bannor et al. (2021)
Educational qualification (x2)	Dummy; 1= Educated, 0= Not Educated	Edu	+	Keane et al. (2020)
Marital status (x3)	Dummy; 1 = married, 0 = single	MarSt	+	
Household size (x4)	Number of members, natural logarithm	HHsize	+	Mabe et al. (2020)
Farm characteristic				
Farm size (x5)	Size of cocoa farm in acres, natural logarithm	Fsize	+/-	Danso-Abbeam et al. (2020)
Farming experience (x6)	Year in farming, natural logarithm	Fexp	+	Danso-Abbeam et al. (2020)
Access to resources (x7)	resources accessibility, natural logarithm	AccR	+	
Control (x8)	In charge of farm, natural logarithm	Ctrl	+/-	
Privilege (x9)	Opportunity, natural logarithm	Priv	+/-	
Power (x10)	Influence, natural logarithm	Pow	+/-	

Source: Authors' Construct, 2022

The collected data were analysed with the aid of version 20 of the Statistical Package for Social Sciences (SPSS). In assessing the specific roles women play in cocoa production, descriptive statistics such as percentages, means, and frequencies were used. In examining the relationship between the socio-economic characteristics of women cocoa farmers and their productive roles, multiple regression was utilised, and finally, in analysing the challenges women face in cocoa production, descriptive statistics were employed.

Productive roles: This is the dependent variable. It represents the decision by women to participate in the production activities of cocoa in the study area (Oyekale, 2021). The sampled farmers were asked whether they played a role in the production of cocoa (i.e., from pre-planting to post-harvesting activities) or not. It was decided to model the women's role in production as a continuous variable, with the women farmers who have done so being treated as 1 = never, 2 = sometimes, and 3 = always. The activities measured included pre-planting (Mabe et al., 2020), planting (Pérez-Zuñiga et al., 2021), farm maintenance (Nyamekye and Dansoh, 2021), harvesting (Keane et al., 2020), and post-harvesting (Yaro et al., 2021).

Age: This variable represents the age of women. The woman's age is expressed in years. The age of women is likely to influence their productive roles in cocoa production (Ndubuaku & Asogwa, 2016). This is a continuous variable, and it is measured in years. The a priori expectation is positive.

Education: This variable describes whether or not the farmers have been educated or not. Education was modelled as a dichotomous variable where educated farmers (farmers who have received some level of education) were assigned 1 and not educated farmers were assigned 0 (Keane et al., 2020). Education in this study comprises a basic education level implying 9 or fewer years of primary formal education, a secondary education level implying 10–12 years of formal education, and a tertiary education level implying 13 or more years of formal education as his or her highest level of education attained (Keane et al., 2020). A farmer who has attained any or all of the above categorizations is said to be educated. The a priori expectation is positive.

Marital status: The marital status of women was measured as a dummy variable. That is, women who were married were treated as 1 and 0 for single or unmarried women. According to Bannor et al. (2021), the marital status of women significantly determines their respective roles in cocoa production. Thus, it is a prior expectation that the variable would positively affect women's productive roles.

Household size: The variable identified the size of the number of members living under the same roof. Thus, the expectation is that the size of the household will influence the productive roles of the women (Mabe et al., 2020). This is a continuous variable, and it is measured in years. The a priori expectation is either positive or negative.

Farm size: This variable describes the size of the respondents' farms sampled. Large farms would make it easier to realise the benefits of scale economies (Danso-Abbeam et al., 2020). Consequently, it is expected that productive roles and farm size are positively connected. The unit of measure for all the farms is acres. This is a continuous variable, and it is measured in years. The a priori expectation is positive.

Farm experience: This variable describes the experience of women in cocoa farming and its related activities. Having enough experience in cocoa production affects production roles (Danso-Abbeam et al., 2020). Consequently, it is expected that productive roles and farming experience are positively connected. This is a continuous variable, and it is measured in years. The a priori expectation is positive.

Access to resources: This was measured as the availability and accessibility of all necessary resources that aided in the production of cocoa by female cocoa farmers. Kassie et al. (2015) found that resources were necessary to assist farmers. This was measured as a continuous variable in the model with the expectation that it would be positive.

Control: The variable measured the ability of women to take charge of the production roles in cocoa production. A negative or positive expectation with a continuous measurement of the variable in the model.

Power: In the model, power was defined as the authority or influence gained by female cocoa farmers in production. The expectation is that women with authority will play a significant role in the production of cocoa. According to what the study predicted, there could be a negative or positive relationship between the variable and productive roles. It was measured as a continuous variable.

Privilege: In this study, privilege was measured as the opportunity to take part in productive roles. It is anticipated that privilege will positively correlate to the adoption of technologies, as asserted by Ahmed (2015) and vice versa by Mulwa et al. (2017). This was modelled as a continuous variable with a priori positive and negative expectations.

RESULTS AND DISCUSSION

Demographic Characteristics of Respondents

Table 2. Demographic Characteristics of Participants

	Women in partnership		**Women as sole owners**	
Variable	**Frequency**	**Percent**	**Frequency**	**Percent**
Age				
25 years or less	7	3.5	3	1.5
26-35 years	5	2.5	13	6.5
36-45 years	36	18	21	10.5
46-55 years	64	32	42	21
Above 55 years	88	44	121	60.5
Educational level of respondent				
No formal education	51	25.5	48	24
Primary school	50	25	47	23.5
Secondary school A/O level	99	49.5	105	52.5

	Women in partnership		Women as sole owners	
Variable	**Frequency**	**Percent**	**Frequency**	**Percent**
Marital status				
Divorced	6	3	40	20
Married	149	74.5	49	24.5
Separated	5	2.5	13	6.5
Single	1	0.5	22	11
Widowed	39	19.5	76	38
Years of Cocoa Farming Experience				
11-15 years	55	27.5	51	25.5
16-20 years	31	15.5	41	20.5
6-10 years	62	31	66	33
Less than 5 years	23	11.5	23	11.5
More than 20 years	27	13.5	19	9.5

Source: Field data, 2022

This section presents the socioeconomic and demographic information of the participants in the study. Two categories of women respondents were studied, including those who are sole owners of their cocoa farms and those who are in partnership with their husbands in cocoa cultivation. Table 2 displays the findings on the characteristics of the respondents categorised according to whether the respondent is a sole owner of the cocoa farm or is in partnership.

For those women in partnership with their husbands, the study revealed that the majority of them, representing 44%, are over 55 years old; 32% are between the ages of 46–55 years; 18% of the respondents indicated that they are between the ages of 36–45 years; 2% of the respondents show the ages of 26–35 years; and finally, the remaining 3.5% were 25 years or less. The educational level of the respondents was also inquired about, and the findings show that the majority of the respondents have secondary school or A/O level education, which was 49%; 25% of the respondents also indicated they have primary school level education; and lastly, 25.5% of the respondents have no formal education.

The results further indicated that 74.5%, which represents the majority of the females who are in partnership with their husbands, were married; also, 19.5% of the respondents were widowed; 3% were divorced; 2.5% were married but separated; and 0.5% of the respondents, which is very negligible, were single. The study also collected information related to the years of experience in the farming of cocoa, and the result indicated that 31%, representing the majority of the respondents, have been working on the cocoa farm for less than 5 years; 27% of the respondents have been working on the cocoa farm for 11–15 years; followed by 15.5% of the respondents who have 6–10 years' experience on the cocoa farm; 13.5% of the respondents have more than 20 years' experience on the cocoa farm; 11.5% of the farmers show less than 5 years; and lastly, 1% of the respondents have 1% of the cocoa farm.

For those women respondents who owned and operated their farms, it was found that 60% of them were over the age of 55, 21% were between the ages of 46 and 55, 10.5% were between the ages of 36 and 45, 60% were between the ages of 26 and 35, and 1.5% were 25 or younger. Furthermore, in relation to their educational attainments, the result shows that 52.5% of the respondents have secondary school/A/O' qualification; 23.5% of them indicated having primary school qualification; and lastly, 24% of the students have no formal education. For marital status, the results show that 24.5% of the sole owners were married; 6.5% were married and separated; 20% of the respondents were divorced; 11% of the respondents were single; and 38% of the respondents were widowed. On how long these respondents have been working as cocoa farmers, the result shows that 33%, representing the majority, have 6–10 years' experience in cocoa farming, followed by 25.5% who have 11–15 years' experience in cocoa farming; 20.5% have also worked for 16–20 years in the cocoa farm; 11.5% have worked for less than 5 years in the cocoa farm; and finally, 9.5% have worked for more than 20 years in the cocoa farm.

Comparison in the Productive Roles between Women in Partnership with Their Husbands and Women with Their Personal Cocoa Farms in Cocoa Production

Table 3. Roles Played by Women in Cocoa Production

	Women in Partnership				Women as Sole Owners			
ACTIVITIES	**Never (1)**	**Sometimes (2)**	**Always (3)**	**Mean score**	**Never (1)**	**Sometimes (2)**	**Always (3)**	**Mean score**
PRE-PLANTING ACTIVITIES				**1.89**				**1.40**
Inspection of land	61%	13%	26%	1.99	67%	10%	23%	1.56
Negotiations	68%	10%	22%	1.83	76%	8%	17%	1.41
Making of payments	67%	12%	21%	1.82	81%	8%	12%	1.31
Registration of land	71%	12%	17%	1.70	81%	7%	12%	1.31
Land Clearing	37%	40%	23%	2.32	41%	30%	28%	1.87
Felling and Chopping of trees	69%	16%	15%	1.66	73%	21%	7%	1.34
Burning	17%	62%	21%	2.61	36%	25%	40%	2.04
De-stumping	64%	22%	14%	1.71	71%	21%	9%	1.38
Pegs Cutting/ Carrying	72%	12%	16%	1.68	90%	2%	8%	1.18
Lining and Pegging	76%	10%	14%	1.59	91%	2%	7%	1.15

PLANTING				**3.40**				**2.60**
Preparation of Seedlings	13%	56%	30%	2.90	25%	34%	41%	2.16
Carrying of Seedlings	1%	50%	48%	3.41	14%	9%	78%	2.64
Planting of Seedlings	0%	33%	67%	3.63	10%	6%	83%	2.73
Sowing at Stake	2%	27%	72%	3.66	5%	3%	92%	2.87
FARM MAINTENANCE				**2.60**				**1.96**
Weeding	1%	41%	58%	3.48	13%	25%	62%	2.49
Thinning	8%	77%	15%	2.51	30%	44%	26%	1.96
Removal of Diseases Pores	5%	72%	24%	2.84	17%	33%	50%	2.34
Mistletoe Control	43%	45%	13%	1.98	60%	25%	15%	1.55
Carrying Water for Spraying	1%	18%	81%	3.76	11%	7%	82%	2.72
Spraying/ application of pesticides	70%	17%	13%	1.63	91%	6%	3%	1.13
Applying of Fertilizer	36%	50%	14%	2.04	56%	32%	11%	1.55
HARVESTING				**3.22**				**2.51**
Plucking of Pods	9%	69%	22%	2.78	17%	37%	45%	2.28
Gathering	1%	65%	34%	3.22	14%	18%	68%	2.54
Heaping of Pods	1%	59%	40%	3.33	13%	18%	68%	2.55
Pod Breaking	2%	53%	45%	3.38	14%	17%	68%	2.54
Scooping of Cocoa Beans	0%	50%	50%	3.45	13%	16%	70%	2.57
Fermentation	1%	64%	35%	3.17	11%	22%	67%	2.56
POST-HARVESTING				**2.99**				**2.50**
Carting of fermented beans to drying area	0%	57%	43%	3.24	12%	26%	62%	2.50
Drying and sorting of beans	0%	28%	72%	3.70	11%	10%	79%	2.68
Carting of dry beans for sale	49%	30%	21%	2.05	20%	28%	52%	2.32

Source: Field data, 2022

The results are presented in Table 3 and segregated into two categories for the respective respondent types. To measure the productive roles that women play, the study adopted five main productive functions played in cocoa production, which include pre-planting activities, planting, farm maintenance, harvesting, and after-harvesting. The data for this objective was obtained from responses to a three-point Likert scale for both women in partnerships and a scale for sole owners, where the research participants indicated their level of participation in the various specified farming-related activities.

First of all, the table shows results for women farmers who partnered with their spouses. The result showed that, for pre-planting activities, these women play a medium role. The majority of them never take part in land negotiation, with a mean score of 1.83, and the majority never take part in the making of payments on the land, with a mean score of 1.82. Again, the majority of this category of women never participate when it comes to the registration of land, with a mean score of (1.7). Also, women who engage in cocoa production with their husbands are very often involved in the clearing of the land, with a mean score of 2.32. The results suggest that few of them sometimes help in felling and chopping trees on the farm, with a mean score of 1.66. The results, however, indicate that these women take a greater part in the burning of the weeds on the farm, with a mean score of 2.61, but participate less in the de-stumping, lining, and pegging of cocoa trees, with mean scores of 1.71, 1.59, and 1.68, respectively. Another productive function is planting. The period of planting shows that women have great participation in the preparation of seedlings, carrying of seedlings, planting of seedlings, and sowing at stake, with mean scores of 2.90, 3.41, 3.63, and 3.66, respectively. Furthermore, during farm maintenance, these women participate more in weeding, thinning, diseased plant removal, carrying water for spraying, and fertiliser application, with respective mean scores of 3.48, 2.51, 2.84, 3.76, and 2.04. It was found that for pesticide spraying/application and mistletoe control, these women participated less, with mean scores of 1.63 and 1.98, respectively. During harvesting, women, in partnership with their husbands, play a greater role in the plucking of pods, gathering, heaping of pods, pod breaking, scooping of cocoa beans, and fermentation, as seen by the mean scores of 2.78, 3.22, 3.33, 3.38, 3.45, and 3.20, respectively. Lastly, after the harvesting, the women play a greater role in the carting of fermented beans to the drying area and the drying and sorting of beans, with respective mean scores of 3.25 and 3.17. However, it was found that there was low participation in the carting of dry beans for sale, with a mean score of 2.05.

Secondly, the table shows results for women farmers who operated their own cocoa farms. The results indicate that with respect to pre-planting activities, sole owners play a medium role in inspection of land with a mean score of 1.56, and have less participation in negotiations, making of payments, and registration of land with respective mean scores of 1.41, 1.31, and 1.31. This lower participation in pre-planting activities could be attributed to the fact that the land belonged to women, and as such, they are less likely to participate in any functions associated with acquisition. Moreover, the results reveal sole owners have medium participation in land clearing, with a mean of 1.87. However, the result shows that they participate less in the felling and chopping of trees, burning, de-stumping, peg cutting, lining, and pegging, with mean scores of 1.35, 2.01, 1.39, 1.21, and 1.16, respectively. Further inquiry revealed that the majority of these women who own their cocoa land actually use hired labour to perform the above land preparation functions. This could be attributed to the labor-intensive processes of growing cocoa, which does not easily lend itself to mechanisation (Skalidou, 2020). The result further shows that when it comes to planting, women who have their own cocoa farm have greater participation in the preparation of seedlings, carrying of seedlings, planting of seedlings, and sowing at stake, with mean scores of 2.16, 2.64,

Table 4. Independent Samples Test

	Levene's Test for Equality of Variance		t-test for Equality of Means						
	F	Sig.	t	df	Sig (2 tailed)	Mean difference	Std. error difference	95% confidence interval of difference	
								Lower	Upper
Women in Partnership	11.475	0.001	1.912	59	0.061	0.351	0.184	-0.016	0.718
Sole Owners	0.071	0.710	0.172	69	0.864	0.024	0.137	-0.250	0.297

Source: Field data, 2022

2.73, and 2.87, respectively. The results reveal that during the maintenance of the farm land, women who owned their own cocoa farms played many roles, like weeding, removing disease pores, and carrying water for spraying, with mean scores of 2.49, 2.34, and 2.72, respectively. However, it is found that they participate less in thinning, controlled mistletoe, spraying, and application of pesticides and fertiliser, with respective mean scores of 1.96, 1.55, 1.13, and 1.55. The result also reveals that when it comes to the harvesting of cocoa beans, women who own cocoa farms play greater roles in the plucking of pods, gathering, heaping of pods, pod breaking, scooping of cocoa beans, and fermentation, with mean scores of 2.28, 2.54, 2.55, 2.54, 2.57, and 2.56. Likewise, the results reveal that when it comes to post-harvest activities, women who own their lands play a greater role in the carting of fermented beans to the drying area, the drying and sorting of beans, and the carting of dry beans for sale, with mean scores of 2.50, 2.68, and 2.32, respectively.

Overall, the outcome of the respective roles played by the two categories of women suggests that women in partnership are more involved in cocoa production roles than their counterparts, who are sole owners of their cocoa farms. While this might appear counterintuitive, this finding could be attributed to the use of hired labour by sole owners to carry out most of their farming operations. According to Spangler and Christie (2020), the roles of women in agricultural production responsibility and decision-making increase as males are withdrawn from the household, especially through migration. The work of Pattnaik and Lahiri-Dutt (2020) also lends credence to this assertion. Thus, according to their study, women are supposed to play greater roles in their farm operations if they are sole owners of their farms. But as the outcome of this study suggests, women may translate this autonomy into taking decisions that see them utilise hired labour to engage in their cocoa production.

It is also observed from the study that the roles of the women tend to increase as they approach harvesting and after harvesting. This observation is consistent with the study by Bulkis et al. (2020), where they found that between males and females, females allocated more hours to harvesting and post-harvesting activities than males. One other finding of this study is the relatively higher roles of women in partnerships in post-harvest activities such as drying and sorting of beans and carting of dry beans for sale. But according to Barrientos and Bobie (2016), while there are certain activities predominantly executed by males, such as selling to local buyers, when a woman owns her farm, she is the one responsible for selling her beans. Thus, this current study is inconsistent with their findings.

A further independent sample t-test was done to compare the two categories of ownership. The output indicates that the mean for women in partnerships is 0.351 and for sole owners is 0.024. Looking in the standard error section, it can be seen that they are not exactly equal, but they are close enough to assume equal variances. The p-value for women in partnership is 0.001, which is less than the standard significance level of 0.05 and indicates that it is statistically significant. The p-value for the sole owner is 0.710, which is greater than the standard significance level of 0.05 and indicates that it is statistically insignificant. With these, it can be said that women in

Socio-Economic Characteristics of Women Cocoa Farmers and their Productive Roles

Table 5. Regression estimate on socio-demographic factors and productive roles

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	Coeff.	Std. Err.	Beta		
Constant	.100	.104		.963	.336
Age	.001	.002	-.021	-.538	.591
Education	.802	.047	.798	17.22	.000*
Marital status	.033	.055	-028	-.606	.032**
Household size	-.002	.006	-.012	-.297	.001***
Experience in farming	-.002	.002	-.037	-.943	.767
Farm size (acres)	.000	.005	-.004	-.094	.351

*Note: ***, **, * denotes significant level at 1%, 5% and 10%*
F: 67.744; Sig: 0.000; R2=.614; Adjusted R2=.605

Source: Field data, 2022

partnership are significantly better than sole owners and that women in partnership play an active role in cocoa production than women who are sole owners.

The "F statistic" is an ANOVA result. The disparity between the within variance and the between-group variance may be seen in the ratio of 67.744. The findings had a significant value (p = 0.000), demonstrating that socio-demographic parameters predicted the productive roles played by women in producing cocoa. From the result, marital status is significant at the 1.0% level, and the relationship is positive. This indicates that as marital status increases, there will be a relative increase in women's productive roles in cocoa production. A further explanation for this is that married women are more likely to get involved in the productive roles of cocoa production as compared to unmarried or single women. Married women have social responsibilities to take care of and therefore would like to engage in productive roles as an alternative livelihood strategy. Unmarried women, on the other hand, would always prefer to go into other businesses due to how tedious farm activities are and thus would be unwilling to engage in any productive roles.

Education level also showed significance, with a 1% level of confidence and a favourable association. This suggests that a rise in the proportion of female cocoa growers will result in a rise in the roles they play in terms of production. Women with higher education or some other type of formal education are more likely to play active roles in the production of cocoa. Women who have a background in education are more likely than women without a history of education to use agronomic technologies. There is a chance that these women will attempt to apply this technology to their own cocoa plantations in an effort to boost yield and income. Thus, even though there is still a need for labour participation, the willingness to participate in productive activities is necessary to ensure that proper agronomic practices are used on the farm. The results are consistent with those of Azumah and Adzawla (2017), who discovered that knowledge of the protocols for using the urea deep insertion technique also requires some level of education. In a similar vein, Danso-Abbeam and Baiyegunhi (2017) came to the same conclusion, noting that education raises farmers' understanding of new technology and expands their productive responsibilities.

Other factors, like age, farm size, household size, and agricultural experience, were statistically insignificant at the 10% probability level, according to Table 5. This proved that a cocoa woman's age has no bearing on the productive functions she plays in the production of cocoa. Furthermore, women's productive duties are unaffected by the size of the farm and home. Women's involvement in cocoa production is not influenced by their experiences in cocoa cultivation. Since the researcher had already anticipated all of this, we reject the null hypothesis that these characteristics have an impact on how productive female cocoa growers are in the study region.

This result concurs with the study by Kassie et al. (2015), which suggested that the lack of land can induce agricultural intensification through the adoption of improved technologies and therefore less productive roles among cocoa farmers. In relation to farm size not predicting female farmers' productive roles in cocoa farming, however, the results are at odds with those of research by Bezu et al. (2014) and Danso-Abbeam and Baiyegunhi (2017), which revealed that farm size was important and had a favourable impact on the adoption of new technologies and increased productive roles in cocoa production. It is contrary to the current finding that Kassie et al. (2013) and Teklewold et al. (2013) found an association between household size and the use of better technology to increase productive roles in producing cocoa.

Additionally, contrary to Simtowe, Asfaw, and Abate (2016) and Danso-Abbeam and Baiyegunhi (2017), who found a positive and substantial association between a farmer's age and the productive roles played in cocoa production, the study's findings were inconclusive. Denkyirah et al. (2016) discovered a negative correlation between age and pesticide adoption. The study concluded that prior agricultural experience was not significant. Azumah, Tindjina, Obanyi, and Wood (2017) and Ahmed (2016) likewise concluded that experience was unnecessary to explain the productive responsibilities played by farmers. However, experience considerably and favourably influenced farmers' adoption of climate-savvy coping techniques as productive roles in Northern Ghana, according to Azumah, Donkoh, and Ansah (2017).

Effect of the Productive Role of Women in Cocoa Farming on their Access to Resources, Privilege, Power and Control

Table 6. Regression estimate on predictors of Women Cocoa Farmers on their Access to Resources, Privilege, Power and Control

Estimates	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	Coefficient	Std. Error	Beta		
(Constant)	.459	.430	-.052	1.069	.290
Age	-.002	.003	.135	-.863	.392
Marital status	.233	.106	.084	2.197	.033**
Household size	.019	.014	-.009	1.334	.188
Farm experience	-.001	.005	.005	-.153	.879
Farm size	.001	.013	-.063	.071	.944
Planting	-.094	.094	.112	-1.002	.321
Farm maintenance	.125	.112	.223	1.122	.267
Harvesting	.287	.111	.039	2.578	.013***
Post-harvesting	.048	.116	.658	.410	.684
Pre-planting	.452	.065	-.004	6.927	.000***

*Note: ***, **, * denotes significant value at 1%, 5%, and 10%*
F: 25.825; Sig: 0.000; R2=.832; Adjusted R2=.800

Source: Field data, 2022

The F-statistic had a positive coefficient and was statistically significant at the 1% confidence level. The disparity between the within variance and the between-group variance

may be seen in the ratio of 25.825. This indicates that access to resources, privilege, power, and control as dependent variables are predicted by the socio-demographic parameters and productive roles of women in cocoa farming.

The results in Table 6 indicated that 3 out of the 4 explanatory variables were significant at the 1% and 5% alpha levels, respectively. Marital status was significant (p = 0.033) and positive for access to resources, privilege, power, and control. This implies that the marital status of women in cocoa farming influences their access to resources, privileges, control, and power. Also, an R-square of 0.832 (i.e., 83.2%) indicates the goodness of fit of the study model. An R-square > 50.0% can be termed a good model for regression analysis.

Table 6 indicates that married women are likely to get access to resources, privilege, power, and control over cocoa production as compared to unmarried women. This is because unmarried women will prefer to focus more on their businesses than engage in farming activities. However, most married women are likely to inherit some farmland from their spouse, giving them the opportunity to venture into cocoa production. According to Nyantakyi-Frimpong (2019), men owned the majority of the land, while women had access to land through their fathers, spouses, and sons. Indeed, Doss et al. (2015) and Kieran et al. (2015) found that the proportion of women who own land in Sub-Saharan Africa (SSA) is quite low. Highly single women have been found to be more autonomous and to favour having individual property rights, which allows them to buy their own land. Married women rely heavily on and feel a special emotional connection to family properties.

This result, however, conflicts with Nyantakyi's (2019) claim that owning land in Ghana places one in a respectable socioeconomic stratum. Hence, a person is respected and recognised more the more land they own. The inference is that although women often hold some authority and tend to own more land in matrilineal communities, they transfer ownership to their husbands due to what Adegbite and Machethe (2020) described as socio-cultural norms. Their power appears to be ineffective and surface-level as a result. In matrilineal communities, men eventually tend to own more land, but they are unable to pass on their family's land to their offspring. In Ghana, access to land is typically through familial ties, share cropping agreements, rentals, skin or stool sales, or outright purchases.

Harvesting had a positive coefficient and was significant at the 1% alpha level, indicating that as harvesting activities increase, it will result in an increase in women's access to resources, privilege, power, and control. With a lot of harvesting activities to be carried out on cocoa farms, women are likely to be included. Thus, they are likely to have control and power over these activities on the farm, which might influence their access to resources positively. This will also provide an avenue for women to learn about and adopt new agronomic technologies. The feminist political ecology (FPE) hypothesis postulates that access to, control over, and mediation of access for others are governed by people's relative power inside their families. Limiting and restricting tactics are part of access and control. Disparate power according to age and gender may have an impact on this.

In addition to taking inspiration from feminist post-structural perspectives, FPE highlights the idea of a home as a complex unit rather than a single cooperative, unsophisticated entity engaged in production and consumption. Gengenbach et al. (2018) viewpoint differs from the conventional unitary one in that it views households as having more complexity. According to the FPE paradigm, women have different interests in terms of having access to and control over productive resources (Nyantakyi-Frimpong, 2019). According to Gengenbach et al. (2018), FPE emphasises the disparate access to and control over resources that already exist from a more intersectional perspective that recognises inequality between men and women inside households.

Further, at a 1% confidence level, pre-planting activities were significant and had a positive relationship. This implies that a relative increase in pre-planting activities will lead to an increase in women's access to resources, privilege, control, and power, and vice versa. Women who are involved in pre-planting activities are more likely to adopt new technologies for cocoa production. Hence, this is likely to affect their access to resources and privileges over other farm inputs for production. This group of women is also more likely to have complete control and power over their farms than women who do not participate in pre-planting activities. According to a study by Kassie et al. (2020), women make up between 49 and 60 percent of the working force in both Western and Eastern Kenya. Women, on the other hand, have less control over domestic work. A phenomenon, according to Kabeer (2015), is caused by long-standing disparities in the paid jobs of women; nonetheless, in order to maintain their marriages, women contribute more to the unpaid labour on farms. Because of the current patriarchal bias inside households, women can only make decisions about the use of family labor. Chant and Brickell (2013) identified unfair intra-household power relations as a contributing factor in this phenomenon.

The Challenges Women Face in Cocoa Production

Table 7. Challenges of Women in Partnership with their Husbands in Cocoa Production

Female Farmer in Partnerships			Personal Cocoa Farms		
Challenge	**Mean**	**Std. Dev**	**Challenge**	**Mean**	**Std. Dev**
Limited participation in training (extension services)	1.87	1.240	Limited access to cocoa market (reliance on intermediaries and lower prices)	1.26	.629
Limited access information	1.96	1.267	Limited access to training (extension services)	1.25	.591
Limited access to farming income	3.42	1.188	Limited access to information	1.27	.615
Limited Financial Support from spouse in the household	3.08	1.052	Limited access to land	1.94	.980

Do you face issues like Inadequate finance without any support from your spouse	3.31	1.065	Limited access to credit facilities	2.39	.885
Do you lack support from spouse when it comes to your children's school fees despite constant reminders	2.57	1.290	Limited access to cooperative membership decision-making bodies	1.66	.779
			Do you owe individuals and/or institutions (bank, schools, etc.) for which you are unable to pay despite constant reminders?	1.32	.632
			High cost of transportation Standardization	2.16	.875
			Fluctuating price of farm produce	1.76	.932
			Inadequate access to agrochemical	2.31	.909
			Lack access to machine to help in the farm	2.36	.879
			High cost of labour	2.67	.673
			Inadequate processing facilities	2.21	.965
			Inadequate storage	2.17	.966
			Incidence of pest	2.35	.856

Source: Field data, 2022

Table 7 presents a descriptive analysis of the challenges women who partner with their husbands to cultivate their farms face in cocoa production. The result reveals that the majority of the these women rarely agree that they have limited opportunities in participation in training (extension services) with a mean score of 1.87; the majority of the respondents expressed that they regularly have limited access to information with a mean score of 1.96; again, the majority of the women demonstrated that there was limited financial support from their spouse in the household with a mean score of 3.08; most of the respondents said they do face issues like inadequate finance without any support from their spouses with a mean score of 3.31; most of the respondents said they do lack support for their children's school fees despite constant reminders with a mean mark of 2.57.

Table 7 also presents a descriptive analysis of the challenges women with personal cocoa farms face in cocoa production. The result indicates that most of the women rarely have limited access to the cocoa market, with a mean mark of 1.26. Again, majority of the respondent said they rarely have limited access to training with mean of 1.25; most of the respondents express that they rarely have limited access to information with a mean score of 1.27; majority of the respondent also express that they rarely have limited access to land with mean score of 1.94; majority of the respondent said they have limited access to credit facilities with mean mark of 2.39; most of the respondent express that they rarely have limited access to cooperative membership decision-making bodies with mean mark of 1.66; majority of the women farmers express that they rarely owe individuals and/or institutions (bank, schools, etc.) for which you are unable to pay despite constant reminders with a mean score of 1.32; majority of the respondent express that there is high cost of transportation with mean mark of 2.16; most of the respondents express that rarely do they experience fluctuating price of farm produce with mean mark of 1.76; most of the respondents expressed that there exist Inadequate access to agrochemicals with a score of 2.31; lack of access to machines to help in the farm with a mean score of 2.36; high cost of labour with a mean score of 2.67; inadequate processing facilities with a mean score of 2.21; inadequate storage with a mean score of 2.17; and incidence of pests with a mean score of 2.35. The findings in this study corroborate the study by Adegbite and Machethe (2020), who identified such challenges as the high cost of agricultural labour and productive inputs as contributory drivers to increasing gaps in gender-related financial inclusion.

CONCLUSION

While prominently featured in the production of one of the country's highest foreign currency-earning commodities for the economy, women have often not been accorded the deserving recognition for their roles in cocoa production. In recent times, however, increasing attention has been drawn to this misrepresentation, and efforts are being made not only to showcase the roles of women but also to offer women the necessary support to increase their relevance in cocoa production. To this end, this study was conducted to investigate the role of women in the production of Ghana's cocoa in the Ashanti Region. Findings from the study showed that women cocoa farmers play an enormous role in the production of cocoa. They play roles in both the pre-harvest stage and the post-harvest stage. The results show that women in partnership with their spouses play a more active role in cocoa production than women who are sole owners. Marital status, farming experience, and educational level are the key factors influencing women farmers' production roles. Again, marital status and pre-planting and harvesting activities influence women farmers' access to resources, privilege, power, and control. Women farmers in partnership with their spouses face the challenge of support from their husbands, while women operating as sole owners face the challenge of high labour costs.

The study recommends that the government and institutions in charge of regulating the cocoa sector formulate policies supporting more women in the cocoa production communities to venture more into cocoa production. This will serve as a form of motivation for these women to be able to earn more on their own, which will raise their economic and social wellbeing. This is especially true for those women farmers who are sole owners of their farms. The study found that there was limited access to credit facilities for women farm-

ers. So, the study recommends that the right steps be taken to get credit facilities ready for these farmers so that they can be more productive in cocoa production. The study also discovered that because agrochemicals are difficult to obtain and shipping them is costly, the various authorities should ensure that obtaining them is simple and quick. The study discovered high labour costs, insufficient processing facilities, insufficient storage, and pest infestations as common challenges among women cocoa farmers. These are problems that need a lot of attention from the government and its agencies, like the Food and Agriculture Ministry (MoFA) and COCOBOD. Therefore, the study recommends that the above authorities look into those issues and set out policies and programmes to address these shortfalls in order to encourage more women to venture into cocoa production, where they can engage and thrive. Results show that in order to make a difference, key stakeholders in the cocoa value chain must massively support women cocoa farmers.

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Applied Studies in Agribusiness and Commerce – APSTRACT
University of Debrecen, Faculty of Economics and Business, Debrecen
SCIENTIFIC PAPERS
DOI: 10.19041/APSTRACT/2024/1/6

CONSUMERS' PERCEPTION AND WILLINGNESS TO PAY FOR ORGANIC TOMATOES IN OFORIKROM MUNICIPAL, ASHANTI, GHANA

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Abstract: *Although conventional tomatoes are often preferred by consumers, organic tomatoes are thought to be safer and healthier. This is because some customers do not fully comprehend the advantages of organic tomatoes. The purpose of this study was to investigate how customers perceive and are willing to pay for organic tomatoes. 399 systematically chosen respondents provided the data, which was collected. The data were analyzed using descriptive and inferential statistics such the Perception Index, Contingent Valuation Method, and Tobit Regression Model. The findings indicated that the majority of respondents were familiar with organic tomatoes. A perception rating of 1.24 indicates that respondents had a favorable opinion of organic tomatoes. Organic tomato buyers were willing to spend at least GHC 9.63 per kilo. Consumers' willingness to pay for organic tomatoes was influenced by their view of the health benefits, their level of education, their income, and their knowledge of and familiarity with organic tomatoes. As a result, the study advises producers or farmers to inform their customers about the health advantages of organic tomatoes and to focus on consumers with high incomes and educational levels since these factors greatly influenced their willingness to pay.*

Keywords: *consumers' perception; organic tomato; willingness to pay*
(JEL code: Q13)

INTRODUCTION

In wealthy nations, there has been a dramatic rise in demand for organic fruits and vegetables over the past 20 years (Owusu & Anifori, 2013). The fact that organic foods typically contain higher quantities of specific nutrients, lower levels of pesticides and herbicides, and may have positive health effects for consumers, can be related to the rising trend in demand (Crinnion, 2010). According to reports, consumers' evolving tastes, preferences, and perceptions of food risks and environmental issues are driving the continued development of agriculture, and production systems must adapt to keep up with the changing trends (Skreli et al., 2017). Tomatoes that are organic are generally thought to be healthier, tastier, and safer. Mostly because of its health advantages, it is regarded as the vegetable that people eat the most globally. Because it generates revenue for the poor and the nation as a whole, tomato production has a high marginal return and benefits rural, peri-urban, and urban groups in the nation (Coulibaly et al., 2011). As a result, it helps to reduce poverty.

The recent rise in awareness of organic tomatoes has increased consumer knowledge of environmental issues in affluent economies. The low amount of domestic consumption can be explained in a few different ways. The lack of knowledge among consumers regarding the attributes and distinctions between conventional and organic tomatoes has been the first problem. Numerous studies have found that growing organic tomatoes in a greenhouse is easier than growing them outdoors because it reduces the risk of exposure to pests and diseases, makes it simple to control weeds and the microclimate, protects plants from extreme weather like drought and storms and strong winds, makes better use of available resources, and extends the growing season (Mihov & Tringovska, 2010).

The majority of customers, however, prefer to buy and consume either the traditional local tomatoes grown in an open field or imported tomatoes. Customers frequently have no idea where tomatoes were grown—whether locally or abroad—or what kinds of agrochemicals were employed (Lendel Kade Narine et al., 2013). The effects on consumer health are more severe as a result. On the other hand, taking

into account how farmers will be compensated is necessary to balance the advantages of organic tomatoes for customers. Alternative protected systems and organic farming methods alter the quality of farmers' products while gradually raising production costs (Lendel Kade Narine et al., 2013). Improved tomato producing technology are primarily to blame for this. In fact, there are other factors to consider in addition to manufacturing, such as the marketability of such products and their ability to attract customers. Examining consumer willingness to pay for organic tomatoes and perceptions of organic tomatoes is crucial to prevent the issue of needless tomato waste and associated costs to producers.

Many studies have been done on how consumers behave when purchasing agricultural products like fresh-cut products, green products, organic foods, vegetable oils, and fresh vegetables, but few have examined how consumers perceive and are willing to pay more for tomatoes from a food safety perspective (Rezai et al., 2013). It is unclear how consumers perceive and are willing to pay more for organic vegetables than for conventional vegetables. The purpose of this study is to investigate consumers' perceptions of organic tomatoes, their knowledge of them, whether they are willing to pay for them, how much they are willing to pay, and the factors that affect their decision to do so.

MATERIALS AND METHODS

The Oforikrom Municipal Assembly is the subject of this investigation. The municipal is one of the Ashanti region's 43 district assembly and is regarded as one of the most employment-focused districts. Bosomtwe district assembly to the east, Asokwa municipal assembly to the south-west, Asokore Mampong to the north, and Kumasi metropolitan assembly to the west all share borders with the Municipal. According to the 2010 population and housing census report from the Ghana Statistical Service, the municipal population was 303,016 with a 5.4% annual growth rate. Based on the 2010 population and housing census, the anticipated population for the year 2020 is 375,651, with 50.2% men and 48.8% women. The segmentation of the Municipal includes twenty (20) communities.

The Oforikrom Municipal was specifically chosen because of the diversity of income levels and the citizens' involvement in farming and trading. The appropriate place for this study is Oforikrom Municipal because of its international character. The sample size determined using Yamane's formula was 399 respondents. Based on income level and economic activity, a purposeful selection technique was utilized to choose 8 communities from the total of 20 in the Oforikrom Municipal Assembly. In the chosen 8 communities of Oforikrom Municipal, Bomso (39), Ayiyga (45), Boadi (50), Oforikrom (60), Anloga (55), Ayeduase (48), Kotei (55) and KNUST (47) were interviewed using a systematic random sampling technique, which involved interviewing one person from every two households. Both primary and secondary sources were used to acquire the data. The primary data was collected using an open-ended and closed-ended structured questionnaire administered during an in-person interview.

SPSS (statistical software for social science) and Microsoft Excel were used to examine the data. Socioeconomic traits and customers' awareness and knowledge of organic tomatoes were examined using descriptive statistics. To gauge consumer knowledge of organic tomatoes, a nominal scale of (Yes=1 and No=2) was used. The results analysis employed frequency and percentage.

Analysis of consumers' perception of organic tomatoes

The perception index of customers toward organic tomatoes was calculated using a three-point Likert scale (1=agree, 2=neutral, and 3=disagree). On a three-point Likert scale, consumers were asked to select whether they agreed or disagreed with various claims made about organic vegetables. To make it easier to grasp, the perception was broken down into categories including health, nutrition, economy, and environment. Using the perception index and mean score model for ranking of individual perception scores, it is possible to simulate the customers' perception of organic tomatoes.

Analysis of consumer willingness to pay for organic tomatoes

The readiness of consumers to pay a premium for organic tomatoes and, if so, how much, was assessed using the contingent valuation method (CVM). A base price of Ghc 9.00 was thus established, with the lowest bid being Ghc 5.00 and the highest being Ghc 12.00. Respondents were tested using discrete choice questions, which are statistically referred to as discrete dependent variables. Questions with discrete choices came in the form of Yes/Yes, No/No, No/Yes, and Yes/No statements. The willingness of consumers to pay the base price, the lowest bid, or the maximum bid was questioned.

$$\frac{\{(fx1*1)+(fx2*2)+(fx3*3)}{X}$$

Where fx1 to fx3 represents the respondents for each category and X is the total number of respondents.

$$\frac{m1+m2+m3+m4}{M}$$

Whereby m1 to m4 represents the three perception themes and M is the number of perception statements.

Consumers' willingness to pay a premium for organic tomatoes

Socio-economic factors determine how much consumers in Oforikrom Municipal are ready to spend for organic tomatoes. Due to the nature of the dependent variable, tobit regression was utilized. The following empirical description of the Tobit regression model is as follows:

$$WTPOT = \beta0 + \beta1Age + \beta3Gender + \beta3HHS + \beta4Edu + \beta5HP + \beta6NP + \beta7EP + \beta8Y + \beta9Attrib + U$$

Where WTPOT denotes consumers willing to pay for organic tomatoes, Age represents the age of the respondent, Sex represents the sex of the respondent (1 if female, 0 if male), HHS represent the household size of the respondent, Edu represents the educational level of the respondent, HP represents the health perception of organic tomatoes, NP represents the nutritional perception of organic tomatoes, EP represents the economic perception of organic tomatoes, Y represents the monthly average income of the consumer, Attrib represents the attributes of organic tomatoes and U denotes the error term. a0 denotes the constant term and β1 … … β9 are the coefficient of the postulated explanatory variables. The expected signs of the coefficients of the explanatory variables are in the table below.

Table 1. Description of variables for the Logistic regression model

Variables	Description	Expected Sign
Age	Years	-/+
Gender	1 if female, 0 if male	-/+
Household size	Number of people in the household	-/+
Education	Number of years in school	-/+
Health perception	Perception about organic tomatoes being healthier (1if the respondent agrees, 0 if otherwise)	-/+
Nutritional perception	Perception about organic tomatoes contains vitamins (1 if the respondent agrees, 0 if otherwise)	-/+
Economic perception	Perception on I would like to purchase if they are available (1 if the respondent agrees, 0 if otherwise)	-/+
Monthly average income	GHC	-/+
Attributes	Attributes of organic tomatoes (1 if important, 0 if otherwise)	-/+

Factors affecting consumer's willingness to pay for organic tomatoes

Willingness to pay is a mathematical expression of a change in consumers' utility in relation to a commodity which is evoked by a change in the level of some attributes of that commodity (Hanemann et al., 1991). The stated preference method is considered appropriate in dealing with hypothetical products in this case organic tomatoes. To elicit customers' willingness to pay, the stated preference technique may utilize open-ended or closed-ended questions. The open-ended style has lost favor over time, even though it does not need extensive statistical analysis because the responses are straightforward and self-evident (Hanemann et al., 1991). The use of closed-ended questions provides for in-depth statistical analysis of data gathered. This study uses discrete choice questions, in which the responses are statistically defined as discrete dependent variables. Responses from discrete choice questions are in forms, Yes/Yes, Yes/No, No/Yes, and No/No, where consumers are asked if they are willing to pay a specified amount (B). the probability that a consumers' willingness to pay be equal or greater than the amount (B) is given mathematically as:

$$\Pr\left(WTP \geq B\right) = 1.\, C_d(A)$$

Where $C_d(A)$ represents the cumulative distribution of various willingness to pay.

The response of discrete choice questions being Yes/ No, we denote Yes by 1 and No as 0 therefore:

yi = 1 if the ith consumer is willing to pay price B and yi = 0 if otherwise

Hence, view yi as a realization of a random variable Yi that can take the values 1 and 0 with probabilities α and 1-α respectively. Therefore:

$$\Pr(Yi = yi)_i = a^{yi}(1 - a)^{1-yi}$$

For yi = 0,1. If yi = 1, is obtained a_i and if yi = 0, then $1 - a_i$ i is obtained. It becomes fairly easy to verify by direct calculation of expected value and variance of Yi.

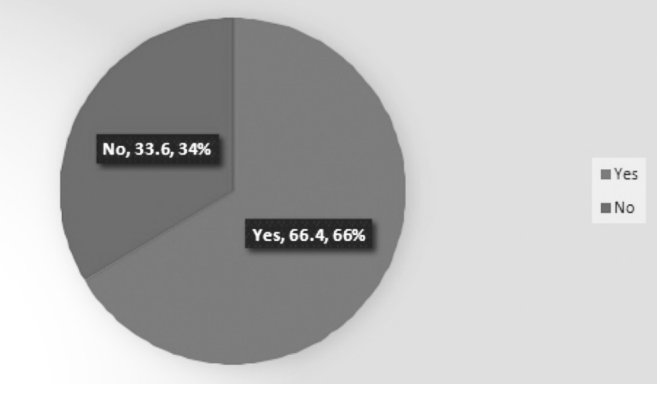
Mathematically: $E(Yi)_i = a_i$ and $Var(Yi) = \sigma^2(1 - a)$

RESULTS AND DISCUSSION

Consumers' awareness of organic tomatoes

The percentage of consumers who knew that organic tomatoes existed is depicted in Figure 1. The majority of those surveyed (66.4%) claimed to be familiar with organic tomatoes. 33.6% of the respondents were still unaware that tomatoes might be organic. This supports the finding of Yahaya (2008) that consumer knowledge about food safety and health issues influences their purchasing. It may be because customers are aware of the health benefits connected with its consumption.

Figure 1. Awareness of organic tomatoes

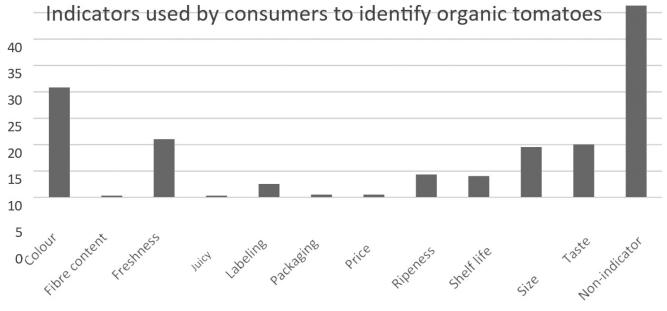


Source: Field survey, 2021

Indicators consumers used to identify organic tomatoes

The characteristics or indicators that consumers utilize to distinguish or identify inorganic tomatoes were further elicited from the 265 respondents who indicated that they were aware of organic tomatoes. Different indicators, such as color and freshness labeling, were used in response. The indicators that consumers used to distinguish organic tomatoes are shown in Figure 2. Following freshness (11%), flavor (10%), and size (9.5%), about one-fifth (20.8%) indicated they use color to identify. As the first things to be noticed and things that do not require professional verification, color and freshness were mentioned as the primary markers. The fiber level (0.3%) and juice content (0.3%) seemed to be the least indicative, and this is because consumers must conduct additional research on these indicators before they can distinguish organic from inorganic. Customers who claimed they were unaware of organic tomatoes are represented by the bar graph in the diagram labeled "non-indicator."

Figure 2. Indicators used to identify organic tomatoes

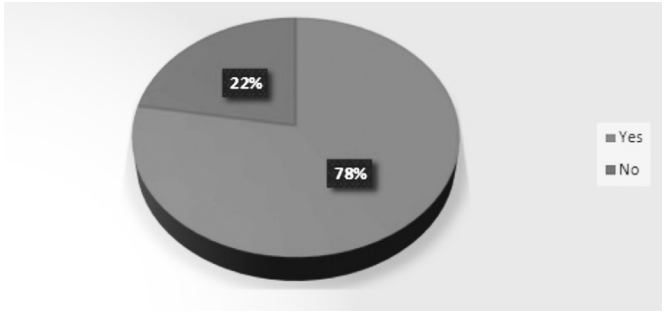


Source: Field survey, 2021

Number of consumers who like organic tomatoes

The percentage of consumers who choose organic tomatoes is shown in Figure 3. The majority of consumers (77.7%) indicated they enjoy organic tomatoes. This can be due to the advantages of organic tomatoes in terms of health. Additionally, it provides farmers who are already engaged in organic tomato production as well as those who wish to enter the industry with strong evidence of the need for organic tomatoes.

Figure 3. Number of consumers who like organic tomatoes

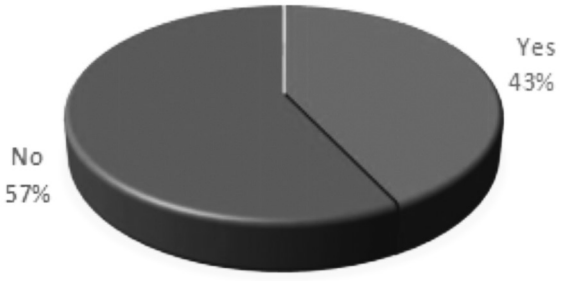


Source: Field survey 2021

Number of consumers who consume organic tomatoes

The number of organic tomato consumers in the Oforikrom Municipal Assembly is shown in Figure 4. Only 170 consumers—or 42.6%—of the overall sample—mentioned eating organic tomatoes: that is, 170 consumers. This shows that while some consumers prefer conventional and tomato paste over organic tomatoes, they still do not consume them due to their high cost, scarcity, and preference. During the administration of the questionnaires, the consumers gave these explanations.

Figure 4. number of consumers who consume organic tomatoes

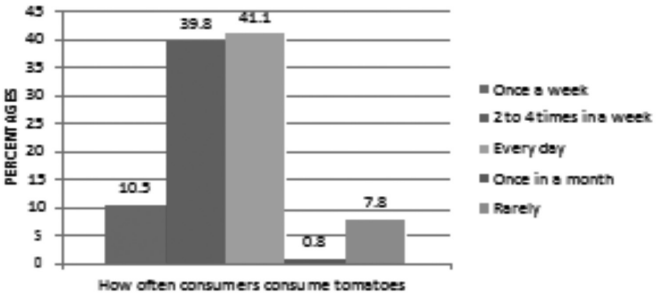


Source: Field survey, 2021

How often consumers take in tomatoes

The frequency of tomato consumption in the Oforikrom Municipal Assembly is depicted in Figure 5. The bulk of consumers (41.1%) consume tomatoes every day, followed by 39.8% who do so twice to four times per week, 10.5% who do so once per week, and 7.8% who don't. This proof demonstrates the regular use of tomatoes in meal preparation.

Figure 5. Frequency of consumption of tomatoes

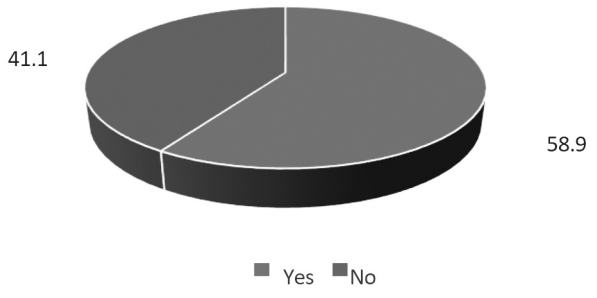


Source: Field survey, 2021

Awareness of the benefits of consuming organic tomatoes

In the Oforikrom Municipal Assembly, tomato consumption is depicted in Figure 5 on a regular basis. It was found that the majority of consumers (41.1%) consume tomatoes every day, 39.8% do so two to four times per week, 10.5% do so once per week, and 7.8% do not. This data demonstrates that tomatoes are a common ingredient in meals.

Figure 6. Consumers awareness of the benefit of consuming organic tomatoes



Source: Field survey, 2021

Some of the benefits consumers consider in buying organic tomatoes.

Table 2 shows some of the benefits consumers consider in buying organic tomatoes. These benefits are arranged in order of importance.

Table 2. Some of the benefit stated by consumers of organic tomatoes

Benefits	Frequency	Percentage	Ranking
Healthy	132	33.1	1st
Source of vitamins	25	6.3	2nd
Prevention of disease	19	4.8	3rd
Boost immune system	18	4.5	4th
Nutritious	17	4.3	5th
Prevention of cancer	7	1.8	6th
Provision of strength	6	1.5	7th
Less harmful to the body	3	0.8	8th
Help in blood circulation	3	0.8	8th
Delicious	1	0.3	9th
Prevention of constipation	1	0.3	9th

Source: Field survey, 2021

The majority of consumers (33.1%) place a high priority on health benefits, which are followed by vitamin sources (6.3%), disease prevention (4.8%), immune system support (4.5%), cancer prevention (1.8%), strength-giving (1.5%), aids in blood circulation (0.8%), less harmful to the body (0.8%), deliciousness (0.8%), and constipation prevention (0.3%).

Important attributes consumers look out for when buying organic tomatoes

Table 3 shows that freshness, size, and cost are the three main considerations for consumers when buying organic tomatoes. With a mean of 2.93, or around three (3), the majority of respondents ranked fresh as being the most important. This supports research by Acheampong et al. (2012) and Florkowski et al. (2014) that found the majority of consumers prioritize freshness when purchasing veggies. It was also shown that price (mean of 2.79) and size (mean of 2.80) were significant factors that customers took into account while purchasing organic tomatoes. Since they were ranked in the 7th and 8th levels of the characteristics, the fiber content and FDA certification were likewise significant but not given as much weight. This suggests that any investor who wishes to get involved in the production of organic tomatoes should take these crucial factors that influence consumer purchasing decisions into account.

Table 3. Attribute consumers look out for when buying organic tomatoes

Attributes	Not important	I don't know (2)	Important (3)	Mean	Ranking
I. Fresh	9(9)	9(18)	381(1143)	2.93	1st
II. Size	51(51)	27(102)	321(963)	2.80	2nd
III. Price	31(31)	22(44)	346(1038)	2.79	3rd
IV. Health benefits associated with organic tomatoes	33(33)	50(100)	316(948)	2.71	4th
V. Free from chemicals and pesticide	46(46)	37(74)	316(948)	2.68	5th
VI. Nutrtitional content of organic tomatoes	43(43)	75(150)	281(843)	2.60	6th
VII. Fiber content	50(50)	118(236)	231(693)	2.45	7th
VIII. FDA certification	61(61)	145(290)	193(579)	2.33	8th
I. Fresh	9(9)	9(18)	381(1143)	2.93	1st
II. Size	51(51)	27(102)	321(963)	2.80	2nd

Source: Field survey, 2021

Consumers perception of organic tomatoes

Table 4 shows the result of each perception statement used in the study. Under the health statement, consumers agreed to the statement that organic tomatoes are healthier for human consumption with a mean score of 1.12 closer to one. Also, consumers agreed that organic tomatoes boost the human immune system having a mean score of 1.16 which is closer to one.

Table 4. Consumers perception of organic tomatoes

	Agree (1)	Neutral (2)	Disagree (3)	Mean
Health statement				
I. Organic tomatoes are healthier for the human consumption	363(363)	25(50)	11(33)	1.12

II. Organic tomatoes boost the human immune system	346(346))	44(88)	9(27)	1.16
III. Organic tomatoes are pesticide-free	318(318)	58(116)	23(69)	1.26
IV. Organic tomatoes are safe and help in the prevention of disease such as cancer	310(310)	68(136)	21(63)	1.28
Perception for health				1.21
Nutrition statement				
V. Organic tomatoes contain natural vitamins	339(339)	48(96)	11(33)	1.17
VI. Organic tomatoes are rich in fiber content which help prevent constipation and promotes a healthy digestive tract	314(314)	70(140)	15(45)	1.25
VII. Organic tomatoes are highly nutritious than inorganic tomatoes	333(333)	57(114)	9(27)	1.19
VIII. Perception for nutrition				1.20
Economics statement				
IX. I would like to purchase if they are available	349(349)	37(74)	13(39)	1.16
X. I am willing to pay a premium for organic tomatoes given the extra benefit for health	290(290)	87(174)	22(66)	1.33
XI. I am willing to buy if it is well packaged	320(320)	65(130)	14(42)	1.23
XII. I am willing to pay for organic tomatoes if the price is affordable	359(359)	28(56)	12(36)	1.30
XIII. Perception for economics				1.26
Environmental concern statement				
XIV. I am willing to buy if it is free from a harmful substance that affects the health of human	343(343)	43(86)	13(39)	1.17
XV. Organic tomatoes production promotes the growth of micro-organisms in the soil	250(250)	118(236)	30(90)	1.44
XVI. Perception for environmental concern				1.31
XVII. Mean perception index				1.24

Source: Field survey, 2021

Once more, consumers felt that pesticides were not present in organic tomatoes, giving them a mean score of 1.26, which is similarly near to one. The health perception index was 1.21, indicating that consumers concur with all of the aforementioned health claims. This confirms research by Gumber & Rana (2017) and Daz et al. (2012) that shows customers' health-related concerns have a favorable impact on their purchase choices.

Consumers who agreed with the nutrition statement about the presence of natural vitamins in organic tomatoes had an average mean of 1.17, which was closer to one. The overall nutritional perception index was 1.20, which indicates a favorable relationship between buying organic tomatoes. This validates the result by Gupta (2014) that buyers think about the nutritional advantages of a product before making a purchase. Table 4's economic perception index score of 1.26 indicates a favorable correlation between price, produce availability, packaging, and customer knowledge of the advantages of organic tomatoes. This is because most consumers take their income status into account when making a purchase decision. This finding can help organic tomato growers decide how much to charge for their product, as well as how to package it and make it available on the market. Table 4's environmental concern perception result was 1.31, which suggests a favorable relationship between buying organic tomatoes and that relationship. The findings of Dáz et al. (2012) are consistent with this because consumers consider environmental concerns while buying organic tomatoes because their production does not hurt the environment. Consumers in the Oforikrom Municipal Assembly have a favorable opinion of the environmental benefits of organic tomatoes, as evidenced by the overall mean score of 1.24.

Willingness to pay a premium for organic tomatoes

According to the findings, people in the Oforikrom Municipal Assembly would buy organic tomatoes if they were offered at a competitive price with alternatives like inorganic tomatoes and tomato paste. The price for inorganic tomatoes is represented by the responses of Yes/Yes for GH12.00, Yes/No for GH9.00, and No/Yes for GH5.00. One kilogram of organic tomatoes currently costs GHC 12.00. 51.88% of consumers who said Yes/Yes were willing to pay GH12.00 for 1 kilogram of organic tomatoes. Consumers who answered Yes/No were prepared to spend GH9.00 on 1kg of organic tomatoes. This shows that GH 9.00 was willing to be spent by 27.82% of consumers in the Oforikrom Municipal Assembly for 1 kg of organic tomatoes.

Table 5. Consumers' willingness to pay more for organic tomatoes

Response of consumers	Prices GH¢	Frequency	Percentages (%)
Yes/Yes	12	207	51.88
Yes/No	9	111	27.82
No/Yes	5	58	14.54
No/No	<5	23	5.76

Source: Field survey, 2021

The price of inorganic tomatoes was determined by the consumers' willingness to pay GH5.00 for 1 kg of organic tomatoes. This shows that, out of a total of 58 consumers in the Oforikrom Municipal Assembly, 14.54% were willing to pay

GHC 5.00 for 1 kg of organic tomatoes. The 5.76% of consumers who said No/No indicated that they would not pay any bid price. When asked why they would not pay more for organic tomatoes, respondents gave a variety of responses, including that the product is already available at a lower price and that organic tomatoes are too expensive. These remarks seem to support prior research findings that even food products with important and proven health benefits may not be appealing to consumers if they are too expensive to justify buying. Munene (2006) made this observation.

Amount consumers are willing to pay and the determinants

Table 6 shows the average amount consumers were willing to pay for organic tomatoes with a maximum of GH¢12 and minimum amount of GH¢4.

Table 6. Consumers' willingness to pay more for organic tomatoes

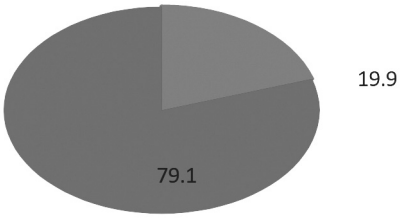
Mean	Maximum	minimum	Standard error
9.63	12	4	0.1925

Source: Field survey, 2021

Determinants of WTP for organic tomatoes

The dependent variable (WTP for organic tomatoes) at GHC 9.00 of the base price at the supermarket was divided into two groups, with 316 respondents (or 79.1% of the sample) answering "Yes, Yes, and Yes, No" and 83 respondents (or 19.9% of the sample) responding "No, Yes, and No, No" (Figure 7). According to the study, the majority of consumers would be prepared to pay the current price for organic tomatoes and even more.

Figure 7. Willingness to pay



Source: Field survey, 2021

The elements in Table 7 that affect customers' willingness to pay for organic tomatoes include socioeconomic characteristics, awareness and knowledge, and perception. When using a logistic regression model, a binary dependent variable (1=WTP GHC 9.00 or higher and 0=otherwise) was used. Table 7 provides the coefficient, standard error, t-value, odds ratio, and significance of these variables. The average income was determined to be 10%, which was favorable and noteworthy. This indicates that a respondent's willingness to pay for organic tomatoes will likely grow by around 1.002 times for every unit increase in income. Consumers who believe organic tomatoes are better for human consumption were 4.292 times more willing to spend than their counterparts, according to favorable and substantial research at the 5% level. This is corroborated by the conclusion of Narine et al. (2009) that consumers' health consciousness affects the wholesale price of organic tomatoes.

Table 7. determinants of organic tomatoes

VARIABLE	B	S. E	SIGN	EXP (B)	95% CI LOWER	UPPER
Constant	-2.552	1.166	0.029	0.078		
Age	0.007	0.023	0.747	1.007	0.963	1.054
Years of For. Educ.	-0.023	0.037	0.525	0.977	0.909	1.050
Household	0.058	0.089	0.514	1.060	0.890	1.263
Gender	-0.114	0.340	0.737	0.892	0.459	1.736
Average	0.002	0.001	0.056	1.002*	1.000	1.004
Org. Tom. are healthier	1.457	0.595	0.014	4.292**	1.338	13.765
Pesticide 1	0.352	0.368	0.338	1.422	0.692	2.924
FDA certification	0.592	0.332	0.074	1.808*	0.943	3.466
Size of tomatoes	0.490	0.387	0.206	1.632	0.764	3.486
Extra benefits	0.758	0.324	0.020	2.133**	1.129	4.030
Highly nutritious	0.794	0.432	0.066	2.212*	0.949	5.153
Cont. vitamins	0.708	0.455	0.120	2.030	0.832	4.953
Percep. that Org. pesti. free	-1.119	0.482	0.020	0.327**	0.127	0.841

Source: Field survey, 2021

FDA certification of organic tomatoes was favorable and significant at 10%, implying that customers are 1.808 times more likely to pay for certified organic tomatoes than uncertified ones. Given the additional benefits, I am willing to pay a premium for organic tomatoes. This result was also positive and significant at 5%, indicating that there is a likelihood of about 2.133 times greater for a respondent who agrees with the statement than for a respondent who disagrees.

It was also significant at 10% with a positive association that organic tomatoes are more nutrient-dense than inorganic tomatoes. When compared to consumers without this view, they were 2.212 times more likely to pay. Pesticide-free organic tomatoes were shown to be unfavorable and significant at 5%. This suggests that a person's WTP will fall by 0.673 times for every unit higher in their impression that organic tomatoes are pesticide-free. This is due to the fact that organic items (such as tomatoes) are recognized to be pesticide-free; therefore, if farmers make any effort to boost this view, it may appear that the product has been adulterated, which will lower their WTP.

CONCLUSION

Only 33.6% of respondents to the study were unaware of the existence of organic tomatoes, the study found. It was discovered that customers distinguish organic tomatoes from conventional ones using cues like color, freshness, and taste. Juiciness and fiber content were the least important characteristics. The majority of survey participants also concur that organic tomatoes are better for you, more nutrient-dense, have a nicer flavor and better taste, and contain fibre that help reduce constipation in people. Consumer perceptions of organic tomatoes are favorable in terms of health and nutrition, according to a health perception rating of 1.21. The nutrition perception score of 1.20 showed that the majority of consumers believe organic tomatoes to be nutrient-dense. The average perception score, which was 1.24, indicates that customers in the Oforikrom Municipality have a favorable opinion of organic tomatoes.

According to the study, 51.88% of consumers were willing to spend the highest bid (GHC12.00) for 1 kg of tomatoes, 27.82% were willing to spend GHC9.00 for 1 kg, 14.54% were willing to spend the lowest bid (GHC5.00) for 1 kg of organic tomatoes, and only 5.57% were not willing to spend any of the bid prices but a sum that was lower than the lowest bid for 1 kg of organic tomatoes. Overall, GHC 9.63, which is higher than the lowest bid but less than the highest bid, was the average price paid. Additionally, it was discovered that factors like income, knowledge of and awareness of health perception, nutritional perception, economic perception, and their decision to pay for organic tomatoes based on size affect the amount consumers are willing to pay as they significantly influenced the willingness to pay for organic tomatoes.

The study makes the following recommendation: Producers should advertise and promote the product to increase consumer knowledge of and awareness of the health benefits of the product in order to increase consumer willingness to pay, as increased consumer willingness to pay is correlated with increased consumer perception of the health benefits of organic tomatoes. Producers should take into account variables like average monthly income, age, educational attainment, perceptions of the health, nutritive value, and economic value of organic tomatoes in order to enhance sales of organic tomatoes in Oforikrom. These variables have an impact on consumers' purchase decisions. Since consumers are prepared to pay an additional GHC 9.63 for organic tomatoes, the government and investors should engage in their production. As a result, there is a favorable opinion of the product's price.

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Applied Studies in Agribusiness and Commerce – APSTRACT
University of Debrecen, Faculty of Economics and Business, Debrecen
SCIENTIFIC PAPERS
DOI: 10.19041/APSTRACT/2024/1/7

QUANTITATIVE RESEARCH OF FACTORS (CONVENIENCE OF ACCESS AND GENDER) INFLUENCING THE FOOD STORE CHOICE IN NAGYKŐRÖS

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Abstract: *The objective of the research is to analyze the food purchasing decisions of Hungarian customers depending on priority factors (convenience of access and gender) that impact the food store choice. To identify the characteristics of food shopping behaviour, we conducted a customer survey of 220 individuals in the city of Nagykőrös. The data collection was carried out using a standard questionnaire and an online survey on the Nagykőrös public life community social media portal, and by informing shoppers about the possibility to fill in the questionnaire in the Municipality's posts. The sample can be considered representative based on the gender distribution of the primary food purchaser. During the analysis of the data, in addition to descriptive statistics, we utilized factor analysis to describe the mindset of the customers, and created segments based on the factors influencing the choice of store using cluster analysis. For the vast majority of consumers, the primary determinant in selecting a store is the affordable price level, regardless of how often they make purchases. When shopping on a daily basis, customers prioritize the store's proximity to their residence, promotional discounts, and variety of products available. Men tend to value a relaxed ambiance and convenient parking, while women prioritize special deals and competitive prices when choosing their regular shopping location. We have identified price sensitivity, accessibility, location, and atmosphere as key factors. Throughout our research, we have categorized customers into four distinct clusters: Action-oriented family members (36.1%), Conscious shopping family members (29.9%), Price-conscious seniors (20.6%), and Curious beginners (13.4%). A significant hurdle for Hungarian retail companies is to enhance the quantity of their loyal customers, which they can solely achieve by taking market share from their rivals (primarily other retail companies). Initially, they must determine whether their customer base favours their kind of store for everyday or bulk shopping. They must cater to the demands of their target customer base (potentially the clusters established by our research) in relation to the key factors influencing store selection and purchase frequency, in order to attain success in their business. We suggest utilizing the factors that influence store selection as segmentation criteria.*

Keywords: *food store choice, convenience of access, gender, clusters, daily and bulk shopping*
(JEL code: M31)

INTRODUCTION

Understanding customer behaviour has been a concern of researchers for a long time. With its help, customers can be reached in a more targeted manner and their buying responses will be more predictable. Customers evolve as society changes, and so do their habits and expectations.

Customer preferences have changed during the pandemic (CSISZÁRIK-KOCSIR et al, 2022). The authors discuss the factors driving store choice, then present trends based on findings of the primary customer customer survey, and highlight associated opportunities and threats.

MATERIALS AND METHODS

In order to define the research methods, the objectives were to choose and utilize them in a purpose-driven manner, diversify and implement them in a practical and outcome-oriented approach. After conducting a literature review and secondary research both domestically and internationally, primary research was carried out, which included quantitative research (online questionnaire survey) and qualitative research (customer interviews and expert interview). The qualitative research results have already been published by the authors (FÖLDI and LÁSZLÓ, 2020), therefore the subsequent sec-

tion will focus on discussing the circumstances and methodology of the quantitative research.

The research was specifically focused on the city of Nagykőrös, based on MASSEY's (1991) observation that local findings have global validity, meaning that the changes in the food retail structure in Nagykőrös and the impact of the Covid pandemic on consumer behaviour and store selection can be interpreted as representative of Hungary as a whole. According to MASSEY (1991), the worldwide occurrence can be encountered on a regional level, meaning that the reorganization of business spaces and the impact of the pandemic on consumer habits can be comprehended by examining solely the town of Nagykőrös. Conversely, the ultimate consumer who purchases products or services is, as stated by SIMAI (2009), fundamentally 'domestic', in other words, linked to a specific nation and within that, to a more restricted locality.

The objectives of the study are:

O1 To comprehend travel tendencies that impact preferences for grocery store choices

O2 To comprehend the significance of convenience of access in impacting the selection of grocery stores as a place of residence or employment, and for families with children, proximity to the child's educational instituition

O3 To understand gender disparities and resemblances in the selection of daily and bulk food shopping.

Among the quantitative research methods, we opted for online surveys (CAWI, Computer-assisted web interviewing). This decision was driven by the need to facilitate the broadest possible response and to minimize expenses. We utilized a standardized questionnaire. This approach enabled us to conduct statistical and mathematical analysis of the research findings. The online questionnaire was made available on the Nagykőrös public life community portal and through the Municipality's posts. A total of 220 questionnaires were eligible for evaluation. The survey was carried out from 7th September 2020 to 13th September 2020. The table below presents the thematic distribution and structure of the questions in the standardized questionnaire (Table 1).

Table 1. Structure of the questionnaire on the food purchasing habits of the population of Nagykőrös

Topic	Number of questions
Filter question (Nagykőrös residence)	1
Preference examination of food purchasing habits	6
Food store choice	8
Distance to shop, place of residence and workplace - convenience of access	3
Sociodemographic questions	13

Source: edited by the authors

The makeup of the sample accurately reflects the population in regards to the gender distribution of the primary food shoppers (KSH, 2012) and can thus be deemed representative. The factors contributing to the disproportionate representation of females in the sample composition consist of their greater likelihood to participate (85%) and the subject matter of the survey.

According to the Central Statistical Office (CSO), among the Hungarian population aged 10-84, 42.9% of females and only 28.7% of males report shopping as a daily activity, which indicates that females dedicate more time to this task (KSH, 2012). This implies that since females spend more time shopping, they possess greater expertise than males in this domain. If shopping is considered to be a responsibility carried out by females in each household, it is also important to examine marital status, and the percentage of unmarried males in the population is depicted in alignment with the survey sample. According to Eurostat data, 19% of males aged 65 and above in the European Union live alone (HVG, 2020), whereas the CSO (KSH, 2020) discovered 568,744 (13.79%) individuals of the same household type nationally. The count of single-person households in Nagykőrös was obtainable from the 2011 census data, with a figure of 3,141 individuals, a rise of 27.8% compared to the 2001 census data. When examining their gender distribution, two thirds of them were females in 2001, which shifted by 4.4 percentage points towards males in 2011 (KSH, 2001, 2011). The composition of the sample by gender and age group is depicted in Table 2.

Table 2. Distribution of respondents by gender and age group (N=220)

Distribution of respondents by gender	Capita	%
Female	1	1
Male	6	6
Distribution of respondents by age group	**Capita**	**%**
between 18-24 years old	26	11.8
between 25-34 years old	55	25.0
between 35-44 years old	49	22.3
between 55-4 years old	46	20.9
over 55 years old	44	20.0

Source: edited by the authors

The data gathered were analyzed using SPSS 22 statistical software. Fundamental metrics (average, deviation, mode, median, frequency, cross-tabulation, Kendall's rank correlation coefficient) were computed, and multivariate techniques (factor, cluster, difference analysis) were employed to investigate more complex correlations.

RESUTLTS AND DISCUSSION

Literature review

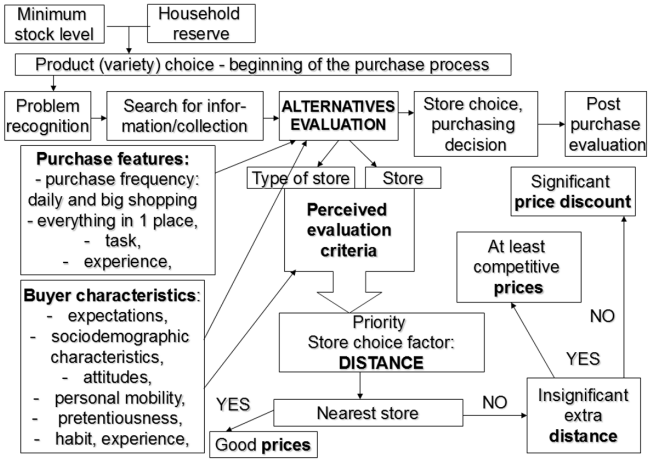
In terms of the number of stages in the purchase decision process, two directions can be distinguished. They primarily refer to the 4th or 5th phase - often called as the decision or buying stage - due to the significance of selecting a

store (HAWKINS et al. 1986; HOFMEISTER-TÓTH, 2003, 2008, 2014; VERES and SZILÁGYI, 2006; LANTOS, 2010; BAUER and BERÁCS 2016). Authors SZÁNTÓ (2007) and HOFMEISTER-TÓTH (2014, 2018) emphasized the significance of the fourth section in its name, the choice of the store. Until then, those belonging to the second direction divide the purchase decision process into 3 stages (pre-purchase, purchase and post-purchase), which was quoted in the Hungarian literature by TÖRŐCSIK (2011) from authors FOSCHT and SWOBODA (2005). This is the direction represented by NÉMETH (2018), although the content of each phase differs from the above authors. Each phase is listed separately, based on its events. This method gives a sense of the interdependence of the phases and assigns to them the identification of further events (NÉMETH, 2018). KOTLER and KELLER (2012) classifies the store selection as a straightforward sub-decision.

Store choice is described by many researchers as preceding brand and product choice (MONROE and GULILTINAN, 1975; HOFMEISTER-TÓTH and TÖRŐCSIK, 1996; TÖRŐCSIK, 1998; BAUER and BERÁCS, 2002; JÓZSA et al 2005; VERES and SZILÁGYI, 2006; BLACKWELl et al, 2006, BAUER et al 2007; LANTOS, 2010). In certain instances, the selection of the store comes before the selection of the brand, although this is contingent upon the product category, brand, situation, and customer behaviour (FÖLDI, 2012). With the advent of new research outlook, the sequence of consumers' purchasing decisions also alters, as the preference for store becomes prominent, gains independency, and takes precedence, may take precedence over the selection of product and brand (PÉNZES – PÓLYA, 2018).

The initiation of FÖLDI's (2012) store choice model begins with the household's minimum stock level and backup (material and product). The absence of these is seen as the beginning of the buying process. This five-phase procedure of problem identification and information search is identical to the overall understanding of the customer decision process. It demonstrates its distinctive approach by illustrating the decision system for evaluation of alternatives. The choice options are influenced by the characteristics of the purchase

Figure 1. Földi's food store choice model



Source: Földi (2012) p. 173.

and the habits of the buyer (similar to the ASSAEL (1984) and BLACKWELl et al. (2006) models), but also take into account additional constraining evaluative perspectives. These cover, for example, the perceived evaluation criteria - for ASSAEL (1984), the importance of perceived characteristics -, including the location of the shops to be selected, i.e. the distance to be travelled. The need for 'convenience', which is also reflected in the factors determining the choice of store, is also important in terms of distance, i.e. when the shopper considers the range and price level of the nearest shop and then compares it with a shop further away on the basis of these criteria. If the buyer experiences a significant discount, he or she may travel greater distances, however, for shorter distances, more competitive prices are sufficient to choose the more distant store (Figure 1).

Authors GOODMAN and REMAUD (2015) conclude that store selection factors are more effective for segmenting consumers than traditional demographic factors, according to their research findings. We have identified two factors influencing food store choice, based on the findings of FÖLDI's (2012) doctoral thesis. One factor is proximity, which can be understood as the ease of access, while the other is gender, based on the findings of NÉMETH's (2018) doctoral thesis.

(1) Ease of access

According to most studies on store choice, the most important influencing factor is the location of the store (ARNOLD et al, 1983; FREYMANN, 2002). This was mentioned in different ways by different authors, but all authors, included in the literature review, mentioned it (FÖLDI, 2012; NÉMETH, 2018). The location and size of the store were mentioned most often (TÖRŐCSIK, 1995, 1998; HOFMEISTER-TÓTH and TÖRŐCSIK 1996; DANKÓ 2000, TÖRŐCSIK 2006, 2011). The authors VERES and SZILÁGYI (2006) added convenience of access to the location, while HOFMEISTER-TÓTH (2003, 2008) called it location and size of the store. The location of the store (LANTOS, 2010) was also interpreted as distance by BLACKWELL et al. (2006). The factor was also mentioned as place of the store (GYENGE, 2008; PÉNZES-GYENGE 2010), although LEHOTA et al. (2005) interpreted it as accessibility, location and approachability of the store. According to OLACH's (1997) research, distance can be interpreted in several ways: distance from home, distance from work, distance from the place of vehicle drop-off.

For consumers, convenience, efficiency, and experience are the main factors they expect from a store and which determine their decisions (TÖRŐCSIK, 2017).

Daily shopping and bulk shopping appear to be different shopping types (TÖRŐCSIK, 2011; HOFMEISTER-TÓTH, 2014). According to FÖLDI (2012), the store choice criteria for daily and bulk shopping can be distinguished, because the most important criteria for daily shopping are the proximity of the store to the place of residence and the freshness of the goods.

Contrary to the findings of WIIG and SMITH (2009), KRUKOWKSI et al (2012) also found that proximity to home is playing an increasingly important role in food store choices. According to SZŰCS - VILLÁNYI (2017), maximum convenience has become a priority for shoppers. Nowadays, con-

venience, efficiency and price are the motivational driving forces that determine the choice of where to purchase (KURUCZ, 2018). Based on the results of a nationally representative research by SZAKÁLY et al (2020), proximity to the store ranked in the bottom third of factors influencing food store choice with a mean of 4.26 (on a pentavalent Likert-scale), a standard deviation of 0.988 and a relative standard deviation of 23.19%. Based on their factor analysis, three factors were identified, one of which was convenience. Out of their four clusters, the 'Fast and convenient shoppers' group in the second cluster scored 4.55 for the proximity of the store, while the 'Demanding and motivated shoppers' group in the fourth cluster scored an average of 4.52 for the same variable. The researchers' results showed that the factors influencing store choice were grouped into three factors in order of importance: price and speed, good image and convenience. These are consistent with the motivational drivers of store choice identified in Nielsen research (KURUCZ, 2018).

The role of location has become an increasingly important factor in the choice of store. Shoppers prefer to choose retail shops closer to their homes and ease of access has become an important factor (TRADEMAGAZIN, 2020).

According to GfK, 16% of domestic shoppers have switched stores due to the crisis (Tisza, 2020), and there are indications of a change in competition based on store size, with proximity also gaining more significance in store selection (TRADEMAGAZIN, 2020). In terms of store dimensions, stores with a floor space of 400-1,000 m2 have experienced the greatest growth, while those between 1,000 and 2,500 m2 have experienced less growth. It is also noteworthy that the average amount spent on purchases has increased in the 400-1,000 m2 category, and although certain products were pricier compared to the largest stores, overall shoppers spent more (HUF 3,266 vs. HUF 3,204). In stores with a floor area of 400-1,000 m2, high-value shopping baskets (over 10,000 HUF) made up 30% of the total, while in stores between 1,000 and 2500 m2, the percentage was slightly lower at 26.7% (TÖRŐCSIK et al., 2020).

The primary determinant of grocery store choice and satisfaction is whether the store is easily accessible from home or on the way to work (TISZA, 2023).

(2) Gender

The relationship between gender roles and shopping is associated with the female role as the mother of a family (NAGY, 2001). A gender analysis of shopping duration shows that 90.32% of men and 71.04% of women shop for less than 30 minutes, signifying that females spend a longer time in stores (NAGY, 2001; KSH, 2012). The participants of the research spent an average of 15 and 16 minutes on food, consumer or consumer durables respectively in the two study periods, resulting in an average of 11 and 9 minutes per day. For males, individuals who are single and aged 60 or above spend the most time shopping for daily groceries. The majority of this demographic is retired, affording them more time for shopping. Both males and females dedicate the most time to shopping on Saturdays and the least on Sundays for daily consumer goods (SEBŐK, 2017).

Researches have indicated, not solely based on empirical evidence that women typically serve as the main drivers of consumption within a family, women possess a more positive attitude on shopping compared to men. In numerous instances, the contrasting conceptualization and engagement of both genders in consumption and shopping can also be observed as an outcome in primary investigations. There are distinctly divergent perspectives towards specific forms of shopping, as well as the emotions associated with them (TÖRŐCSIK and SZŰCS, 2021). A study conducted on a representative sample of 50-70-year-olds in Hungary further demonstrates the contrasting attitudes of the genders towards shopping, even within this specific age demographic (EFOP 3.6.2., HEGEDŰS and TÖRŐCSIK, 2020).

The food purchasing behaviour of women has been examined from various perspectives by multiple researchers (RAMPRABHA, 2017; WAHYUDDIN et al, 2017; SHIER et al, 2022) both in Hungary (FÖLDI, 2011; DOGI et al, 2014; BALOGH, 2016, DÖRNYEI et al, 2019) and internationally (RAMPRABHA, 2017; WAHYUDDIN et al, 2017; SHIER et al, 2022). While ANGGRAINI et al (2016) explored the choices of food stores among women (188 individuals, aged 19-50) residing in an impoverished neighborhood in Jakarta, Indonesia, NÉMETH (2018) examined the decisions regarding the location of grocery stores among Hungarian males.

Secondary research

The town has a unique variety of food shopping. Five multimantional and two Hungarian food retail corporations, along with independent retailers and specialty stores, are found within the municipality, in addition to the daily market. The appearance of global chains in the FMCG market and the resulting market transformation in Nagykőrös has mirrored the nationwide trend, with a decrease in the number of independent retail establishments. Local specialized fruit and vegetable shops and small food vendors have been compelled to form partnership agreements in order to stay competitive. This is exemplified by the establishment of local stores of domestic chains as franchisees.

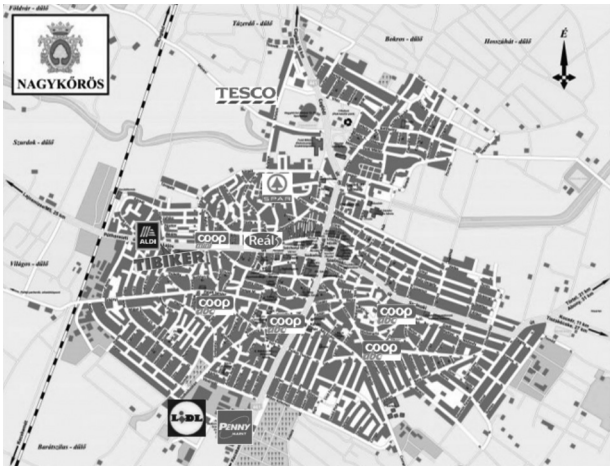
Since the 2000s, Nagykőrös has also garnered growing interest as a possible retail destination for multinational retail chains operating in the FMCG market in Hungary. The factors contributing to this are (1) convenient access, including various expressway connections (M5 and M44), efficient main road links (441) and close proximity to the county seats (Kecskemét 25 km and Szolnok 50 km), (2) the population size (almost 24,000 KSH 2023) and the relatively steady population.

In the first three quarters of 2020, the retail store network in Pest County generated a revenue of HUF 1,272 billion at current prices, accounting for 15% of the nationwide total. On an unadjusted basis, sales rose 1.4 percent year-over-year, while sales fell nationwide. Changing shopping habits due to the coronavirus outbreak and restrictions on store hours have disrupted a multi-year retail sales boom. Following a decline in April, sales at retail stores in the county surpassed the previous year's level from May to July, but then fell again (KSH, 2020).

The "quasi-monopoly" of the first Penny-Market Kft. (1998) in the store chain market was abolished by the opening of Tesco-Global Zrt. in 2007. The commencement of the two multinational chains was followed by the opening of LIDL Hungary Bt. (2009), then SPAR Hungary Kft. (2015) and finally ALDI Hungary Food Bt. (2017). These have gradually reduced the market share of the largest domestic chains operating in Nagykőrös, such as CO-OP Star Zrt., Szilvási és Társa Bt. (Szil-Coop) and REÁL Hungária Élelmiszer Kft. During this period, seven multinational chains were engaged in food retailing. Tesco-Global Zrt. as hypermarket, Spar Magyarország Kft. as supermarket, CO-OP Star Zrt. as three supermarket stores, Szil-Coop Kft. and Reál Hungária Élelmiszer Kft. as supermarket, and Lidl Magyarország Ltd., Aldi Magyarország Élélmiszer Ltd. and Penny-Market Ltd. as discount store. By June 2020, the number of food and grocery stores (82 stores) in Nagykőrös had decreased by 27.4% (31 stores) compared to December 2010 (KSH, 2020).

In the neighboring county seat, Kecskemét, there is also an Auchan food hypermarket, Tesco superstores with a broader selection of products, and Metro Cash & Carry limited-service wholesaler. These stores have been a significant draw for the community when deciding where to purchase groceries prior to the chains that have appeared in Nagykőrös. The geographical arrangement of the stores is depicted in Figure 2.

Figure 2. Location of grocery stores in Nagykőrös



Source: edited by the authors

There are many overlapping characteristics in the selection of location for multinational food stores. They were interested in convenient accessibility, so they established themselves near a primary thoroughfare, and they transformed extensive regions to align with their own brand identity in order to accommodate the appropriate range of retail space. The expansive floor area and parking capacity meant that they could only operate on the outskirts of the city, due to the densely developed nature of the city center. On multiple occasions they had to inaugurate a store adjacent to a competitor's store, Spar adjacent to Tesco, Lidl next to Penny Market, and, most recently, Aldi opened a discounted store next to Tibiker (a food supermarket, an independent small business).

Primary research

The favoured sizes of grocery stores showed a downward trend. 72.8% of the survey participants expressed their preference for medium-sized stores (ranging from 200-400m2). Only 22.3% ranked the size category above 400 m^2 as their top choice, leaving only 4.9% of respondents who favoured smaller shops (under 200 m^2).

A significant majority (60.5%) of the participants stated that promotional leaflets were a primary source of information. However, for the younger age group (18-24 years), brochures no longer hold the same importance. On the other hand, the surveyed individuals above 55 years old do pay attention to and actively seek out bargain shopping opportunities. Nevertheless, when examining the relationship between the variables, it was determined that there was no significant correlation between the two factors, namely age group and sources of information.

There is a moderate (Cramer's V: 0.230) statistically significant (0.002) correlation between respondents who endorse Hungarian enterprises and age groups. Age group has an impact on the inclination to support domestic businesses, due to the significant correlation. Nevertheless, for three-fourths of participants aged 18-24, backing for Hungarian domestically owned enterprises holds no importance. The same criterion holds significance for 62% of respondents aged 25-34, 81.8% of respondents aged 35-44, 85.7% of respondents aged 55+ and 90.6% of respondents aged 45-51. Simultaneously, 60.2% were unaware or declined to specify Hungarian, domestically-owned stores and chains operating in Nagykőrös.

On average, respondents are more willing to go further away for an offer (3.80 on a pentavalent Likert scale). Half of the participants rated their inclination as a 4 (more willing).

The most commonly selected type of store was discount, where half of the participants visit once a week. This was followed by specialty stores with an average of 4.25 and hypermarkets with an average of 3.75. The least frequently visited source of supply was identified by participants as the daily market (3.21 on average), yet once a week was the most commonly chosen frequency. There is a significant (0.008) but weak (0.240) correlation between daily market and age group criteria in the cross-tabulation analysis. 44% of individuals aged 45 and above visit the daily market at least once a week.

Table 3. The most important store choice factors

Daily shopping	• Fast service (4.709) • Kindness of sellers and cashiers (4.525) • Proximity of the shop to the place of residence (4.0)
Bulk shopping	• Shops' special offers (4.451) • Brand range of stores (4.185)
Daily and bulk shopping	• Lower price level (4.082 – 4.043) • Calm atmosphere (4.052 – 4.005)

Note: measured on a pentavalent Likert scale, where 1 is not important at all and 5 is very important

Source: edited by the authors

Table 4. The importance of store choice factors for daily and bulk shopping (N = 220)

Factors of daily shopping				Factors of bulk shopping			
Female		Male		Female		Male	
4.676	Fast service	4.965	Fast service	4.535	Shops' special offers	4.692	Fast service
4.503	Kindness of sellers and cashiers	4.793	Kindness of sellers and cashiers	4.513	Fast service	4.692	Kindness of sellers and cashiers
4.166	Shops' special offers	4.357	Calm atmosphere	4.303	Brand range of stores	4.533	Shops' special offers
4.067	Lower price level	4.259	Easy parking	4.131	Kindness of sellers and cashiers	4.518	Brand range of stores
4.060	Proximity of the shop to the place of residence	4.142	Proximity of the shop to the place of residence	4.0	Lower price level	4.423	Calm atmosphere
4.052	Brand range of stores	4.0	Brand range of stores	3.997	Calm atmosphere	4.115	Lower price level
3.993	Easy parking	3.9	Shops' special offers	3.927	Easy parking	4.115	Easy parking
2.810	Proximity to workplace	3.821	Lower price level	3.554	Proximity of the shop to the place of residence	2.960	Proximity of the shop to the place of residence
2.353	Close to the child's educational inst.	3.103	Proximity to workplace	2.577	Proximity to workplace	2.115	Proximity to workplace
2.042	Close to place of the children's private lessons	2.379	Close to the child's educational inst.	2.236	Close to the child's educational inst.	2.0	Close to the child's educational inst.
1.08	Calm atmosphere	2.103	Close to place of the children's private lessons	2.1	Close to place of the children's private lessons	1.884	Close to place of the children's private lessons

Note: measured on a pentavalent Likert scale, where 1 is not important at all and 5 is very important
bold font = same range of important by gender

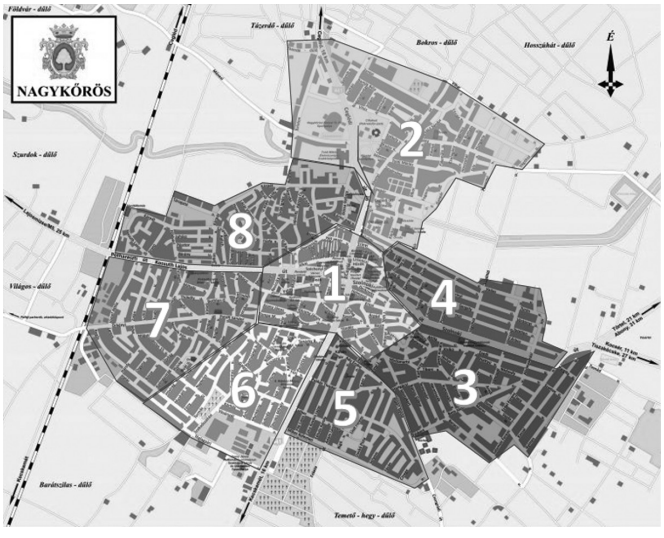
Source: edited by the authors

To comprehend the criteria for selecting a store, attitude statements were employed to investigate everyday and bulk shoppings. The factors that were determined from the examination of existing literature have distinct impacts on everyday shopping, which entails a smaller number of items, and bulk shopping, which entails a lengthier duration (Table 3). There was no significant correlation found in the cross-tabulation analysis of either everyday shopping and place of residence, bulk shopping and place of residence, or age group.

Many of the store selection factors are identical for both genders when deciding where to shop for everyday and bulk purchases. For instance, two of the utmost important factors in everyday shopping are fast service and the kindness of sellers and cashiers. Men give priority to a calm atmosphere and convenient parking, while women give priority to promotional deals and affordable prices when selecting their everyday shopping destination. These findings are summarised in Table 4.

There exist disparities in the aspects deemed crucial in impacting the decision to make a bulk shopping based on gender. Men prioritize factors akin to those considered in daily shopping, while women seek out special offers, fast service, and their preferred brands. When it comes to daily and bulk shopping, proximity to one's residence holds more importance than proximity to one's workplace. The educational institution attended by a child and the location of their extracurricular activities do not influence parents' grocery shopping habits. This can be attributed to the mode of transportation used for shopping (65% of shopping is done by car) and the size of the municipality (measuring 228 km^2). One of the objectives was to investigate the reasons behind the selection of location for purchases. As a result, store preferences were analyzed in relation to the

Figure 3. Designation of the disctricts of the city of Nagykőrös



Source: Own edition

residential area (Figure 3) using cross tabulation analysis. Participants from all districts of the city showed equal willingness to travel (rated on a hexavalent Likert scale) in search of a good offer. This phenomenon can be explained by the proportion of car ownership (65%). It can also be stated that residents of all districts equally chose Lidl's store in Nagykőrös as their preferred option. Additionally, it can be observed that Aldi was the second most popular store in 5 districts, while Tesco or Spar were favoured in 2 or 2 other districts. These two stores are in a similar competition for the third place.

Differencies were observed by individuals residing near the hospital. According to them, the third preferred store was the Coop, which can be attributed to the close proximity of more stores near their residence (the survey results of 21 participants residing in the hospital vicinity indicated that the store played a significant role in their everyday (3.4091) and bulk shopping (3.0455)). Conversely, for those residing in suburban areas, Tibiker's shop ranked third. The rationale behind this choice, as indicated by their answers to the attitude statements, encompasses the store's atmosphere (daily: 4.25; bulk: 4.27), the kindness of the sales personnel (daily: 5.25; bulk: 4.90), the fast service (daily: 5.33; bulk: 5.18), and the pricing (daily: 4.00; bulk: 3.72). The respondents are open to selecting a store farther away, as the nearest ones are not the most popular options.

We analyzed the associations between the preference for each store and location of residence. Consequently, we discovered that there is a significant (0.024), week (0.246) relationship between the inclination for Spar store and the respondents' residential area. The convenience, as a primary determinant of store selection, is also manifested in the participants' preferences. A comparable correlation was observed in the cross-tabulation examination of Tibiker store and residential district, with a weak (0.249), significant (0.017) correlation between the criteria. Factor analysis was employed to uncover hidden explanatory factors that were not directly observable. The analysis was conducted using principal axis factoring. Factors with an eigenvalue exceeding one were deemed acceptable, indicating that they retain more information than average. The analysis did not include any missing values. The weights are considered meaningful if they exceed 0.35. The model's validity was confirmed based on the results of the Kaiser-Meyer-Olkin (KMO) test (0.691) and Bartlett test (0.000 level of significance). Collectively, the factors account for 54.77% of the total variance of the variables.

The resulting four factors are displayed as four sets of variables (Table 6). The initial factor is related to location, the second to the atmosphere of the store, the third to the external factor of accessibility, and the fourth to sensitivity towards prices. The factors individually account for 25.57% (location), 37.50% (atmosphere), 44.66% (accessibility), and 50.61% (price sensitivity) of the variables.

The analysis was also carried out based on the responses received in terms of bulk shopping. The KMO (0.743) and Bartlett's test (0.000 level of significance) remain applicable in the model. The factors in this case explain a total of 79.72% of the total variance of the variables.

For bulk shopping, only three main distinct categories of variables have emerged. These are connected to the location of the store, the atmosphere of the store, and the level of sensitivity to price. The factors explain 31.44%, 44.82%, and 52.19% of the overall variables, respectively. Contrasts in comparison to the factor groups associated with daily shopping can be observed in the rise in the significant role of parking and the emergence of price as an explanatory marketing tool factor.

Table 5. Correlations between store preferences and place of residence

Residential district		capita	Travel willingness	Average ranking of stores (1 = most popular)							Top 3
				Aldi	Coop	Lidl	Reál	Spar	Tesco	Tibi-ker	
Centre	1	40	3.70	**3.75**	4.63	**2.33**	4.13	**3.15**	4.15	5.88	Lidl, Spar, Aldi
Gáti area	2	29	3.86	3.72	5.21	**1.83**	5.41	**3.38**	**2.97**	5.48	Lidl, Tesco, Spar
Hospital neighborhood	3	21	3.87	**3.48**	3.62	**1.48**	5.10	4.14	3.86	6.33	Lidl, Aldi, Coop
Market Square	4	10	3.80	**3.70**	4.20	**1.90**	5.00	4.50	**2.70**	6.00	Lidl, Tesco, Aldi
Market neighborhood	5	12	3.85	**3.25**	5.25	**1.17**	5.08	4.67	**4.17**	4.42	Lidl, Aldi, Tesco
Catholic cemetery	6	15	3.60	**2.93**	4.93	**1.33**	4.53	4.93	**4.53**	4.80	Lidl, Aldi, Tesco/ Reál
Tormás and its surroundings	7	22	3.95	**2.77**	5.45	**1.36**	5.36	**4.14**	**4.14**	4.77	Lidl, Aldi, Spar/ Tesco
Railway station and its surroundings	8	30	3.94	**2.47**	5.50	**2.43**	5.33	**4.27**	3.67	433	Lidl, Spar, Aldi
Suburban areas	9	12	3.42	**3.17**	4.83	**2.17**	4.75	4.67	**4.42**	4.00	Lidl, Aldi, Tibiker

Note: travel willingness is measured on a hexavalent Likert scale, where 1 is 'I am not willing to travel at all' and 6 is 'I will definitely travel' bold font = 3 most prefered grocery store

Source: edited by the authors

Table 6. Factors of daily and bulk shopping

Attitude statements	Daily shopping				Bulk shopping		
Factors	Location	Atmos-phere	Accessi-bility	Price sensitivity	Location	Atmosphere	Price sensitivity
I shop at a store that is close to my child's private and extracurricular activities (e.g., music or sport school, gym).	0.862				0.920		
I shop in the store that is near my child's educational institution (nursery, kindergarten, school).	0.813				0.914		
I shop at whichever store is near my workplace.	.614				0.771		
I shop at the store closest to where I live.	0.371				0.461		
I shop in the store where I feel in a calm, familiar atmosphere.		0.829				0.849	
I shop in stores where the employees are kind to me.		0.781				0.813	
I buy in the store where the service is fast, I do not wait.		0.467				0.636	
I shop at the store where I can easily find parking.			0.357			0.381	
I monitor the current offers and promotions of each store.			0.911				0.722
I am looking for shops with lower prices.				0.767			0.560

Source: edited by the authors

The K-means method (Sajtos - Mitev, 2007) was chosen for the further procedure of cluster determination, delegating the determination of cluster means to the algorithm. We employed a K-means clustering procedure with a predefined number of clusters. The specified number of clusters defined was four. The analysis was performed by comparing demographic and key issues related to the topic. The findings of the examination are presented in the analysis of variance (ANOVA) table (Table 7).

The members of the groups share similarities, yet possess distinct attributes from those in the other clusters. The entres of the group were considered during the recording of each object. The resultant cluster groups explain the results of a total of 194 respondents (88.2%) (26 omitted entries). Each cluster is comprised of 26, 70, 58, and 40 participants respectively.

The initial group was named "Curious Young Adults" (13.4%). This cluster consists of individuals between the ages of 25 and 34 who are married and either expecting a child or already have one in the household. Their incomes are on the rise, with net per capita earnings ranging from HUF 150 to 200 thousand. Each household possesses one or two automobiles. Their purchasing patterns are characterized by an interest in non-food items, reliance on discount catalogues for information, and a willingness to travel in pursuit of a good deal. When making their daily shopping decisions, they prioritize current special promotions based on the quality of service and

Table 7. Scatter analysis table for cluster analysis

ANOVA						
	Cluster		Error		F	Sig
	Mean Square	df	Mean Square	df		
Age	34.181	3	1.225	190	27.895	0.000
Residential area	427.038	3	1.407	190	303.445	0.000
Size of household	11.595	3	1.121	190	10.343	0.000
Number of detainees	9.280	3	0.995	190	9.324	0.000
Main source of information	43.018	3	1.798	190	23.932	0.000
Attractiveness of non-food products	52.645	3	1.583	190	33.259	0.000
Travel willingness	35.949	3	1.918	190	18.739	0.000

Source: edited by the authors

the friendliness of the sales and checkout staff. Conversely, when purchasing in bulk, they prioritize the store's selection of brands over the friendliness of the salesperson and cashier.

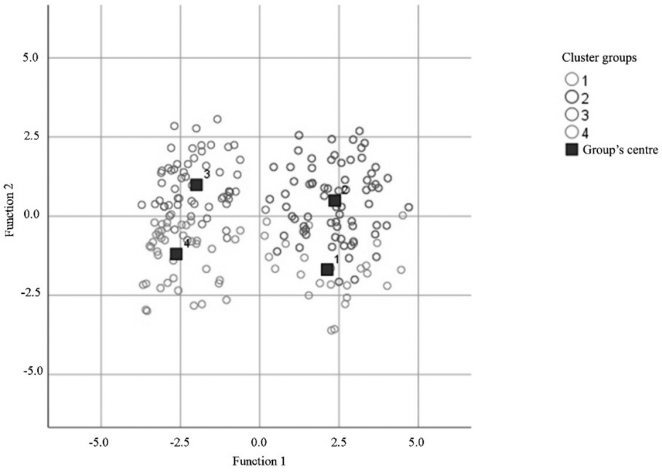
The second cluster consists of "Discount-Oriented Families" (36.1%). The individuals in this category are aged between 45 and 54 and are married with one or two children. They have a comfortable financial situation, with a specific net income of HUF 150-200 thousand. Typically, these households own one to two cars. Their shopping preferences lean towards non-food items, and they are more willing to travel to find these products compared to the members of the first group. Local newspapers and magazines are their primary sources of information for discount offers. When it comes to their daily shopping, the price level of the store plays a role in their decision-making, along with the quality of service and the friendliness of the sales staff and cashiers. For bulk purchases, they prioritize factors such as the store's selection of brands, ongoing promotions, and the quality of service.

The third group consists of "Conscious Family Buyers" (29.9%). They share similarities with "Discount-Oriented Families" in terms of their demographic characteristics. However, they are younger, between the ages of 35 and 44, married, residing in a four-person household, usually with two children. They possess one vehicle. Their net earnings are lower than the preceding two groups. Consequently, they spend less on their average shopping basket. Their working hours are either individual or fixed, which makes them less inclined to shop further away. They do not pay attention to special deals in stores and have no interest in non-food products. They are task-oriented in their daily shopping, preferring a themed, fast-paced shopping experience. The primary factors that influence their choice of stores for daily shopping are proximity to their homes and the availability of parking facilities. They also seek out familiar products when making bulk purchases, so the variety of brands offered by the store, the quality of service, and the friendliness of the sales staff and cashiers are important factors to them.

The fourth cluster consists of "Price-Conscious Seniors" (20.6%). The demographic characteristics of this group include: a higher average age (over 55 years) compared to the other categories, being divorced/widowed in addition to being married, and having smaller household sizes (two people) compared to the previous groups. Only a few of them own a car. Due to their age, they are primarily retired and no longer involved in any form of employment, relying solely on their pension. As a result, their net income is lower, with 20% reporting a net income of less than HUF 150,000. They actively manage their finances and are always on the lookout for discounts and deals in catalogs, even if it means travelling farther distances. They tend to prioritize purchasing non-food items and typically spend less on their shopping compared to other groups. The price level of products is crucial to their daily shopping decisions, along with the friendliness of the sales staff and cashiers, as well as the quality of service provided. When deciding where to buy in bulk, they take into consideration the store's brand selection and the level of service offered, in addition to any ongoing promotions.

The cluster groups identified and the elements within the categories were analyzed using discriminant analysis, with specific focus on their distinctiveness. Categories were assigned based on the clustering factor. The central points of the clusters and the representation of the cluster elements are depicted in Figure 4. The clustering of the majority of the elements is easily recognizable. However, there are variations between the primary clusters based on the placement of the cluster centers.

Figure 4. Scatterplot of the cluster analysis groups (N=194 persons)



Source: edited by the authors

Discussion

Quantitative research indicates that Lidl is the most favoured store. The same store preference factors were discovered to have an impact on both everyday and bulk shopping. The primary factor of importance was the efficient service, followed by the kindness of the sales personnel and cashiers, as well as the ongoing promotions. However, when it comes to bulk shopping, these aspects were ranked in the opposite order.

In the survey, proximity to home was ranked 7th-8th for both daily and bulk shopping, while proximity to work was ranked 9th. These factors do not seem to be particularly influential.

Both the secondary and primary research affirm that shopping is still perceived as a task associated with women's roles.

Based on consumer segmentation, four clusters have been identified, listed in descending order of size: Action-oriented Family (36.1%), Conscious Family (29.9%), Price-conscious Seniors (20.6%), and "Curious Young Adults" (13.4%). In the upcoming period, it may be beneficial to examine each group individually, as this could contribute to the existing knowledge in the field from both a market and scientific standpoint.

The article partly contains the results of the research work of László (2020), which was prepared and successfully presented at the 2020 Institutional Student Research Conference and then successfully presented at the 2021 National Student Research Conference (winning a podium place in the Consumer Behaviour Section), updated and supplemented with relevant parts.

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Applied Studies in Agribusiness and Commerce – APSTRACT
University of Debrecen, Faculty of Economics and Business, Debrecen
SCIENTIFIC PAPERS
DOI: 10.19041/APSTRACT/2024/1/8

PHARMA SUPPLY CHAIN RESILIENCE. A SYSTEMATIC REVIEW

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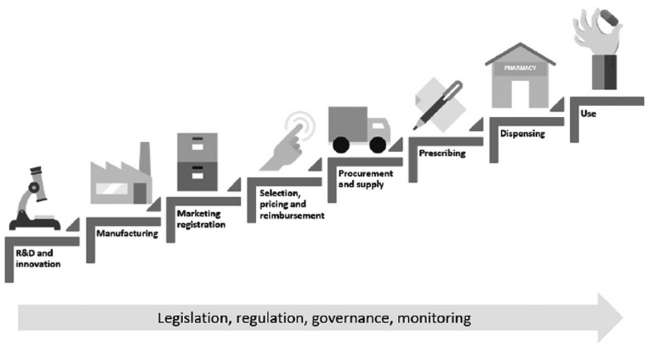
Abstract: *This study offers a thorough exploration of critical consideration of resilience in pharmaceutical supply chains, aiming to provide a comprehensive overview of the existing literature on this subject. Given the increasing globalization, regulatory complexities, and disruptions, the pharmaceutical industry encounters unique challenges in maintaining the business continuity of supply chains. Design/Methodology/Approach: We conducted a systematic analysis of 41 documents, including articles, reviews, and conference papers, employing bibliometric methods to visualize the dataset. Findings: Our findings indicate a notable increase in literature in recent years, particularly concerning risk mitigation strategies, collaboration among supply chain stakeholders, and investments in technology-driven solutions for resilience in pharmaceutical supply chains. Furthermore, we have identified several research directions. This review emphasizes the necessity for ongoing scholarly efforts aimed at fostering pharmaceutical supply chains resilience given the post-COVID-19 situation with goal of ensuring the uninterrupted availability of essential medications to patients worldwide.*

Keywords: *pharma, resilience, supply chanis, bibliometrics, review*
(JEL code: R4)

INTRODUCTION

In the pharmaceutical business, where a continuous and dependable supply of drugs is important to public health, the notion of supply chain resilience is critical. The ongoing distribution of essential medications is dependent on pharmaceutical firms' capacity to properly negotiate numerous interruptions, such as natural catastrophes, alterations to legislation, and worldwide medical emergencies (NIAZ and NWAGWU, 2023). As presented in Figure 1, the phases of a pharmaceutical value chain are R&D and innovation, manufacturing, marketing, registration, procurement and supply, prescription, dispensing and use. Meanwhile, the entire value chain is regulated, monitored, governed and legislated (United Nations Office of Drugs and Crimes).

Figure 1. The Pharmaceutical Value Chain



Source: United Nations (UN)

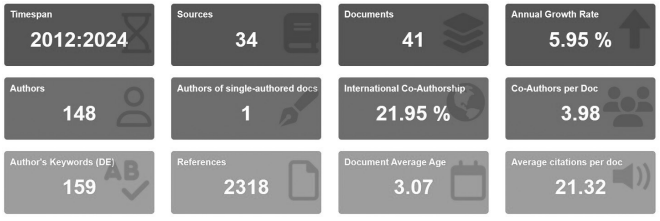
Supply chain resilience is critical to reducing the effect of these issues, ensuring that patients continue to have access to life-saving medicaments when they are most needed (ALKHOURI, 2024). Furthermore, recognizing the importance of resilience in pharmaceutical supply chains, researchers, governments, and industry stakeholders have increased their focus on understanding and improving this component of supply chain management (PATEL, 2023). This study will look into the relevance of doing a bibliometric review to examine existing research on resilience in pharmaceutical supply chains. By summarizing and critically reviewing a wide range of academic publications, we want to provide insights into current research interests, theoretical frameworks, empirical findings and emerging trends in this field. This study also aims to suggest topics for additional exploration and give insights that can help improve pharaceutical industry decision-making and policy-making. Our study describes how we gather materials and use the bibliometric method in Material

and Methods, then followed by providing the results in the Results and Discussion section using a Wordcloud, Keywords of Co-occurrence network, and thematic mapping. Moreover, the findings are then critically evaluated. Finally, conclusions are derived from the analysis

MATERIALS AND METHODS

We performed a thorough bibliometric study utilizing the Scopus database, which contains a wide range of scholarly literature from several domains, including pharmaceutical supply chains. Our search strategy involved identifying relevant scholarly works by employing the keywords: "supply chain resilience" AND "pharmaceutical" OR "pharma". More detailed information is presented in Figure 2. Then by using biblioshiny package (ARIA and CUCCURULLO, 2017), we analyzed the articles. Detailed information regarding the retrieved scholarly publications is presented in Figure 2. We obtained a total of 41 papers from 2012 to 2024. 34 (thirty-four) of these documents were derived from scholarly journals, 3 (three) from book series, 3 (three) from conference proceedings, and 1 (one) from a trade journal. The overall annual growth rate amounts to 5.95%. Method used to analyze the dataset is bibliometric analysis, which visualizes the current research environment (ARIA and CUCCURULLO, 2017) concerning pharmaceutical supply chain resilience, by assessing and analyzing a large body of scholarly publications. Bibliometric analysis is a powerful tool in identifying trends, patterns, and gaps in the current literature.

Figure 2. Information about dataset



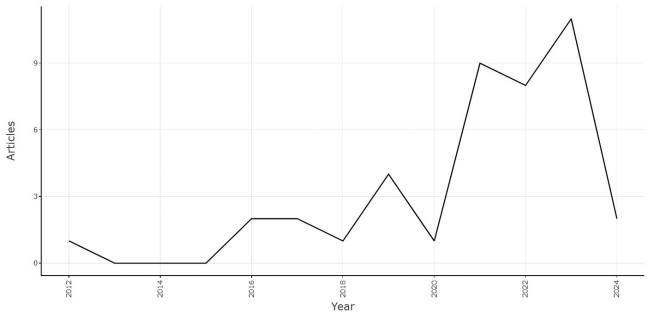
Source: Authors' work

RESULTS AND DISCUSSION

As depicted in Figure 3, there was a decline in research activity on the topic from 2012 to 2013, followed by a period from 2013 to 2015 where no scholarly work was identified. However, research on the topic experienced growth after 2015, with a noticeable increase in scholarly activity. It is evident that the topic gained popularity among scholars particularly after 2020. This was influenced significantly by COVID-19, which is further supported in Figure 4, where authors emphasize the keywords 'COVID-19' and 'pharmaceutical industry'.

As visualized in Figure 4, the COVID-19 pandemic highlighted the "complexity", "capability", and "chain resilience" of companies in pharmaceutical industry. Moreover, disruptions affected a variety of areas, including "inventory management", "advanced event processing", and "demand planning". Keywords such as "big data", "internet of things", "digital supply chains", and "decision support systems" and "augmented and virtual reality", "blockchain technology" were used to demonstrate the critical role of technology breakthroughs in improving supply chain resilience.

Figure 3. Annual Scientific Production



Source: Authors' work

Figure 4. Word Cloud with Authors' Keywords

Source: Authors' work

Furthermore, Figure 5 depicts the authors' keywords network. The image is divided into two categories: the blue network focuses on the operational elements of the drug industry, with an emphasis on humans. Meanwhile, the red network emphasizes the supply resilience.

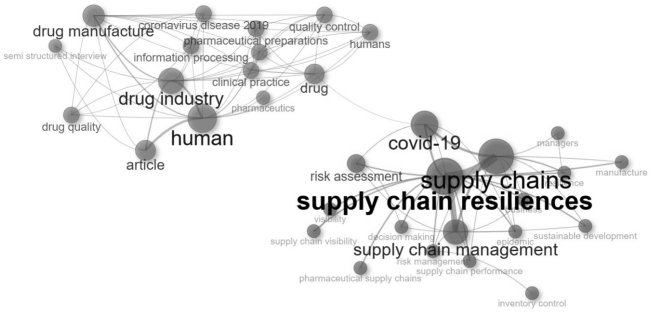
The formulations and compositions of medicinal products developed by pharmaceutical companies for medical use are known as pharmaceutical preparations. (GIBSON, 2001) Quality control is an important part of the manufacturing process because it ensures that pharmaceutical preparations meet strict quality criteria and a thorough testing and analysis of raw materials, intermediates, and finished products to detect and correct (FELLOWS et al., 2022). Moreover, information processing plays a major role in pharmaceutical production and quality control efforts. Advanced technology and data-driven approaches are used to successfully manage and analyze large datasets related to manufacturing processes, quality characteristics, and regulatory obligations. (WEITZEL et al., 2021) This comprises using computerized systems for data

gathering, processing, and reporting, as well as implementing quality management systems. The pharmaceutical industry involves enterprises engaged in the research and development (R&D), manufacturing, and distribution of medications (PAMMOLLI et al., 2011). Within this sector, pharmaceutical preparations undergo manufacturing, subjected to rigorous quality control protocols to ensure product safety and efficiency (GUADIX et al., 2019) Information processing technology is seamlessly integrated into various facets of the pharmaceutical industry, facilitating streamlined manufacturing operations, real-time monitoring of quality metrics (CRAIG et al., 2023), and compliance with regulatory restrictions (SAHA et al., 2023; ALGORRI et al., 2022)

Furthermore, healthcare providers depend on pharmaceutical items to provide effective treatment to patients, whether it's antiviral medications, antibiotics to treat secondary infections, or supportive therapy to control symptoms. Clinical practice itself has an impact on pharmaceutical supply chains by increasing demand for pharmaceuticals used to prevent, diagnose, and treat COVID-19 (ALI et al., 2020). In a pharmaceutical supply chain, humans depending on their role as patient and/or healthcare workers rely on access to medications to manage their symptoms and improve the outcomes and monitoring patient responses. As such, building supply chain resilience by managing supply chains by managers and manufacturers and addressing risk management played a significant role. As a result supply chain managers and manufacturers play an important role in enhancing supply chain resilience by successfully managing supply networks and resolving risk management issues (TAKAWIRA and POOE, 2024). This is due to supply chain managers and manufacturers play critical roles in orchestrating the flow of goods and materials, ensuring the timely production and distribution of pharmaceutical products (SARKIS et al., 2021)

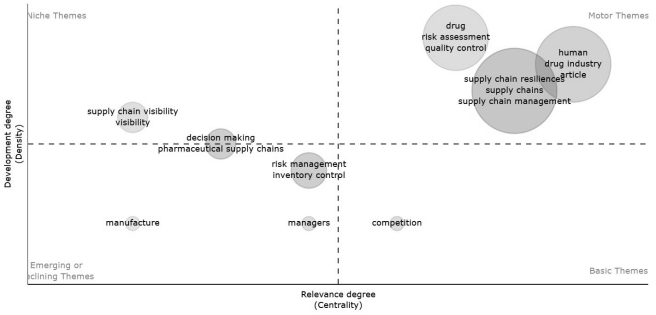
Another dimension of supply chain resilience within pharmaceutical supply chains is supply chain performance, which encompasses collaboration, coordination, and visibility. (BØ et al., 2023; NGUYEN et al., 2021) Additionally, supply chain visibility fosters collaboration and coordination among stakeholders by facilitating transparent real-time information sharing. This results in better decision-making and responsiveness to fluctuations coming from demand and / or supply, enhancing the inventory control (LÜCKER et al., 2019).

Figure 5. The Co-occurrence of Authors' keywords



Source: Authors' work

Figure 6: Thematic mapping



Source: authors' work.

Furthermore, pharmaceutical companies can gain quick visibility into their supply chain operations by using advanced technologies which enables implementation of data-driven solution with the aim of improving of performance and overall sustainable development (DEBNATH et al., 2023).

Figure 6 visualizes thematic mapping that represents the themes of a dataset organized in 4 clusters: motor themes, basic themes, niche themes, and emerging /declining themes.

Motor themes are broad notions or issues that are fundamental to pharmaceutical supply chain resilience with important concerns. They provide a high-level understanding of the major patterns driving the study. These driving areas include 'drug, risk assessment, quality control', 'supply chain resilience, supply chains, supply chain management', and 'human, drug industry, article'.

Basic themes assist researchers in identifying the variety of views leading to a more complete knowledge of the research. In basic themes, the primary focus is on'competition'. While competition can encourage innovation, cooperation, and market responsiveness in pharmaceutical sector (LIN and LEKHAWIPAT, 2023), it also creates obstacles and dangers to supply chain resilience (SHIRMOHAMMADI et al., 2023). Pharmaceutical businesses have to achieve a balance between competitive pressures and resilience demands. This can be done by implementing tactics that encourage innovation, cooperation, and agility while minimizing competition's effects on supply chain dependability (AHMAD et al., 2023). This can be achieved by implementing technology and innovation, developing strategic relationships with mid-term and long-term focus, and managing risks and decision-making (XU et al., 2023)

The Niche themes represent specialized topics not directly connected to supply chain resilience in pharmaceutical industry. The niche themes include 'supply chain visibility, visibility' and 'decision-making, pharmaceutical supply chains'. These topics are more focused on operational effectiveness to ensure chain resilience.

Additionally the declining theme is 'manufacture' this can be due to the researchers shifting their research interests in emerging 'risk management' and 'inventory control' and ' managers' related to logistics, suppliers, and information technology, neglecting the manufacturing-related issues in supply chain resilience research. Furthermore, as presented in the word of cloud, the researchers have emphasized their research in emerg-

ing new technologies and strategies such as additive manufacturing, robotics, and automation (STASEVYCH et al., 2023; JOSHI and PATEL, 2023). And the researchers are focused on digitization and agility, with new resilience strategies in order reshape manufacturing processes (SHETTY et al., 2023).

CONCLUSIONS

In recent years, research in the pharmaceutical supply chain has experienced significant growth, particularly post-COVID-19. This can be due to the COVID-19 revealing the significant gaps in addressing major disruptions and global dependency on pharmaceutical products. Scholars have delved into various dimensions of the pharmaceutical industry, focusing on areas like risk management, COVID-19 response strategies, inventory control, supply chain visibility, and technological advancements. This research trend marks a departure from the traditional emphasis on manufacturing, and now concentrating more on exploring effective ways to manage risks, optimize inventory control, and managerial practices within pharmaceutical supply chains.

Future research direction

1) What collaborative resilience strategies can pharmaceutical companies adopt to strengthen supply chain resilience?
2) What collaborative approaches can competitors in the pharmaceutical industry explore to address common challenges and drive collective innovation?
3) What are the implications of supply chain localization and regionalization for the resilience of pharmaceutical supply chains?
4) How can pharmaceutical supply chains integrate sustainability principles to enhance resilience?
5) How can pharmaceutical companies improve their risk management with the help of risk assessment frameworks, leveraging predictive analytics, modeling techniques, and integrating risk management into strategic decision-making processes?

Limitations:

This study analysis only the scholarly indexed by Scopus database, other databases can bring insights on the pharma supply chain resilience. Also, the time period studied is from 2012 until 2024.

Supplementary Materials:

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Author Contributions:

Methodology, D.Q.; software, D.Q.; validation, J.F., and B.B.D.; formal analysis, B.B.D.; data curation, D.Q.; writing-original draft preparation, B.B.D., J.F., & D.Q.; visualization, B.B.D.; supervision, J.F., project administration, J.F. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest:

The authors declare no conflicts of interest.

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Applied Studies in Agribusiness and Commerce – APSTRACT
University of Debrecen, Faculty of Economics and Business, Debrecen
SCIENTIFIC PAPERS
DOI: 10.19041/APSTRACT/2024/1/9

DO MULTIPURPOSE COOPERATIVES HAVE ADDRESSED THEIR MEMBER S AGRICULTURAL OUTPUT MARKETING CHALLENGES OF SMALL HOLDER FARMERS IN ETHIOPIA?

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Abstract: *Multipurpose cooperatives offer a powerful tool for enhancing the livelihoods of small-scale farmers, particularly in developing economies. By joining forces, these farmers gain greater collective bargaining power, allowing them to negotiate better prices for their crops and increase their incomes. In developed countries as well, farmer cooperatives play a central role in streamlining production and marketing activities for family farms. They act as a crucial bridge between farmers and markets, ensuring smoother exchange and coordination within the agricultural sector. However, despite their significant contributions, multipurpose cooperatives also face challenges that influence them to play their significant role of agricultural product marketing. The aim of this study was to examine the benefits and difficulties associated with members of a multipurpose cooperative participating in the selling of agricultural products in the Kersa district of Jimma Zone, Oromia Regional State, Ethiopia. For this study, four multipurpose cooperatives were chosen using a two-stage sampling technique, resulting in a sample size of 196 cooperative members. Quantitative data was collected through a structured questionnaire from primary sources, while qualitative data was collected through focus groups and key informant interviews. Descriptive statistics such as mean, chi-square, standard deviation, frequency, and percentage were used to analyze the data. The result showed that 66.36% of cooperative members were participants, whereas 33.64% were non-participants. Multipurpose cooperatives are serving as the primary source of agricultural inputs. However, the output marketing activity of the sampled multipurpose co-operatives in the district is not as remarkable. The study suggests that local cooperative agencies should encourage more members to participate in selling their crops through the cooperatives.*

Keywords: *Output Marketing, Multipurpose cooperatives, Challenges, Smallholder farmers, Ethiopia*
(JEL code: Q13)

INTRODUCTION

Ethiopia stands out as one of the nations in its region where agriculture significantly shapes the economy. With agriculture representing 40.2% of the country's GDP, providing employment for 80% of the workforce, and contributing 70% of export earnings, it holds a central position in Ethiopia's economic landscape (MDG, 2015). Agriculture is the cornerstone of the Ethiopian economy contributing about 53% of the GDP and accounts for more than 90% of all exports (MDG, 2015; Stellmacher & Kelboro, 2019). As the Ethiopian economy depends on agriculture, the cooperative sub-sector provides vital support services and plays a crucial role in the transformation of the agriculture sector (Tesfamariam, 2015).

Establishing agricultural cooperatives in rural areas has the aim of increasing the efficiency of the marketing system, with the cooperatives playing a significant role in improving the productivity of farmers. By providing farm inputs, particularly improved seed and fertilizer, agricultural cooperatives help to maximize agricultural output. Maximizing agricultural output is a crucial decision to enhance farmers' earnings and standard of living. If agricultural cooperatives were capable of capturing members' markets by offering fair prices, access to alternative market opportunities would not be such a crucial issue for corporations (Alemu & Gebreyohannes, 2016). However, smallholder farmers incur significant production and transaction costs due to inadequate infrastructure, including all-season roads, market and transportation facilities, and restricted access to productive resources (D. A. Tefera, Bijman, & Slingerland, 2016). The Ethiopian government is focusing on the development of cooperatives to revolutionize the agriculture industry. The cooperatives will help organize smallholder sector coordination and facilitate farmer access to inputs, credit, and output markets. Agricultural cooperatives played a vital

role in the Growth and Transformation Plan I (GTP I) from 2011 to 2015 and are expected to enhance the commercialization of smallholder agriculture in the second Growth and Transformation Plan II (GTP II) (Delelegne A Tefera, Bijman, & Slingerland, 2017). Over the last decade, there has been a significant increase in the number of cooperatives and members. In Ethiopia, both unions and primary cooperatives have experienced remarkable growth in numbers. For example, between 2008 and 2013, the number of unions has increased by 44% (Royer, Bijman, & Abebe, 2017). In response to the favorable environment, the number and diversity of cooperatives have expanded rapidly (World Bank 2008). In Ethiopia, there are a total of 311 cooperative unions, which are made up of 8,909 primary cooperatives with a capital amount of 2.3 billion birr. The majority of these cooperatives (47%) are multi-purpose cooperatives, followed by saving and credit cooperatives (28.3%), and consumer cooperatives (7%). The multi-purpose cooperatives are currently the most common type of cooperative in the country in terms of number, membership, and capital (Tesfamariam, 2015). Collective marketing is a beneficial practice for smallholder farmers in output markets. It allows them to share fixed marketing costs, which improves their ability to negotiate for better prices and enhances their market power. By engaging in collective marketing, small farmers can also form contractual arrangements with large buyers, which would otherwise be very costly for buyers to negotiate, monitor, and enforce due to the geographic dispersion of individual farmers. In cases where there is an imbalance of information between buyers and producers, producer organizations can leverage their local knowledge to screen members and ensure compliance with agreed-upon contractual terms through peer-pressure (Shiferaw, Hellin, & Muricho, 2011).

Several examples of ineffective collective action for agricultural marketing exist in Africa and other regions, but they are not well recorded (Markelova, Meinzen-Dick, Hellin, & Dohrn, 2009). The history of farmer cooperatives in Africa has been discredited due to their inability to thrive in unregulated markets once the government withdrew direct and indirect subsidies. However, the success of collective action and farmer organizations in output markets is also contingent on the product in question (Poulton, Kydd, & Dorward, 2006). There has been some debate about the effectiveness of cooperative organizations, leading to exploration of alternative forms of collective action that do not require the establishment of formal producer organizations. While there are concerns about fairness and benefit distribution in some cases, the private sector often supports producer organizations to ensure access to consistent and high-quality produce in sufficient quantities (Shiferaw et al., 2011). Some scholars including (Leza & Kuma, 2015); Mersha and Ayenew (2018), stated that, it is challenging to conclude that the majority of Ethiopian cooperatives have fulfilled their intended purpose due to their inefficiency in providing services, especially in the areas of input and output marketing, as well as adopting quality technology extension services. Other scholars argued that market mechanisms alone won't be sufficient to bring about the necessary change, particularly in rural areas with sparse marketplaces {Narrod, 2009 #16}(Doner, Ritchie, & Slater, 2005; Dorward et al., 2004; Narrod et al., 2009).

As result of this MPC member farmers face difficulties in participating in even local markets due to subsistence production and the inability to penetrate other factors that influence the search for markets (Dalango, Mulugeta, & Melaku, 2018). Moreover, the roles of the MPPCs examined in the world have adapted to the dynamic change. The world of global market forces and dynamic economic, environmental and political change is creating new challenges and opportunities for their organizations. Therefore, this paper intends to examine challenges of multipurpose co-operatives members' participation in agricultural output marketing in Kersa District, Jimma Zone, Oromia region, Ethiopia.

MATERIALS AND METHODS

Description of the Study Area

Kersa district is one of the districts in the Jimma Zone of the Oromia Region of Southwest Ethiopia. It is located at about 324 km away from the capital city, Addis Ababa in the southwest and 22 km away from the capital city of the zone, Jimma in the east direction. Four districts of the zone border Kersa district in four directions. These districts are Tiro Afeta from the East, Manna from the west, Limmu kossa from north and Dedo from the South geographical directions, respectively. According to KARDO (2019), the district has about 32 Keble's, of these 30 of them are rural based administrative (peasants associations) which is the largest share of the administrative of the district and 2 of them are under the town administration.

Socioeconomic Characteristics of the District

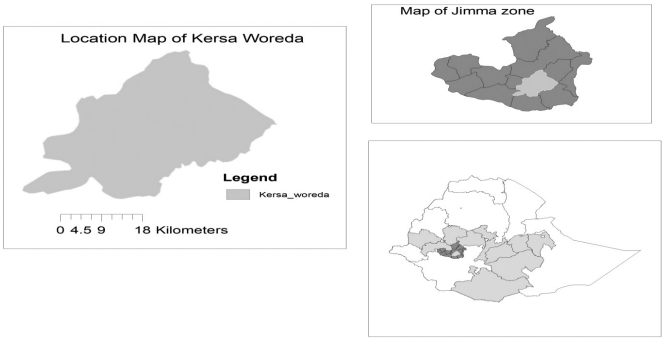
The 2007 national census reported a total population for this District of 165,391, of whom 83,579 were men and 81,812 were women; 5,426 or 3.28% of its population were urban dwellers. Agriculture is the most important source of household income in the study area. The area is mostly known for its vegetation coverage, suitability for coffee, crop, livestock and bee production. The major cash crops which grown were:-Maize, Sorghum, Barley, sample i.e. 10%) Wheat, soya bean, field pea, Coffee, Chat (Cath edulus), fruits and vegetables. The soil type of the study area is characterized with black to red soils. Industry in the Woreda includes 14 grain mills.

There are three major types of primary Cooperatives were found in the District. They are Multipurpose, saving and credit and other service cooperatives with 34,823 members in which 4,184 of them are women members. The multipurpose agricultural cooperatives in the District were 30 which mean all rural kebeles do have one multipurpose cooperative. Kersa has 14 kilometers of dry-weather and "a few" kilometers of all-weather road, for a minimum average road density of 14.3 kilometers per 1000 square kilometers, which is less than the Zonal average of 70 per 1000 square kilometers. About 55% of the urban and 11.35% of the rural population has access to drinking water.

The farming calendar of the districts is from June to August and like most part of the country rain fed agriculture is practiced. According to the same source, the living styles of

the people in the area are characterized by mixed-farming and petty trades. The farmers' rear different livestock such as cattle, sheep, and goats horse and horse basically to generate additional income to supplement the income generated from agricultural produce (Figure 1).

Figure 1. Map of the study area



Topographic Condition of the District

The district is located in the Gilgel Gibe catchments of southwest Ethiopia (Figure 1). It is characterized as hot humid tropical with bimodal heavy rainfall which is uniform in amount and distribution, ranging from 1200 to 2800 mm per year, with where; short and main seasons occurring from mid-February to May and June to September, respectively. In normal when population greater than 10, 000 years, the rainy season extends from mid-February to early October. The mean annual temperature of the area is less than 19.5°C. The district has three basic agro-climatic conditions; namely, high land (Dega), Middle land (Woyina-Dega) and Kolla (low land) agro-ecological zone. The districts altitude ranges from 1740 to 2660 meters above sea level; mountains include Sume, Gora, Kero, Folla and Jiren. Perennial rivers include the Gilgil gibe, Kersa, Bulbul, Melekta and the Birbirsa (KARDO, 2019).

A survey of the land in this District shows that 58.6% is arable or cultivable (37.5% was under annual crops), 17.3% pasture, 6.0% forest, and the remaining 18.9% is considered swampy, degraded or otherwise unusable. The climate of the Gilgel Gibe catchment is characterized as hot humid tropical with bimodal heavy rainfall which is uniform in amount and distribution, ranging from 1200 to 2800 mm per year, with where; short and main seasons occurring from mid-February to May and June to September, respectively. In normal when population greater than 10, 000 years, the rainy season extends from mid-February to early October. The mean annual temperature of the area is less than 19.5°C. (KARDO, 2019).

Research Design

According to Ker linger (1986), "a research design" is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems. Normally, a research design will determine the type of analysis you should carry out to get the desired results. For this study, mixed research design which combines both cross sectional survey and descriptive research, elements of qualitative and quantitative viewpoints, data collection, analyses, and inference technique was used. This is due to the fact that it gives the potential to cover each method's weaknesses with strengths from the other method.

Sampling Procedure and Technique

According to Cooperative promotion office report of 2010 shows there are 30 MPCs found in the District. For this study a two-stage sampling technique was used to the study area. First, out of 30 Multipurpose Cooperatives in the District, four of them were selected purposively based on their potential in agricultural input and output marketing.

In the 2nd stage, by using simplified formula for proportions suggested by Yamane (1967) was used to determine196 sampled respondents as:

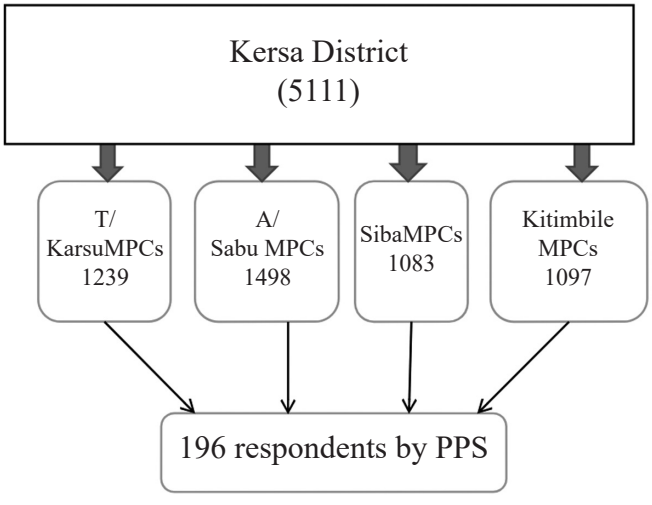
$$n=\frac{N}{1+N(e)^2}$$

$$n=\frac{5111}{1+5111(0.07^2)}$$

$$n=196$$

Where n is the sample size, N is the population size (Multipurpose cooperative members) and e is the level of precision where e = 1- precision and assumed as e = 7%. Totally 196 respondents would be selected randomly from four multipurpose cooperatives based on probability proportional to size of cooperatives (Table 1).

Figure 2. Sampling procedure



Source: KDCPA, 2019

$$¿\frac{196}{5111} x\,100 = 3.83$$

$$¿\frac{1239\,x\,3.83}{100} = 47.45 \quad 48$$

$$=\frac{1498\,x\,3.83}{100} = 57.37 \quad 57$$

$$¿\frac{1083\,x\,3.83}{100} = 41.47 \quad 42$$

$$¿\frac{1291\,x\,3.83}{100} = 49.44 \quad 49$$

Table 1. Sampling Procedure

MPCOs	Total member of MPCs			Sampling size
	Male	Female	Total	
T/karsu	1111	128	1239	48
A/Sabu	1280	218	1498	57
Siba	995	88	1083	42
Kitimbile	1097	194	1291	49
Total	**448**		**5111**	**196**

Source: KDCPA, 2019

Methods of Data Collection and Sources of Data

For the purpose of the study, both qualitative and quantitative data were collected from primary and secondary data sources. For qualitative data, 8 Focused Group Discussion (FGD) with Multipurpose Cooperatives committees (4 with committee and 4 with members in each study kebele), 12 Key informant interviews with Woreda cooperative promotion expert, development agent, community leaders and cooperative leaders were conducted. For the quantitative data, structured interviews and questionnaires on relevant variables were used to collect data from 196 sample respondents selected for the study.

As far as secondary data was concerned different sources such as baseline information of the schemes, development plans (annual plans), and annual reports of the kersa Woreda and the selected Multipurpose cooperatives and promotional offices, journals, published and un published documents were used as a source of information.

Method of Data Analysis

The study was undertaken using two broad categories of data analysis, namely descriptive statistics and binary logistic regression model were used. To address the first and third objectives (roles and challenges of MPCs in agricultural input and output marketing) of the study, descriptive statistics were used while the second Objective (factors affecting the participation decision of MPCs in agricultural input and output marketing) was analyzed by binary logistic regression model. The members house hold survey data were analyzed, presented and interpreted by using appropriate statistical techniques both descriptive and inferential statistics. Qualitative data from FGD and KII were analyzed using content analysis while quantitative data were analyzed using econometric model. To summarize the collected data descriptive statistics such as mean, SD, tables and percent were used. Moreover, Statistical Package for Social Sciences (SPSS) software version 20 was used to process and analyze the collected data.

RESULT AND DISCUSSION

The Role of MPCs in agricultural input and output marketing activities

Output/Product/ Marketing

The type of output being marketed by the multipurpose cooperatives generally varies from grains, vegetables, and milk to mineral products. Output markets were serious problems in the study area. These limitations were mainly caused due to problem of qualified and committed leadership, limited financial capital and lack of well infrastructural facilities.

Grain marketing activity

In the View of FGD, Multipurpose Cooperatives in the study area undertake different types of agricultural outputs/ grain. The major types of grain marketed by MPC in the study area were maize and coffee. They reported that there is an agreement made with Union. Based on an agreement made with their union (Jimma Multipurpose Cooperative Union) and WFP they purchase their agricultural products at competitive market price both from the members and non-members on cash basis at prevailing market price. Then the Union purchase from them paying them commission.

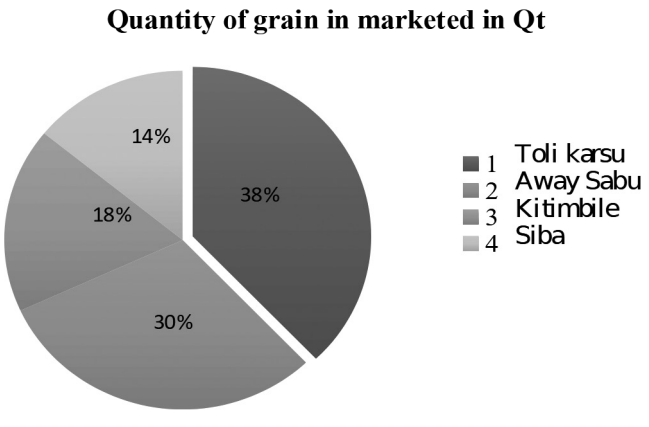
According to the interviewed key informants, the same result was obtained as in the questionnaire survey as they reflect that enough basic initial capital, good infrastructural services (road, transportation, and standardized ware house or storage) ,good interpersonal skills of managers, good understanding the concept of cooperative marketing, good educational level, good business skill and experience of management in cooperative have significant role in the grain marketing of the multipurpose cooperatives. However, in contrast to survey questionnaire results, there is very slight difference on the influence education in relation experience of management to work with cooperatives. They give priority to the experience of managers to work in cooperatives than educational level of managers. This furthermore; an inexperienced manager is a challenge for the success of cooperative marketing as one key informant said:

"If we see Toli Karsu Multipurpose Cooperative the former manager was twelve Grades complete with only one year of experience in cooperative business however during that time the Multipurpose Cooperative was almost approaching to fail, conversely, the current manager had many year of experience in cooperatives and that is why the Cooperative became better than before in agricultural output marketing activity".

On the Other hand, lack of Capital, unskilled working force, low commitment from committee members and distrust among members and management committees are among ma-

jor constraints affecting the marketing activities of Multipurpose Cooperatives. Besides, the data obtained from household survey shows that, although grain marketing activity is provided by the entire sample MPC, the present grain marketing activity of the sampled multipurpose co-operatives in the district is not as such remarkable. The respondents stated that the grain marketing activity was inadequate and unreliable. These limitations were mainly caused due to problem of qualified and committed leadership, limited financial capital and lack of well infrastructural facilities like enough and standardized ware house and transportation vehicles.

Figure 3. Total amount of output marketed in 2011



Source: KDCPA, 2019

According to the graph Toli karsu, Away sabbu, Kitimbile and Siba are the first, second, third and fourth multipurpose co-operatives undertaking grain marketing activity 38 % , 30 % , 18 % and 14 % in the study area respectively. Furthermore the result from of Key informant interviewee justified that Toli karsu and Away sabu MPCs have more activity performance compared to other MPCs as they have more better warehouse and proximity to the District and road accessibility than other MPCs.

On the other hand multipurpose cooperatives in the district do not make regular purchase and sale of farmers' grain. It is realized from the study that the normal marketing strategy of the co-operatives is to buy the grain in October and November (i.e. immediately after harvest time), and recollect a good portion of it until the lean periods (June, July and August) in expectation of better price, as they do not have adequate market outlet during harvest time. This has resulted in high fluctuation of their grain marketing activity.

According to the independent sample t- test conducted in this study, the mean difference in distance between the participant and non-participant household heads is found to be significant at 1 percent probability level (t= -6.804) (Table 2).

Non-farm Income:

The mean annual non-farm income of participants was 701.92 birr and that of non-participants was 1153 birr. The independent t- test shows that there is no significance difference between participants and non-participants members on the probability of participation in agricultural input and output marketing. (t=2.85).

House hold Members Expenditure:

The total annual expenditure per household on mean spent Birr. 2,967.45 with standard deviation of 2,352.34 Birr and the mean house hold members' expenditure of the participants and non-participant were 3054.38 Birr and 2,791.21 Birr respectively. According to the independent sample t- test conducted in this study, the difference in mean of House hold expenditure of MPCs farmer members between the participants and non- participant was found statically non-significant at (t=0.725) (Table 2).

Table 2. The socioeconomic characterstics of Sampled respondents

Explanatory Variables	Participant N=130		Non-participant N=66		Total N=196		t-value	P-value
	Mean	SD	Mean	SD	Mean	SD		
Age of HH	46.89	11.042	41.26	10.022	44.99	11.01	3.48	.001***
Education	6.25	2.61	3.21	1.37	5.22	2.68	10.666	.000***
Family Size	4.32	2.01	3.83	2.06	4.16	2.04	1.596	.112
Land hold	1.54	0.68	1.09	0.56	1.39	.67	4.874	.000***
Livestock hold	3.70	2.15	4.36	2.17	3.92	2.17	-2.033	.043**
Share hold	2.32	1.16	2.09	1.13	2.26	1.16	1.284	.201
Non-farm income	701.92	1254.51	599.32	1153.00	667.40	1219.27	0.555	.578
Expenditure of HH	3054.38	2395.95	2791.21	2272.17	2967.45	2352.34	0.725	.469
Distance of HH from MPCs office	3.20	1.66	4.70	1.35	3.71	1.72	-6.804	.000***

** Significant at less than 10% level of significance*
*** Significant at less than 5% level of significance*
**** Significant at less than 1% level of significance*

Table 3. The Chi-square value of dummy Variables

Explanatory Variables	Categories	Participant	Non-participant	Total	%	P-value	x^2
Output price perc	High	74	31	105	53.57	0.266	0.744
	Low	56	35	91	46.43		
Change in income	Yes	118	15	133	67.85	0.000***	92.91
	No	112	51	63	32.15		
Membership	Yes	113	29	142	72.44	0.000***	40.52
	No	17	37	54	27.56		
Fert.price perc	High	78	63	141	71.94	0.000***	27.25
	Low	52	3	55	28.06		
Seed price perc.	High	83	60	143	72.96	0.000***	16.25
	Low	47	6	53	27.04		

****Significant at less than 1% level of significance.* *Source: Own survey 2019*

Shareholding of MPC members:

The total mean in shareholding of the sample respondents was 2.26 and the mean difference between participants and non-participant was 2.32 and 2.09 respectively. An independent sample t test was analyzed to compare the mean difference between the participant and non-participant households in the agricultural input and output marketing by MPCs and the result shows statistically non-significant at (t = 1.284) (Table 2).

The Chi-square Result

To observe the difference between the two categories, Chi-square test was conducted and statistically significant difference was observed between participants and non-participants agricultural input and output marketing (Table 3). This means there is statistically significant relationship between participants and non-participants of agricultural input and output marketing of MPCs in the study area.

Accordingly, the Chi-square test result shows that out of 5 categorical explanatory variables output price perception, Change in standard of living due to joining Cooperatives, Membership in cooperatives other than MPC, Fertilizer price perception and seed price perception 4 of them Change in standard of living due to joining Cooperatives, Membership in cooperatives other than MPC, Fertilizer price perception and seed price perception have a significant relationship between participants and non-participants of MPC members' in agricultural input and output marketing.

Perception on the output price (OUTPUTP): The chi-square result found that Perception on the price of output has no statistically significant difference with the participation of members in the agricultural input and output marketing by cooperatives between the two groups (= 7.44).

Change in standard of living due to joining MPCs: Based on the perception of sample respondents, the average changed living standard due to joining of the multipurpose cooperatives was 86.92 and 13.08 percent for the participants and non-participants respectively. The chi-square test showed that, there was statistically significant relationship in the mean of change on standard of living due to joining a cooperative between the participants and non- participant to the agricultural input and output marketing at less than 1 percent probability level (= 92.91) (Table 3).

Membership in other cooperatives: This was coded as a dummy variable, which took the value of one if the farmer was a member of cooperative and zero otherwise. This variable was expected to affect the MPC member participation in agricultural input and output marketing positively. This is because; members of MPCs are likely to get benefits and information and thus could participate. The study result showed that the mean experienced respondents on membership in other cooperatives for the participants and non-participant was 72.44 percent and 27.56 percent respectively. The chi-square analysis revealed the existence of statistically significant difference in percentage between being a membership in other cooperatives or not in the probability of participation in agricultural input and output marketing result shows statistically significance at less than1% probability level (χ 2=40.52) (Table 3).

Fertilizer and Improved Seed Price perception: With regard to the respondents' perception of fertilizer and seed price on participation of agricultural input and output marketing perceived mean in fertilizer high price was 55.32 and 44.68 for the participants and non-participant respectively. 58.04% and 41.96 % for the participant and non-participant respondents was perceived high price of the improved seed respectively. The chi-square analysis on the perception of the household head on the fertilizer price and seed price with participation of farmer members on agricultural input and output marketing by multipurpose cooperatives was statistically significant at less than 1 percent (χ 2= 27.25). The perception of the household head on the improved seed price with farmer members in agricultural input and output marketing by multipurpose cooperatives was statistically significant at (χ 2 = 16.25) (Table 3).

Challenges of MPCs in agricultural input and output marketing

Although cooperatives are considered as an appropriate tool of rural development, they are facing critical problems, which retain them from their positive role (Alemu & Gebreyohannes, 2016). Some of the constraints of cooperatives are: low institutional capacity, inadequate qualified personnel, low entrepreneurship skill, lack of financial resources, lack of market information, poor members' participation in the different activities such as financing the cooperative, patronizing the business activities of the cooperatives, control and supports it. Moreover, the prices of agricultural inputs are increasing from year to year and farmers are complaining on it. These multifaceted problems make very difficult the overall activities of the cooperatives in general and the agricultural inputs and outputs marketing in particular. The aforementioned problems place the farmers as usually price takers due to the fact that they have poor marketing skill and limited bargaining power. There have been attempts made by the government to improve the marketing skill and bargaining power of farmers through establishment of cooperatives and promoting other group action approaches (Dawit, 2005).

There are a number of problems, which impede MPC from playing their agricultural input and output marketing role. Among these the major challenges identified in the study area were internal and external challenges. Internal challenges were those emanated from the cooperatives (primary up to federation level) members, managers, managements and Board members while external challenges belongs to government structures, which was established to support cooperative sector. In line to this study (Nuredin, and Byeong, 2015), have identified the two basic challenges that hinder cooperatives were internal and external challenges).

Internal challenges

Based on focus group discussion held with different committee members of the four cooperatives indicate that the major internal factors that hindered agricultural input and output marketing role of MPC were:- lack of capital, unskilled working force, lack of commitment from committee members, lack of trust, low infrastructural facilities (transport and storage or ware house),unwillingness to serve committee, fear of marketing risk, poor members participation, frequent committee changes due to mischief and dependency on the union. Besides, involvement of different stakeholders in the decision making of different Woreda political leaders, agricultural and cooperative office leaders, and lack of business skill created major interference on the cooperative overall activities. The other point that was raised by the committee members during decision was risk. Risk and business are two inspirable things which cannot be avoided but require proper planning and responsive marketing decisions to be competitive in the business and minimize the risk. Hence, cooperative members in this regard lack the knowledge, commitment, and flexible decision making power and business skill which tied-up the cooperatives role expected to be played by in the market.

Inadequate capital/Lack of Capital:

Adequate capital is one of the fundamental requisites for the sound cooperatives business operation. From the stand point of ownership, there are two kinds of capital equity and debt capital. Equity capital is provided by the members'; owners of the business. In the balance sheet it is referred to as the net worth. It is the equity that the owners have in the business which left when the total liabilities are subtracted from the total assets. Ideally the members of cooperatives should provide the capital to finances its operations. Since the cooperative exists to deliver benefits to its members, each member should contribute to capital in direct proportion to usage of services the cooperative provides. However, according to some of Focused Group Discursion to identify lack of capital they told that their multipurpose cooperatives in the study area have no adequate capital to undertake agricultural input and output marketing and still now dependent on their union. In the view of one of the key informant interview this could be due to lack of members trust and transparency. Moreover he said that from their establishment our cooperative has paid back share.

Lack of professional skilled manpower:

In the study area, the societies are managed by committees having no cooperative background. Whereas, in principle, cooperatives have unique features for which professionals having cooperative background are needed to handle technical aspects of the society. Failure to report timely and reluctant to conduct general body meeting is another worst scenario emanated from lack of qualified leader

Lack of trust:

Trust is the member's confidence or faith towards the cooperatives, management committee, and employees. It was assumed as if members have confidence/ faith towards the above; they will participate in business practices of the cooperatives. The survey result indicates that the majority of the respondents have no trust towards the board of directors and

Table 4. Sampling Procedure

No-	List of Constrains	Frequency	%	Rank
1	Lack of Capital	65	33.16	1st
2	Unskilled working force	42	21.43	3nd
3	Low commitment from committee members	47	23.98	2rd
4	Lack of trust	14	7.14	4th
5	Fear of marketing risk	7	3.57	6th
6	low infrastructure (transport and storage)	4	2.04	8th
7	Un willingness to serve as committee	5	2.55	7th
8	Poor members participation	12	6.13	5th
	Total	**196**	**100**	

Source: House hold survey, 2019

the employees. There were members who have no trust towards the management body, and employees. They expect the exaggerated benefit from their products. Members see their cooperatives as profit making organizations. There were also management bodies that have no trust towards the members in terms of product provision and loan repayment.

External Challenges

The external challenges identified by sampled respondents were: absence of continues and relevant training, poor governance, weak leadership and supervision; weak and irregular technical assistance; expertise lack knowledge and skill, weak documentation and information; weak horizontal and vertical relation, and coordination. Moreover unstable structure would result in high staff turnover; lack of regular follow up, attitude and practice of corruption, as the same time reluctant to fight corruption in court; unfair resource allocation to cooperative promotion sector particularly at district level which was reflected in shortage of human resources, budget, and logistics; weak public relation activities, and in some case interference also a big challenges.

Weak performance of agricultural markets (both input and output markets) in Ethiopia has been described in various studies as a major barrier in boosting agricultural sector and the overall economy (D. Alemu, 2005). With an inefficient marketing system, the surplus resulting from increased production benefits neither the farmers nor the country. The agricultural markets in the country are highly influenced by the production system itself. That is, most of the agricultural production is undertaken by small scale producers who are scattered all over the country, engaged in different agricultural enterprises without specialization, and with limited marketable surplus (Ibid).

There are a lot of bottlenecks in implementing input and output marketing by cooperatives in the study area. With tremendous growth in size and operations and complexity of agricultural marketing, cooperatives are facing challenges which emerged from their members, management, and their competitors. It is found that agricultural cooperatives have had limitations in terms of meeting the needs of their members' efficiency.

Besides, cooperatives have failed to meet members' demand or ceased to participate in their members economic activities (buying and selling of input and output marketing, using available loan and etc,) or to make democratic decisions (attending annual meeting, approving the law and audit report, etc). Thus, the major challenges faced by agricultural cooperatives are on how to operate and meet the needs of members efficiently keeping in mind the basic principles of cooperatives. Cooperatives are considered as an appropriate tool for rural development even though they are facing critical problems, which constraint them from their positive role. These multifaceted problems make very difficult for the overall activities of multipurpose cooperatives in general and agricultural input and output agricultural marketing cooperatives in particular. Hence, members were usually price takers due to the fact that they have poor marketing skill and limited bargaining power.

CONCLUSION

From the different types of cooperatives operating in the rural part of the country, MPCs have a significant role in agricultural input and output marketing. They are organized to render multifaceted service in the rural area to its members and nearby rural community in cost effective manner than investor-owned firms. Moreover, they improve farmers' access to market and negotiation power, ensure timely supply of farm inputs, marketing of farmers' output, spread risk, create competitive marketing system and attain economies of scale which is impossible at individual farmer level. This study attempted to analyze the roles of MPCs in agricultural input and output marketing. The descriptive statistics and econometric model were also used for analyzing the data. T-test was used to compare the mean values of the continuous explanatory variables and examine the existence of statistically significant differences between participants and non-participants of MPCs in agricultural input and output marketing.

The T-test showed significant difference in the age, educational level of members, total live stocks hold, land hold and distance of HH members from MPCs office. Discrete variables were also compared using Chi-square test to see if there is statistically significant difference between the two groups. The Chi-square test also revealed that the discrete variables: Change in standard of living due to joining cooperative, membership in other cooperative Other than MPCs, fertilizer price perception and seed price perception were found to influence farmer member's participation decision in agricultural input and output marketing activity at the different levels of significance.

The result of the study shows that, the agricultural input marketing activity by MPC is very encouraging. The study found that the role of MPFCs in agricultural inputs was relatively better as compared to marketing of output. As the survey shows, multipurpose cooperatives served as a source of farm inputs for about 98.97%, farmer members in the study area. Moreover, they are supplying agricultural inputs such as fertilizers and improved seeds at proximate centers and sufficient quantity while the grain marketing activity by MPC is highly unstable and variable.

Generally, MPCs in the study area are playing insignificant role in marketing farmers output and protecting farmers from low price payment, in providing multifaceted service, in enhancing the farmer's negotiation power, while playing significant role in availing farm inputs at the right time, saving the effort and time incurred to reach the district market and in acting as alternative market outlet in the input marketing.

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