APSTRACT

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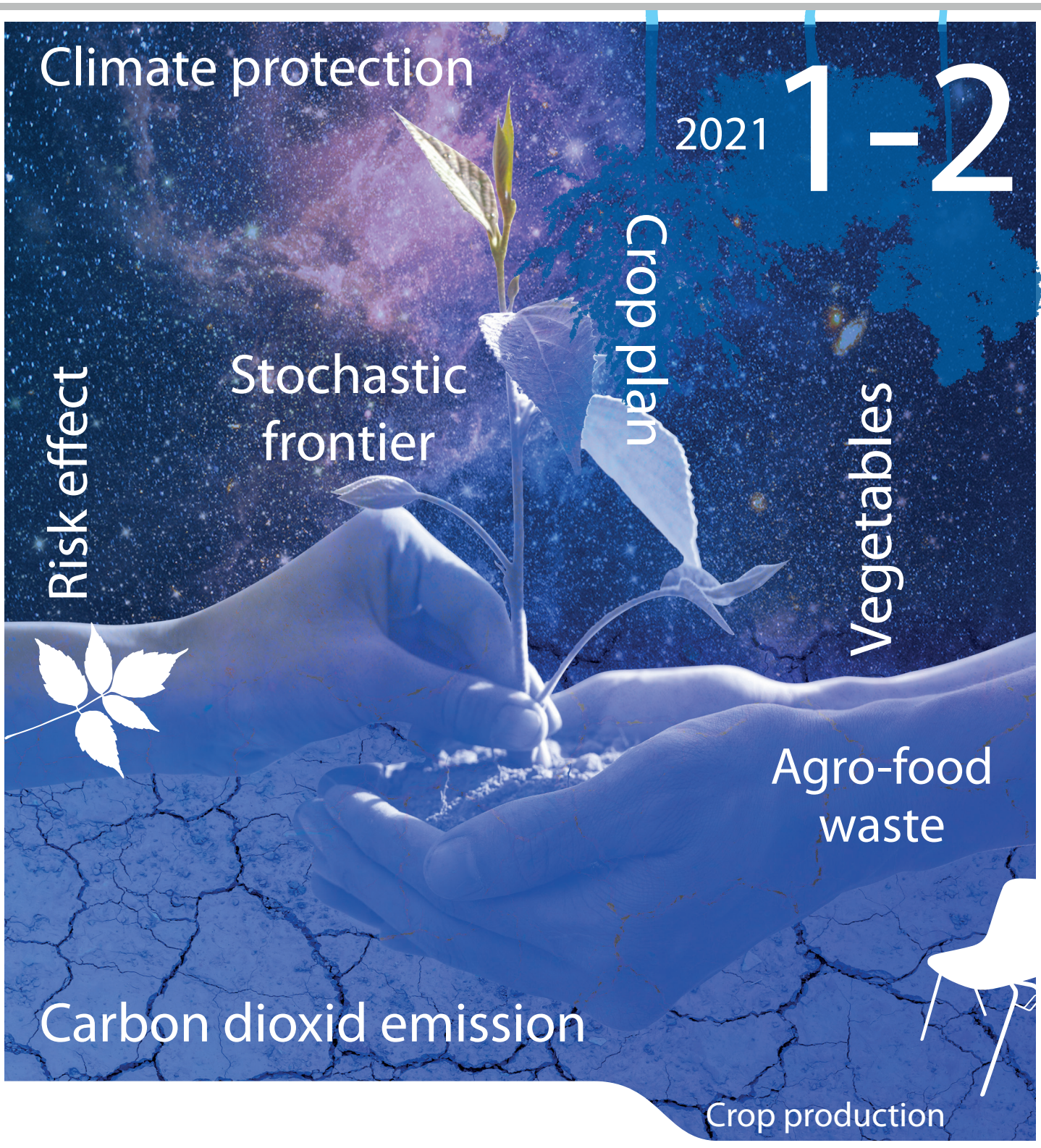

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SCIENTIFIC PAPER

POLITICAL RISK EFFECTS AND ENTRY MODE STRATEGIES OF MULTINATIONAL CORPORATIONS (MNCS) IN NIGERIA

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Abstract: *Research on the political risk and entry mode of multinational companies (MNCs) has been one of the major subjects of interest in international business terrain, and the political risk factor has constitute a major basis for explaining whether exporting, licensing, franchising, or joint venture agreement (JVA) and Foreign direct investment seems to be appropriate. As such, the study examined the effect of political risk as it affects the entry mode strategies of selected multinational corporations in Nigeria as the economy of most developing economies has been characterized as being exposed to political instability and risk. The research adopted the survey technique with inference to the expo facto method and adopted questionnaire as an instrument through content and test re-test appraisal before data were analyzed through the IBM Statistical Package for the Social Sciences. The results from the analysis indicated that franchising remains a viable option of multinationals in Nigeria and the second hypothesis indicated that licensing significantly reduces the risk exposure of multinational corporations as the licensor have lesser liability in an unstable political economy of the licensee. Based on these findings companies are recommended to adopt appropriate entry strategies in line with governmental policies and economic situation before entering foreign markets.*

Keywords: *Multinational Corporations, Political Risk, Joint Venture, Licensing*
Jel Codes: M1, M10.

INTRODUCTION

The influence of multinational corporations in development of economic activities of developing countries cannot be overemphasized. Multinational Corporations are companies with international subsidiaries in the host country in which they are often faced with political risk. Weston and Sorge's (2012) defined political risk as the undertakings of national governments which impedes business transactions, or the terms of agreements. Brooke and Remmers (2010) states that political environment is an element of business risk which could lead to collapse of business based on political changes. It is most commonly conceived as government meddling in business operations. There is "micro risk" where political occasions bring about requirements on all outside big business and "micro risk" which influences just "chosen fields of business action or remote ventures with explicit attributes Robock (2012). Moreover, in accordance to Jiménez and Bjorvatn (2018), a portion of the investments in developing markets dwell in nations which are seen to be politically dangerous and regardless of the way that one would expect worldwide FDI stream to fall because of political hazard, they have really done the inverse and have risen. It in this manner follows that once MNCs have put resources into a nation that is politically unsafe and these hazard components show themselves, MNCs respond and on occasion it might be past the point where it is possible to stay away from the unfriendly outcomes. These risks have prompted the improvement of an industry committed to giving protection covering political dangers to worldwide tasks and they are typically alluded to as Political risk insurers.

STATEMENT OF RESEARCH PROBLEM

In Nigeria, the activities of most multinational companies have been identified as unethical because of the harms they have caused on the society. MNCs have gain monopoly of power due to complexity of their raw materials and strong financials; hence straddle the indigenous entrepreneurs and hinders their capability to obtain license agreement since they will not be able to maintain the standards of MNCs.

In tangent, the entry mode of MNCs in developing economies most specifically the joint venture based MNCs has often been affected by political action and policies of the states coupled with political instability and unstable political environment.(Berlin, 2014).Most Nigerian markets have progressively shaky worlds of politics, with increasingly visit changes in government approach. MNCs have explicit attributes that cause them to see political risk contrastingly consequently, there is a requirement for political risk evaluation (PRE) specifically Nigeria market to consolidate all the particular political risk factors as the extent of risk in not ascertained. In order to mitigate failure, assessing political risk is relevant so that the type of investment and entry modes can be determined during the internationalization of MNCs within Nigeria markets. Based on this two hypotheses as listed is postulated.

Ho1: Social factors do not significantly affect licensing.
Ho2: Political risks do not significantly affect joint venture agreement.

REVIEW OF LITERATURE ON POLITICAL RISK AND CAUSES

There is little accord on an 'obvious' meaning of political hazard and the idea of political hazard which appears to have tormented the academicians and corporate leaders because of its temperament, as political hazard is abstract and difficult to evaluate. Wilkin and Zonis (2012) pointed political risk cover a variety of dangers. This variety of dangers imply different implications for various firms" and very regularly for various individuals inside a similar firm. The World Bank (2011) described political risk as 'the probability of interferences of the undertakings of organizations by political powers and occasion, whether or not they occur in have countries or result from changes in the worldwide condition. Instances of political risk incorporate burden of new controls, war, insurgency or insurrection. The causes or features of political risk are contributing components or variables that can be used to choose the level of the robustness of a universe of governmental issues, especially in making countries. These causes or factors are connected with monetary viewpoints, money related and social factors, and can make a universe of governmental issues experience changes sporadically.

CLASSIFICATION OF GENERAL TYPES OF RISKS IN INTERNATIONAL BUSINESS

Risk can be arranged dependent on the point of view of political risk protection offices. Ordinarily, political risk protection, as announced by Bradford, (2011), covers resources against seizure, appropriation, contract denial and currency inconvertibility. Albeit numerous sorts of political hazard can be guaranteed through private back up plans, a few misfortunes that come from political sources can't. Besides, on the part of uninsured misfortunes that outcomes from government traits (as opposed to choices) like racial quantities in the employing of faculty. As it has been noted, political hazard can be named:

a) Governmental, for example, import limitations, or societal, for example, showings, uproars and insurgence
b) Intrastate, for example, confiscation or interstate, for example, war;
c) Insurable, for example, confiscation or uninsurable, for example, tax assessment

STRATEGIES FOR POLITICAL RISK MEDIATION BY MNCS

Research has demonstrated that as MNCs acquire involvement with a nation they become bound to reinvest in that nation in the future Rosenzwieg, (2013). Therefore, MNCs need to develop strategies in order to survive within

such political environment. Some strategies that should be adopted are:

a) **Low Involvement Strategy:** This technique utilizes the basic methodology of picking up scale economy to accomplish cost decrease. Right now, with comparative goals structure alliances to pick up scale in data assembling and activity.
b) **High Involvement Strategy:** this includes making a system of nearby, provincial, and national partners ready to exhaust more prominent assets and build up an increasingly intricate technique since they can hope to influence the world of politics in manners that give sufficient profit for their endeavors.

- **Inference to Institutional theory**

According to Davis (2012), this theory assists with understanding the distinction in institutional conditions among home and host nations that may impact the entry mode choice characterized by specific principles, standards, and qualities. Cultural distance may expand internalization costs, for example, costs identified with gathering data and correspondence in the host nation Steigner& Sutton, (2011). What's more, the host nation hazard (for example political risk) is additionally one of the most examined institutional factors in the entry mode literature. To enter a high-chance nation, the firm may require the assistance of a neighborhood accomplice that can give it access to information about the outside market and offer risk (Luo, 2011). This theory is important to this investigation as it assists with demonstrating diverse political environmental variables that hampers entry mode decision strategy.

EMPIRICAL REVIEW ON SOCIAL FACTORS AND LICENSING

Nordin (2016) as indicated by Davis (2012), this hypothesis assists with understanding the distinction in institutional situations among home and host nations that may impact the section mode choice characterized by specific guidelines, standards, and qualities. Social separation may expand disguise costs, for example, costs identified with gathering data and correspondence in the host nation Steigner& Sutton, (2011). What's more, the host nation chance (for example political hazard) is additionally one of the most looked into institutional factors in the section mode writing. To enter a high-chance nation, the firm may require the assistance of a nearby accomplice that can give it access to information about the remote market and offer risk (Luo, 2011). This hypothesis is important to this examination as it assists with demonstrating distinctive political ecological variables that hampers section mode choice technique.

METHODOLOGY

The methods espoused for carrying out this research include the survey, and ex-post facto. Opinions were gathered by administering questionnaire (survey method) as well as personal interviews. The population of the study is estimated to be 8013 which constitute PZ Cussons, Cadbury and Nestle employees. The three firms were selected purposely based on the criteria that: they reflect characteristics of international businesses (all of these companies operate globally), they have interacted with more than one country in the course of their operations, and they have been into business for a sustainable amount of years.

Table 1 List of the selected multinational companies in Lagos, Nigeria

S/N	Name of Organization	Industry	No of Employees	No of Samples
1.	PZ CUSSONS	FCMG	4961	127
2.	Cadbury	FCMG	727	127
3.	Nestle	FCMG	2325	127
TOTAL			8013	381

Source:Researchers Compilation, (2020).

Sample and Sampling Techniques

The sampling technique that was used in this research work is the Simple Random Sampling technique. This technique allows for all elements in a sample to have equal chances of being selected. The study will use Yaro and Yamani formula with 95% confidence level of the sample size.

It is expressed below:

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

Where: n= Sample size
N= Total population
e= Error Margin (5%)

$$n = \frac{8013}{1+8013(0.05)^2}$$

$$\frac{8013}{1+833\ (0.0025)}$$

$$n = \frac{8013}{21.0325} = 380.98$$

n =381 approximately

Data presentation

Questionnaire was administered to three hundred and eighty one (381) employees of Pzcussons, Nestle and Cadbury Plc. Of this part, Two hundred and eighty six (286) questionnaires representing 75% were returned, and twenty-six (95) questionnaires representing 25% were not returned. The table shows that 286 respondents, 157 (54.9%) are male, while 129 (45.1%) are females. What's more, out of the 200 and eighty six (286) respondents, 125(43.7%) are single while 140 (49.0%) are married and 21(7.3%) are neither married nor single. By suggestion, a large portion of the respondents are married. All the more in this way, 108(37.8%) of the 286 respondents have 1-5 years' work understanding, 108 (37.8%) have 6-10 years' work understanding, 46 (16.1%) have 11-15 years' work understanding and, 24(8.4%) have over 15years work understanding. By suggestions, a large portion of the respondents have between 1-10years of work understanding.

Additionally, there are 57 M.Sc and M.BA respondents which is (19.9%), 187 HND/BSc holders (65.4 percent), 42 are SSCE holders (14.7%) in the example. By suggestion, the respondents have high HND/BSc educational qualification. Once more, out of the 200 and eighty six (286) respondents, 28 (9.8%) are 51 years or more, 47 (16.4%) are somewhere in the range of 41 and 50 years old, 109(38.1%) are somewhere in the range of 31 and 40 years, and 102 (35.7%) are somewhere in the range of 21 and 30 years. By suggestion a large portion of the respondents are between the age of 31 and 40 years. All significantly, out of the 286 respondents, 35 (12.2%) are employees in the artisan industry, 130 (45.5%) are workers in the service industry; 114 (39.9%) are representatives in manufacturing industry while 7 (2.4%) don't indicate their industry. By suggestion, we have a greater amount of service industry employees as respondents in the sample.

Table 2 Frequency Distribution of Demographic Characteristics of Respondents

Characteristics	Category	Frequency	Percentage	Cumulative percent
GENDER	Male	157	54.9	54.9
	Female	129	45.1	100.0
MARITAL STATUS	Single	125	43.7	43.7
	Married	140	49.0	92.7
	Others	21	7.3	100.0
WORK EXPERIENCE	1-5 years	108	37.8	37.8
	6-10 years	108	37.8	75.5
	11-15 years	46	16.1	91.6
	Over 15 years	24	8.4	100.0
INDUSTRY	Manufacturing	114	39.9	39.9
	Service	130	45.5	85.3
	Artisan	35	12.2	97.6
	Others	7	2.4	100.0
EDUCATIONAL QUALIFICATION	SSCE	42	14.7	14.7
	HND/BSC	187	65.4	80.1
	MSC/MBA	57	19.9	100.0
AGE	21-30 years	102	35.7	35.7
	31-40 years	109	38.1	73.8
	41-50 years	47	16.4	90.2
	50 and above	28	9.8	100.0

Source:Author's Fieldwork Computation, 2020

Also table 2 below shows descriptive statistics with respect to Political factors, Social factors, licensing, joint ventures

Table 3 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Political Factors	286	1.20	4.20	2.4552	.51954
Joint Ventures Agreement	286	1.00	4.60	2.5140	.59896
Licensing	286	1.20	5.00	2.8042	.68752
Social Factors	286	1.00	4.40	2.6175	.66647
Valid N (list wise)	286				

Source:Author's Fieldwork Computation, 2020

DATA ANALYSIS BASED ON HYPOTHESES

The hypotheses of the study are: (1) Social factors and political risks do not significantly affect licensing; (2) There is no significant effect of social factors and political risks on joint ventures agreement. Multiple regression analysis was used to test these hypotheses with the aim of achieving the study objectives. Multiple regression is based on correlation but embeds more analysis on complex penetration of the existing variables interrelationships with assumptions of normality for dependent variable (i.e. multinational companies entry mode), multicollinearity that assumed that the independent variables

(Social factors and political factors) are not highly correlated, also Homoscedasticity is even and linearity of variables is linear. Also, the normal curve was used to test for normality on Joint Ventures Agreement and Licensing. This study shows that scores are reasonable and normally distributed.

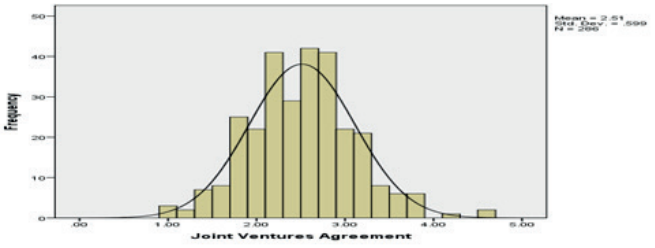


Fig 1 Histogram of Perceived Joint Ventures Agreement Scores.
Source: Author's Fieldwork Computation, 2020

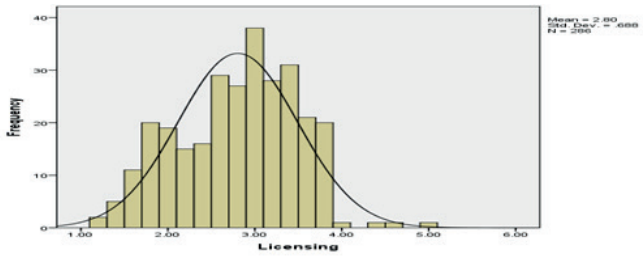


Fig 2 Histogram of Perceived Licensing Scores
Source: Author's Fieldwork Computation, 2020.

Test of Multicollinearity

Multicollinearity shows a correlation of 0.296. Reflecting low multicollinearity challenge among Political risks effects (Political risk factor and social factors). Which below standardized r = .7 and above. The tables below shows all the variables are retained.

Table 4 Correlations among Political Risk Effect Variables

		Political Factors	Economic Factors	Social Factors
Political Factors	Pearson Correlation	1	.366**	.292**
	Sig. (2-tailed)		.000	.000
	N	286	286	286
Social Factors	Pearson Correlation	.292**	.296**	1
	Sig. (2-tailed)	.000	.000	
	N	286	286	286

**. Correlation is significant at the 0.01 level (2-tailed).
Source:Author's Fieldwork Computation, 2020.

Test of Homoscedasticity and Linearity for Hypothesis 0ne

Diagrammed scatter plot in Fig 3 and 4 for testing homoscedasticity and linearity of the relationship between dependent variables (i.e. licensing and joint ventures agreement) and independent variables (i.e. Social factors and political factors). Shows a moderate, positive correlation among the variables.

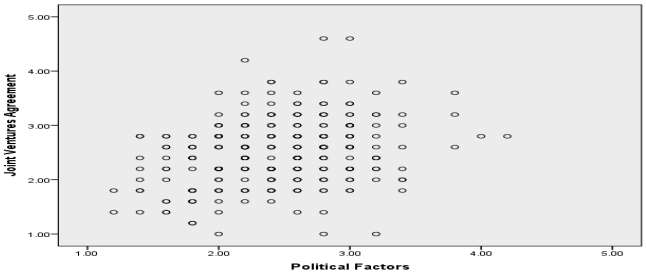


Fig 3 Scatter Plot of Political factors and Joint Venture Agreement Scores
Source: Author's Fieldwork Computation, 2020.

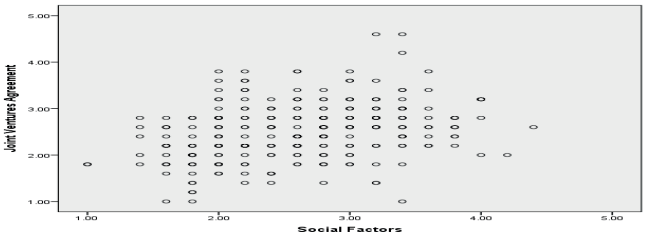


Fig 4 Scatter Plot of Social Factors and Joint Venture Agreement Scores
Source: Author's Fieldwork Computation, 2020.

Test of Hypothesis One

Ho1: Political risk factor and social factors does not significantly affect Joint Venture Agreement. Based on Standard multiple regression reflected F-test of 16.02, less than 1 percent significant to show model was well specified.

Table 5 ANOVAa

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.888	3	4.963	16.020	.000b
	Residual	87.357	282	.310		
	Total	102.244	285			

a. Dependent Variable: Joint Ventures Agreement
b. Predictors: (Constant), Social Factors and Political Factors

Source:Author's Fieldwork Computation, 2020.

The model summary table shows the R Square value of 14.6per cent. This means that the model (which includes Political risk factor and social factors) has 14.6 per cent variance in Joint Ventures Agreement.

Table 6 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.382[a]	.146	.137	.55657

Predictors: (Constant), Social Factors, Political Factors, Economic Factors.

Source: Author's Fieldwork Computation, 2020.

The table 7 below shows a positive relationship between Political risk factor and Joint Agreement Venture reflecting .232 unit increases in Joint Agreement Venture scores which is significant at 1 per cent with 0.05 p value less. The null hypothesis is therefore rejected based on relationship that exists between Joint Venture Agreement and Political risk factor.

Lastly, there was positive relationship between social factors and Joint Venture Agreement which means that a unit rises in social factors scores of .231 unit increase in Joint venture Agreement.

Table 7 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.271	.196		6.495	.000
	Political Factors	.232	.070	.201	3.322	.001
	Economic Factors	.027	.061	.027	.446	.656
	Social Factors	.231	.053	.257	4.369	.000

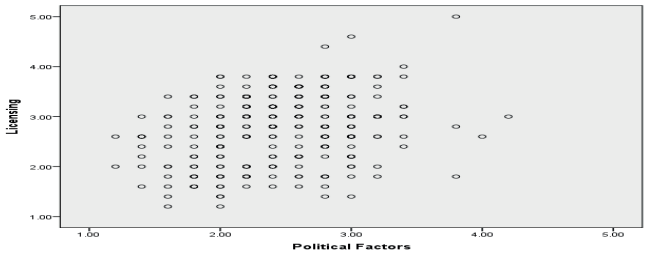
Dependent Variable: Joint Ventures Agreement

Source: Author's Fieldwork Computation, 2020.

Test of Homoscedasticity and Linearity for Hypothesis Two

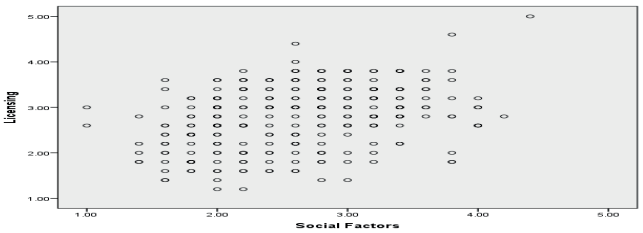
Hypothesis two shows a moderate, positive correlation among the variables. Respondents with low level of licensing entry mode are highly affected by Political risk. On the other hand, firms that are less affected by Political risk factor, economic factor and social factors have high levels of Licensing. The scatter plot shows a fairly even cigar shape along its length for Homoscedasticity.

Fig 5 Scatter Plot of Political Factors and Licensing Scores



Source:Author's Fieldwork Computation, 2020.

Fig 6 Scatter Plot of Social Factors and Foreign Direct Investment Scores



Source: Author's Fieldwork Computation, 2020.

Test for Hypothesis Two

Ho2: Political risk factor and social factors has no significant influence licensing. Standard multiple regression shows that the F-test was 23.14, significant at 1 percent with [p<.000] for Political risk factor and social factors on Licensing. The result of regression as contained in the table of ANOVA,

Table 8 ANOVAa

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	26.608	3	8.869	23.136	.000[b]
	Residual	108.107	282	.383		
	Total	134.715	285			

a. Dependent Variable: Licensing
b. Predictors: (Constant), Social Factors, Political Factors.

Source: Author's Fieldwork Computation, 2020.

Consequently, regression analysis of the Model Summary shows the R Square 1.9 percent. This implies the model (which incorporates Political risk factor and social factors) has around 19 percent of effect on licensing.

Table 9 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.444[a]	.198	.189	.61916

Predictors: (Constant), Social Factors, Political Factors

In particular, the consequence of regression result as contained in the table of Regression Coefficients, tests the second hypothesis of this investigation. From the result underneath, there was a positive relationship between Political risk factor and Licensing such that a unit increment in political risk factor scores caused around .183 unit increments in licensing scores which was factually noteworthy at 1 percent with the guide of the p which is under 0.05. In light of the outcome, the invalid theory is dismissed; subsequently, there was certain connection among Licensing and Political risk factor.

Lastly, there was positive relationship between social factors and Licensing such that a unit rise in social factors

scores induced about .280 unit increase in Licensing scores is statistically significant at 1 per cent with p value (0.000). Based on the result, the null hypothesis is rejected; thus, Licensing is affected by Social Factors.

Table 10 Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.081	.218		4.963	.000
	Political Factors	.183	.078	.138	2.361	.019
	Social Factors	.280	.059	.272	4.757	.000
Dependent Variable: Licensing						

Source: Author's Fieldwork Computation, 2020.

Discussion of Findings of Hypothesis One

The findings of this study have shown that political risk has a positive effect on Joint venture agreement i.e. it has been established that the constraint been faced by joint ventures is on high level of political effect. The Nigeria government should endeavor to create an enabling political atmosphere and political environment which enhances joint ventures and its operational value to the society and for the betterment of the people. However, creating a smooth political environment and political enablement will drive up more hands of local producers in joint partnership with foreign countries which they tends to gain technical and managerial expert skill in business which could aid competence skill labor and contribute positively to the economic growth and development of the country.

Discussion of Findings of Hypothesis Two

The outcome of this study resonates with the views of Nordin (2016) who attempt to measure the impact of social factor on licensing while it is imperative for country to inject more on amenities and create an enabling society for investors in order for them to always prepare ahead of uncertainties. Foreign investor's contribution to growth depends on social conditions in the recipient country, when investors in a particular environment are provided with effective good social conditions of such region will be greatly enhanced because they will have a longer life span to contribute to the country.

Empirical Findings from the Study

The summary of findings from the empirical study is presented in the following sections relative to each objective and findings in the study:

i. The study found that political risk effect does affect Joint venture agreement entry mode indicating that the government of a particular home country should therefore maintain a political stability in law and order in order to reduce the burden for smooth operation as they are capable of developing such home countries effectively where their subsidiaries is located for the betterment of the country and citizen as a whole.
ii. In consonance to the findings of (Zacharakis, 2017) which examine the impact of social factor in which firm with less experience may face difficulties coping with the internal social uncertainty, as they may not have efficient systems for managing their foreign operations.

CONCLUSION

MNCs without incertitude have been discerned as an integral factor of growth and development both in undeveloped and developing countries. It is unfortunate as some of governmental policies and actions do affect them. In global competitive environment MNCs has been increasing in relevance to nations mostly in developing countries through many of its subsidiaries. MNCs in Nigeria have been limited in full huge success. This is reflected in joint venture agreement, foreign direct investment and licensing in Nigeria. In the light of existing literature on political risk effect and Multinational Corporations mode of entry issues captured in this study; and the analyses of collated primary data; the study found that political and social factors had significant effects on MNCs entry mode as captured in this descriptive study.

POLICY RECOMMENDATIONS

i. Following the findings and conclusion, the study made the following recommendations:
ii. Government is implored to create enabling operating environment in the marketplace as it is important to revisit multinational regulatory laws to minimize areas of overlap and to enhance proper execution for favorability of multinational corporations that will develop the economy and create more jobs.

Multinational Corporations are encouraged to continue to study each political risk factor that may hinder smoothly the operational excellence of their firm in advancement of their subsidiaries and they are encouraged to play effective employability creation role in the home country so as to be much perceive as a contributor to their growth and development as much as that is being put to place, they should not put aside their responsibility to the community and society in which they operate in each developing nations.

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SCIENTIFIC PAPER

OPTIMAL CROP PLAN OF COOPERATIVE FARMERS IN OSUN STATE, NIGERIA: A LINEAR PROGRAMMING APPROACH

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Abstract: *Optimal level of production requires better use of existing resources at the lowest possible cost. Despite the inherent advantage of cooperatives to the agricultural sector, the question of how farmers under cooperative umbrella use farm resource for optimal outcome remains unanswered. This study investigates optimal crop mix for cooperative farmers in rural communities in Southwest Nigeria. Primary data were collected for the study through structured questionnaire. The data were fitted to Linear Programming Model. Three different cropping patterns are identified among the cooperative farmers. Based on the results from linear programming model, only maize, cassava and yam are admitted in the final plan and this combination is to be produced at 2.23 hectares. The gross margin value associated with the plan is ₦156, 235.781 (1$ = N365). Input resources such as land, labour, fertilizer, and chemicals are not fully utilized. The slack values for these inputs are 0.31, 651.20, 1929.6 and 140.76 respectively. The sensitivity analysis shows that seed/seedling is the only binding resource in the final plan with a shadow price which suggests that proper allocation of seed and seedlings would improve returns to cooperative farmers. There is need for appropriate farm management strategies to ensure optimal return for farmers. More education and training is suggested to boost cooperative farmers understanding of optimum strategy that is needed to improve production and earnings.*

Keywords: *cooperatives, rural, crops, linear programming, optimum plan*
JEL Code: Q10, Q13

INTRODUCTION

The significance of cooperative farming lies in the opportunity to pool limited resources together in particular areas of activities to achieve mutual economic related advantage (Milovanovic and Smutka, 2018; Bishop, 2012). Since the historical beginning of cooperative movement, a large number of successes have been recorded across the globe (Argaw, 2012). Some of the recorded advantages of farm related cooperatives include provision of inclusive access to land resources (Birchall, 2003), market access (Barrow et al. 2005), and agricultural related services (Adeyemo, 2004). Despite the inherent advantage of cooperatives to the farming and agricultural sector, the question of how farmers under cooperative umbrella use farm resource for optimal outcome remains unanswered. The level of efficiency of smallholder resources has important implications for the agricultural and rural development. Optimal level of production requires better use of existing resources at the lowest possible cost. The efficient method of producing a product is that which uses the least amount of resources to get a given amount of the product. An increase in efficiency in arable crop production could present a ray of hope and could lead to an improvement in the welfare of the farmer and consequently a reduction in their poverty level and food insecurity. As noted by Likita (2005), low yields could be attributed to inefficient techniques of production and input mix, over utilization of household resources, and over dependence on physical labour use instead of machines.

Agriculture in Nigeria as in most other developing countries is dominated by small farm producers who play a vital role in the overall development of Nigeria. Aside provision of food for the ever increasing population, employment opportunities are also provided for over 65 per cent of the

population. Raw materials and foreign exchange earnings for the development of the industrial sector are also expected from Nigeria agricultural sector (Oladeebo, 2004; Olaoye, 2014). Despite the importance of agriculture to the Nigerian system, smallholder farmers still constitute about 80% of the farming population in Nigeria who are also characterized by low level of production (Awoke and Okorji, 2004). These farmers usually produce on small scale at subsistence level, with an average land size of five hectares on annual basis. But, available evidence shows that farmers who produce at relatively low scale may not be able to maximize return without optimal cropping plan. It is expected that optimal level of productive activities ensures efficient resource utilization (Hassan et al., 2005). Possibility of achieving optimum level in production, in addition to a number of factors, could be attributed to appropriate specification of inputs or resource allocation issues. However, allocation problems are generally related to utilization of limited resources to best advantage (Lucey, 2002). In the absence of resource constraints, a producer could allocate resources without being able to optimize (Olayemi and Onyenweaku, 1999). Consequently, it is important to lay greater emphasis on utilization of limited resources and appropriate combination of crop enterprises in an optimal manner in the food supply sector. However, limited studies exist on determination of optimal crop combination for resource poor farmers. This study provides answers to the following research questions: What is the optimum cropping plan for arable crop enterprises? Given the resource constraints and possible alternative combinations, how should the respective farmer allocate available resources to optimize output? What is the minimum size of hectares required for each of the farmers to maximize profit? Is the optimum plan different from the existing crop farm plans for farmers? Answers to these questions are provided through careful analysis of the data using linear programming approach.

Optimum decision making is based on a quantitative analysis for achieving desired goal of arable farmers. The use of linear programming in management and decision making originated in the 1940s during World War II, when a team of British scientists applied it in decisions among the military regarding the best utilization of war material (Taha, 2011). Generally, mathematical programming tools have afterwards been employed in wide range of farm related activities including crops and livestock (Mehta, 1992). In a regional/ inter-regional framework, linear programming approach has been used for studies in optimum resource allocation and resource requirements in many countries (Mellaku, et al. 2018; Wankhade and Lunge, 2012; Gadge et al. 2014).

Under cooperative setting, a number of farmers have been found in different clime with tendencies to pool together their resources to improve production and rural farm earnings (Allahdadi, 2011; Verhofstadt and Maertens, 2015; Baruwa et al. 2016). But, the scope of cooperative farming is remains unknown in Nigeria. However, within Nigeria, application of linear programming models to farm enterprises in various states has also been reported (Tanko, 2004; Igwe et al. 2012). The usage include specification of different levels of products, factor and product prices. While farmers have different reasons for the cropping systems adopted and the enterprises combined, two major reasons that are most outstanding are that of net income stabilization and maximization. Although different levels of crop plan have been suggested for farmers, most recommendation to farmers is strictly limited to different geographical boundaries of farmers. For example, Phillip et al., (2019) in Northern Nigeria recommended combinations involving groundnut, sorghum and maize. Earlier, Igwe and Onyenweaku (2013) did a mix up between crop and livestock making it difficult to have a clear policy guide for the farmers. Tanko (2010) was able to conclude that farm enterprises combination is not optimal for most farmers in Northern part of Nigeria, except in a condition where farmers could be given opportunity to have access to more arable land.

Opportunity to maximize return from adequate crop plan is found to be hindered by poor distribution of financial assets to farmers on equitable basis (Ohajianya and Oguoma, 2009). Farm resources were found to be poorly optimized as areas of cultivation were found to be small. Central to resolving food shortage amidst growing population is determination of adequate crop combination plan for farmers. Ibrahim and Bello (2009) found that combination of maize, cassava and yam was found to be central to resolving food insecurity in Nigeria. Optimal farm plan was examined in sweet potato cropping systems and the optimal crop combination was sweet potato/cassava cropping system. While capital was a limiting resource, land and labour were non-limiting and there were 0.06 ha of unused land and 3.13 man-days of unused labour. Increased capital investment was recommended for increased production of the crop.

Babatunde et al., (2007) found the optimal crop combination in vegetable farming to include mix of tomato, cucumber, onion, and watermelon enterprise. But, contrary to similar studies, land was found to be the limiting factor. Tanko et al., (2006) employed linear programming to determine the most profitable enterprise in Nigeria. The results reveal existence of divergence between the existing and optimum farm plans for the different tenure groups. Farm resources were not optimally allocated and there is a considerable scope for increasing farm incomes by reallocating the existing resources in an optimal manner. Also, the findings of Igwe et al., (2011) on optimum enterprise combination through linear Programming application, showed that combination of crops involving cassava, maize and cocoyam is appropriate for farmers. In addition to geographical variation associated with most existing studies, gross margin analysis of the suggested enterprises is usually not included. Policy recommendation involving optimal analysis is better supported with gross margin analysis to provide clear guide to farmers on the appropriate direction to follow with respect to crop combination to achieve desirable optimal outcome.

MATERIALS AND METHODS

The study was carried out in Osun State, located in Southwestern part of Nigeria with approximately 9,026 km^2

in terms of land area. Primary data were collected using questionnaire. A two-stage sampling technique is used. The first stage involves random selection of two villages from three local government areas in the study area. The last stage involves selection of twenty members of cooperative farming group from each of the villages using the snowball sampling technique. Thus, a total of one hundred and twenty respondents were sampled. Data collected covers socio-economics of respondents, quantities and prices of inputs and outputs. Analysis of the data was carried out using descriptive statistics and linear programming model.

The objective function of the linear programming (LP) is total gross income less the total variable costs (TVC). The TVC includes the costs of human labour, tractor/power tiller hiring, and marketing. Other variable costs include depreciation on fixed cost items and rent on land. Following Tanko (2004), Alam, et al. (1995) and Sama (1997), the implicit form of the model is presented as:

$$Max\ Z=X_1+X_2+X_3...Xn \quad (5)$$

Subject to:

$$X_1+X_2+X_3 \leq \text{Ls (Land)} \quad (6)$$
$$X_1+X_2+X_3 \leq \text{Sd (Seed)} \quad (7)$$
$$X_1+X_2+X_3 \leq \text{Fz (Fertilizer)} \quad (8)$$
$$X_1+X_2+X_3 \leq \text{ch (Chemical} \quad (9)$$
$$X_1+X_2+X_3 \leq \text{mac (Machine)} \quad (10)$$
$$X_1+X_2+X_3 \leq \text{Lab (Labour)} \quad (11)$$

Where,

Z = Total Net farm income of the farm in Naira (N) currency (1$ = 360 N), Ls=Total available land in hectares for the crops, Sd = Amount spend on seeds, Fz = Amount spend on fertilizer, Ch =Amount spend on various chemicals, Mac=Tractor hired over a period, Lab=Number of hired human labour. The constraints were land, labour (human), tractor/power tiller and capital require that the amount of a resource required to produce the n crop activities must not exceed the available. The price coefficient of a production activity in the model is the gross value of output per hectare of all the crops. For a human labour hiring activity, the price coefficient is the ruling wage rate. The price coefficient of a tractor hiring activity is the cost of hiring. For a capital borrowing activity, the price coefficient is the prevailing market rate of interest, while for a selling activity; the price coefficient is the marketing expense per unit of the product sold. The input coefficient is the requirement of a crop activity in respect of the inputs of the different resources measured in terms of per hectare basis (unit of land). The input coefficients for all the crop activities are calculated on the basis of the actual quantities of different resource that are used for those crop activities. Six restrictions/constraints were incorporated in the model. These are: land, human labour, machine, fertilizer, seed, and chemicals requirement constraints.

The crop activities in the model were three; intercrops maize/cassava, maize/cassava/yam, and maize/cassava/ pepper/tomatoes. About 50% (60) cultivated maize/cassava, 16.7% (20) cultivated maize /cassava/yam, while 33.3% (40) cultivated maize/cassava/ pepper/ tomatoes.

Linear programming model specifications

The model shows the unit of each resource combined to obtain the optimum farm plan.

$$\text{MaxZ}=13323.95X_1+701875.8X_2+179603.7X_3$$

Subject to:

$1.0X_1+1.0X_2+1.0X_3 \leq 2.54$ *ha (Land)*
$409.41X_1+409.41X_2+397.9X_3 \leq N1044.25$ *(seed)*
$5123.8X_1+4882.35X_2+5000X_3 \leq$ N12797.62 *(fertilizer)*
$990.1X_1+1041.9X_2+771.01X_3 \leq$ ₦2460 *(Chemical)*
$3548.5X_1+3176.47X_2+3188.9X_3 \leq$ ₦8371.77 *(Machine)*
$3252.14X_1+3644.12X_2+3337.390_3 \leq$ ₦8762.92 *(Labour)*

The objective function (Z) is maximization of the gross margin of the enterprise combined, subject to: X1 = hectare cultivated to maize/cassava intercrop, X2 = hectare cultivated to maize/cassava/yam intercrop and X3 = hectare cultivated to maize/cassava/pepper/Tomatoes intercrop.

RESULTS AND DISCUSSION

Results in Table 1 show the descriptive characteristics of the respondents. Most of the respondents fall in the age bracket below 50 years indicating the level of youth involvement in agriculture. Expectedly, due to gender perception in the study area, more male (80%) are involved in farming activities. Very high percentage (83.3%) of the respondents is married. Level of education of the respondents is relatively impressive with 35.8% having attended primary school education while 36.7% of the respondents attended secondary school. This implies that 72.5% have formal education. The distribution of the respondents by their major occupation shows that 65.8% were farmers. Mode of land acquisition varies: 54.17% of the respondents obtained land by inheritance, 41.7% by rent, while 4.2% purchased their land. The table below shows the distribution of the respondents according to their farm size. Descriptive of land size shows that 78.3% of the respondents have between one and three hectares, 11.8% uses 3.5 to 5.5 hectares, 5% uses 6 to 8 hectares while 4.9% uses 8.5 hectares of land and above.

Table 2 presents the cropping system, production cycles and enterprise combination among the sample respondents. Most of the sample farmers engage in intercropping (54.7%) while 47.5% produce sole crop. These crops are usually produced once a year (54.7%) by some farmers while 45.3% produce twice a year. The enterprise combination of the cooperative farmers varies among different categories of crop including maize, cassava, pepper, tomatoes and yam. However, 49.6% of the farmers combine maize and cassava on the same land area, 33.7% combine maize, cassava, pepper and tomatoes while 16.7% combine maize, cassava and yam.

Table 1: Characteristics of sample respondents

Variables	Description	Frequency (%)
Age (years)	Below 20	8(6.8)
	21-30	19(16.1)
	31-40	29(24.6)
	41-50	24(20.3)
	51-60	23(19.5)
	Above 60	15(12.7)
Gender	Male	96(80.0)
	Female	24(20.0)
Marital	Single	8(6.7)
	Married	100(83.3)
	Divorced	2(1.7)
	Widow/Widowers	10(8.4)
Education	Informal	23(19.2)
	Primary	43(35.8)
	Secondary	44(36.7)
	Tertiary	10(8.3)
Farming experience (years)	1-10	30(25.0)
	11-20	41(34.17)
	21-30	49(40.83)
Occupation	Farming	79(65.8)
	Civil service	7(5.8)
	Trading	34(31.3)
Forms of land acquisition	Inheritance	65(54.17)
	Rent	50(41.66)
	Purchased	5 (4.17)
Land size (ha)	1-3	94 (78.3)
	3.5-5.5	14 (11.8)
	6-8	6 (5)
	8.5 and Above	6(4.9)

Table 2: Production, activity and crop combination of the farmers

	Activity	Frequency (%)
Cropping system	Mono cropping	57 (47.5)
	Intercropping	63(52.5)
Production cycle per year	Once	64 (54.7)
	Twice	53 (45.3)
Enterprise combination	Maize/cassava	60(49.6)
	Maize/cassava/pepper/tomatoes	40(33.7)
	Maize/cassava/yam	20(16.7)

Linear programming analysis of the enterprise combinations

The optimum farm plan of the three identified enterprise combinations of the sampled cooperative farmers is presented in Table 3. The LP outcome supports one (1) out of the 3 basic cropping activities included in the model. The supported activity and its land area allocation (ha) is combination of maize, cassava and yam at 2.23 ha. The optimal solution occurs with most of the resources not fully utilized. The gross margin realized for the optimal farm plan was ₦156, 235.781 (1$ = N356) (programme value). In order to achieve this, the LP results suggest that 2.23 units of maize/cassava/yam should be produced. This implies that the objective of income maximization requires that the farmers should do away with the non-basic activities, and focus more on production of maize/cassava/yam, because forcing in the non-basic activities will reduce the programme value. With respect to resources, the result shows that only one of the specified resources was fully utilized in arriving at the optimum solution. This resource is seed/seedling. The shadow price for the fully utilized resource was N1, 496.15 (1$ = N356). Shadow price is the maximum amount a farmer would be willing to pay for the next unit of input constraints. This implies that if additional value seed/seedling is available, if properly allocated, it would contribute ₦1, 496.15 (1$ = N356) to the farmer's income.

The non-fully utilized resources were land, labour, fertilizer, machinery and chemical. Respectively, the excess values for these non-fully utilized resources (slack value) are 0.31, 651.20, 1929.6, 1301.02 and 140.76 for land, labour, fertilizer, machine and chemical respectively. The LP programme suggests that if the optimum farm plan is to be implemented, the cooperative farmers should spend ₦8, 111.72, ₦10, 868.00, ₦7, 070 and ₦2,319.24 on labour, fertilizer, machine and chemical respectively while 2.23ha of land should be used. The non-basic activities were maize/cassava and maize/cassava/pepper/tomatoes. The non-basic activities have the reduced cost or reduced gradient of ₦599,216.46 (1$ = N356) and ₦415,715.96 (1$ = N356) respectively. Reduced cost is signified by how much the programme value will decrease if any of the non-basic activities was forced into the programme.

Table 3: Linear programming model result

Objective		Original value	Final value	
Enterprise combination		156235.78	156235.78	
Maize/Cassava		0	0	
Maize/Cassava/Yam		2.23	2.23	
Maize/Cassava/Pepper/Tomato		0	0	
Constraints	**Value**	**Status**	**Slack**	**Shadow value**
Land	2.23	Not binding	0.31	0
Seed	1044.25	Binding	0	1496.15
Fertilizer	10867.25	Not binding	1929.62	0
Chemical	2319.24	Not binding	140.76	0
Machine	7070.75	Not binding	1301.02	0
Labour	8111.72	Not binding	651.20	0
Enterprise 1	0	Binding	0	0
Enterprise 2	2.23	Not binding	2.23	2.23
Enterprise 3	0	Binding	0	0

Table 4: Sensitivity analysis of the LP programme

Objective	Final Value	Reduced Cost
Enterprise Combination	156235.78	156235.78
Maize/Cassava	0	-59921.46
Maize/Cassava/Yam	2.23	0
Maize/Cassava/Pepper/Tomatoes	0	-41571.96

DISCUSSION AND CONCLUSION

This study focused on evaluation of crop enterprise combination among cooperative farmers. The analysis of the optimal combination of arable crops through linear programming approach is the core of the study. The optimum cropping plan for crop enterprises is identified under resource constraints while other existing enterprise options for the cooperative farmers are also presented. The study also identified the minimum size of hectares needed for the farmers to achieve the goals. This is consistent with the suggestion of Mellaku et al., (2018). The results from six rural communities in part of south west region of Nigeria suggest that the performance of enterprise allocation through linear programming approach returns higher gross margin for the identified optimum crop enterprise combination.

There is evidence that the optimal combination of crops for cooperative farmers should be a combination of maize, cassava and yam on a minimum land size of 2.23 hectares. While there is existence of geographical difference in studies and lack of focus on cooperative farmers, the findings of this study largely agree with Igwe et al., (2013) on the optimal combination of crops. Also, earlier studies of Ibrahim & Bello (2009) show that farmers would benefit immensely from combination of maize, cassava and yam in savanna region. Yet, most of the resources for this optimal solution are not fully utilized. By implication, cooperative farmers need to do away with activities that are non-basic. Inclusion or forcing of non-basic activities into farming programme could result in 'reduced cost' or 'reduced gradient'. Under different land size and geographical difference, our findings partly align with Phillips et al. (2019) who found inclusion of maize as part of the optimal combination of crops. Reduced cost normally signifies how much the programme value will decrease in the presence of non-basic activities. The only resource input that is fully utilized in the LP solution is seed/seedling of the identified crops. The shadow price for the seed/seedling is measurable suggesting that proper allocation of additional unit of the resource input would lead additional increase in return. Furthermore, the LP solution indicates that a number of resources are not fully utilized by the cooperative farmers. These include land, labour, fertilizer, machinery and chemical with relatively high slack values. Aside, enterprise combinations such as maize and cassava on one hand, and maize, cassava, pepper and tomatoes on the other are found to exist among the cooperative farmers. But, none of these two levels of enterprise combinations are found to be optimal.

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SCIENTIFIC PAPER

PROFIT EFFICIENCY AMONG CATFISH MARKETERS IN LAGOS STATE, NIGERIA: A STOCHASTIC PROFIT FRONTIER ANALYSIS (SPFA) APPROACH

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Abstract: *The study analyzed the determinants of profit efficiency among catfish marketers in Lagos state, Nigeria. Multistage sampling procedure was used to select 120 catfish marketers, data were collected with the aid of a structured questionnaire. The data collected were analyzed with the use of descriptive statistics, enterprise budgetary technique, Shephered-Futrell method and stochastic profit frontier analysis (SPFA) model. The result of the gross ratio and net return on investment reveals that catfish marketing was a profitable and bankable enterprise. About 76.72% of sales revenue was taken up by the costs. The SPFA reveals that cost of catfish purchased and depreciation cost had positive ($p<0.01$) effects on profit while transportation cost ($p<0.01$) and labour cost ($p<0.05$) had negative effects. Furthermore, marital status and credit use ($p<0.01$) had negative effects on profit inefficiency, the mean profit efficiency of the catfish marketers was 74%. The study concluded that catfish marketers were inefficient, however, to improve the efficiency of the marketers and create more job opportunities; the study recommends that credit facilities that will enable the marketers increase their scale of operation, acquire better marketing resources and employ capable hands in catfish marketing should be made available and accessible. Policies that will help to provide good road networks and reduce the pump price of premium motor spirit (PMS) should be given adequate consideration*

Keywords: *Catfish, marketing efficiency, profit efficiency, stochastic profit frontier*
JEL Code: Q13

INTRODUCTION

In recent times, there has been a rising awareness for fisheries and aquaculture in Nigeria which has translated greatly to increase in fish marketing with catfish taking the bulk of the farmed species. This boom in the fishery industry coupled with the increase in human population has led to an increase in annual per capita consumption and high demand for catfish, especially as an important economic source of animal protein to meet the daily dietary requirements; thus, it represents a significant proportion of animal protein in the diet of most Nigerian, and globally, accounting for about 6.7 per cent of all protein consumed by humans (FAO, 2016; Robadue et al., 2018). Catfish production and marketing are equally important in order to create more jobs, increase income and livelihood diversification towards poverty reduction.

According to Shaw (2012), marketing activities are needed in the process of distributing the catfish from producers to its final consumers. These activities have an important role in facilitating the interactions between the forces of demand and supply through the adjustment of catfish prices across time and space, also in dealing with the risks arising as a result of shocks to the demand and supply factors existing in a market. Markets that are well-integrated help in reducing variability in prices encountered by both consumers of catfish and marketers. Hence, it is important to examine the supply chain and its performance especially the marketing activity (Barrett, 2005; Shin et al., 2018). Ladu et al. (2013) reported marketers to be important participants in the distribution process; they take specific roles (such as fishing, processing, marketing and reprocessing to maintain its value pending the time of sale) in the marketing of different forms of fish. Thus, in response to changing economic conditions, there is

a need to examine the ability of these catfish marketer in achieving the highest possible profit given the cost incurred to know how profit efficient they are.

In Nigeria, the annual demand for catfish far exceeds local production which has resulted in high importation. Thus, effort must be concerted if this gap is to be close. There is a need for price efficiency through efficient marketing to encourage marketers. However, challenges such as inadequate market information, poor market structure, inadequate storage facilities and product deterioration had led to price instability and low income of the marketers which has greatly affect price efficiency of the marketers (Eze et al., 2010). Also, catfish marketers travelled longer distances to buy or sell their product, a situation, which has created gaps between supply and demand, exerts pressures on handling and packaging; and has also led to unstable market prices and reduced marker margins. This is coupled with the fact that catfish is a perishable product and is susceptible to spoilage (Ali et al.,2008; Falodun, 2011).

Previous researches carried out on catfish in Nigeria focused on the risk-coping strategies, production, catfish culture and resource use efficiency (Ugwumba et al., 2010; Adewumi and Olaleye, 2011; Olasunkanmi and Yusuf 2014). In spite of the increase in catfish production in Nigeria, little attention has been given to profit efficiency of catfish marketers; given the potentials of the catfish industry in contributing considerably well to the socio-economic development of Nigeria through job creation, income generation, food security and livelihood diversification. It is against this backdrop that this study described the socioeconomic characteristics of catfish marketers, estimated the marketing efficiency levels of catfish marketers, and analyzed the factors influencing profit efficiency among catfish marketers and estimated the profit efficiency levels among marketers.

Theoretical Framework

The theoretical framework underpinning this study was profit efficiency model. The profit function approach combines the concepts of technical and allocative efficiency in the profit relationship and any errors in the production decision are assumed to be translated into lower profits or revenue for the producer (Ali et al., 1994). Profit efficiency, therefore, is defined as the ability of a catfish marketer to achieve the highest possible profit given the prices variable inputs and levels of fixed factors of that farm. Profit inefficiency in this context is defined as the loss of profit for not operating on the frontier. Ali and John (1989) extended the stochastic production frontier model by suggesting that the inefficiency effects can be expressed as a linear function of explanatory variables, reflecting farm-specific characteristics.

The advantage of this model is that it allows the estimation of a marketer specific efficiency scores and the factors explaining the efficiency differentials among marketers in a single-stage estimation procedure. Following Rahman et al. (2012) this study utilizes the Battese and Coelli (1995) model by postulating a profit function, which is assumed to behave in a manner consistent with the stochastic frontier concept. The stochastic profit function is defined as:

$$\pi^* = \frac{\pi}{\rho} = h(q_i, z)\exp(v_i - u_i)$$

Z = vector of fixed input(s); P = output price used to normalize variables in the model; π = marketer's profit defined as total revenue minus the total cost of incurred; while total cost is made up of the cost of inputs; $\exp(v_i-u_i)$ = composite error term.

The profit/economic efficiency (EE) of an individual marketer in the context of stochastic frontier profit function is derived as a ratio of the predicted, observed or actual profit (πi) to the corresponding predicted maximum profit (π*i) for the best marketer or frontier profit given the price of variable inputs and the level of fixed factor(s). Mathematically, it is expressed following Sunday, et al. (2013) as:

$$\text{Profit Efficiency (EE)} = \frac{\text{Actual farm profit}}{\text{Frontier profit}} = \frac{\pi_i}{\pi_i^*} = \frac{(q_i,z)\exp(v_i - u_i)}{(q_i z)\exp(v_i)}$$

$$\text{Profit Efficiency} = \frac{\exp(v_i - u_i)}{\exp(v)} = \exp(-u_i)$$

RESEARCH METHODOLOGY

Study Area

The study was conducted in Lagos state, Nigeria. The state is inland in southwestern Nigeria, with its capital at Ikeja. It is bounded by Ogun state in the west, by the Benin Republic behind its southern borders lies the Atlantic Ocean. The state is located in the rainforest vegetation belt of Nigeria within longitude 3o 45 E and 6035E and latitudes 6.538oN and 6o 35N in the tropics. The land area is 3,577square kilometer. Lagos State is arguably the most economically important state of the country, the nation's largest urban area. Fresh fish production and marketing is common in the state due to large water bodies.

Sampling Technique and Sample Size

Multistage sampling technique was used for this study, the first stage was a purposive selection of Kosofe Local Government Area (LGA) due to high concentration of cat fish marketers, the second stage involved random selection of five markets out of eight markets in the LGA through the use of table of random numbers, the selected markets were; Mile 12 market, Ketu market, Ikosi market and Ajelogo market. The third stage involved selection of 24 catfish retail marketers from each of the selected markets to arrive at a total sample size of 120 respondents.

Data Source and Collection

Data for this study were obtained from primary source. Primary data were obtained with the aid of a structured questionnaire, data collected were on their socio-economic characteristics such as; age, sex, marital status, years of marketing experience, level of education, etc. data were also collected on marketing cost and returns.

Analytical Technique and Model Specification

The data collected from the field was analyzed using descriptive statistics, enterprise budgetary technique, Shephered –Futrell, and stochastic profit frontier model.

Enterprise Budgetary Technique

Enterprise budgetary technique was used to estimate the marketing cost and returns, Following Nwankwo et al. (2017) the enterprise budgetary technique used to estimate the enterprise profitability was specified as;

GM = TR-TVC (4)

GR = TC/TR (5)

NMI = TR-TC (6)

NROI = NMI (7)

TC = FC+VC (8)

Where;

GM= Gross margin, GR=Gross ratio, TR=Gross ratio, TR=Total revenue, TVC=Total variable cost, NMI=Net marketing income/profit, TC= Total cost, NROI= Net return on investment.

Marketing Efficiency

The Sherpherd-Futrell method was used to determine the efficiency of catfish marketing by the, following Ugwumba and Okoh (2010), it is as specified as;

$$ME = \frac{TC}{TR} X \frac{100}{1} \quad (9)$$

Where;

ME = Coefficient of marketing efficiency

TC = Total cost incurred by the marketers

TR = Total value of the product sold.

Stochastic Profit Frontier and Profit Inefficiency Models

A multiple regression model based on the stochastic frontier profit function which assumes Cobb-Douglas functional form was employed to determine the profit efficiency of catfish marketers in the study area. Following Sunday et al. (2013), the model was therefore specified as follows;

$$\ln\pi_i^* = \beta_0 + \sum_{j=1}^{5} \beta_j \ln X_{ji} + vi - ui \quad (10)$$

Where;

π= normalized profit computed for i-th farmer,

ln = natural log,

X_1= cost of catfish purchased (Naira/naira) normalized by the price of catfish,

X_2= cost of labour (Naira/ mandays) normalized by the price of catfish,

X^3= cost of tax levied (Naira/naira) normalized by the price of catfish,

X_5= cost of transportation (Naira/naira) normalized by the price of catfish,

X_5= depreciation on assets (Naira/naira) normalized by the price of catfish,

β_0, $\beta_1 ... \beta_5$ are parameters to be estimated, vi represents statistical disturbance term and ui represents profit inefficiency effects of ith farmer.

The determinants of profit inefficiency of catfish marketers in line with Ogunniyi (2011) were modeled following specific characteristic of marketers in the study area. From equation (2) the component is specified as follows:

$$u_i = \lambda_0 + \sum_{r=1}^{7} \lambda r\, w_r + k \quad (11)$$

Where:

u_i = Profit inefficiency of i-th farmer, $\lambda_0$and λ_r are parameters to be estimated, are variables explaining inefficiency effects, r =1,2,3....,n, k is truncated random variable,

w_1= Marketer`s age (year),

w_2= Level of education (years),

w_3= Marital status (married = 1, single =0),

w_4= Household size (number),

w_5= Farming experience (years),

w_6=Membership of cooperatives (yes =1, no =0),

w_7= Credit access (had access =1, had no access = 0),

RESULTS AND DISCUSSION

Socioeconomic Characteristics

Table 1 shows the frequency distribution of respondents. Almost all of the respondents were female while fewer were male; this implies that women constitute a greater percentage of those involved in catfish marketing in the study area. This result agrees to that Nwankwo et al. (2017) that marketers are predominantly female. More than half of the catfish marketers are within 41-60years of age with a mean age of 42years, this implies that the majorities of the catfish marketers was still very agile, energetic and are within their productive age and this may positively influence their marketing efficiency level, this result supports the findings of Ugwumba and Okoh (2010). Larger proportion of the respondents were married, this implies that most of the catfish marketers are matured and responsible to cater for their households as well as have a clear knowledge of their wellbeing, there is also an implanted sense of responsibility as marital status prompts commitment to business because of the family needs that must be met and this would subsequently enhance marketing efficiency, this result corroborates the findings of Njoku and Offor (2016). More than half of the respondents had primary education. The results signify that catfish marketers are literate which is of significant importance in their marketing decision-making process which may contribute positively to their marketing efficiency. This finding agrees with Ugwumba and Okoh (2010) that revealed that literate marketers find it relatively easy in their dealings with people more especially in the exchange process. Larger percent of the respondents had between 1-5persons in their households with a mean household size of 5 persons, this implies that most of the catfish marketers had a fairly large household labour they could employ in their business, and this result is in line with the findings of Njoku and Offor (2016) and Nwankwo et al. (2017). Larger percent of the respondents had less than 10years marketing experience with mean marketing experience of 9years, this implies that most of the catfish marketers had enough experience about marketing and this may influence their efficiency positively and this may increase their profit, this corroborates the finding of Njoku and Offor (2016).

Table 1: Distribution of Respondents According to their Socioeconomic Characteristics.

Variable	Frequency	Percentage	Mean	Standard deviation
Sex				
Female	111	92.50		
Male	9	7.50		
Total	120	100.00		
Age (years)				
1-20	3	2.50	42	9.46
21-40	42	35.00		
41-60	75	62.50		
Total	120	100.00		
Marital status				
Single	20	16.67		
Married	100	83.33		
Total	120	100.00		
Level of education				
No formal	1	0.83		
Primary	75	62.50		
Secondary	38	31.67		
Tertiary	6	5.00		
Total	120	100.00		
Household size (persons)				
1-5	81	67.50	5	1.78
6-10	39	32.50		
Total	120	100.00		
Marketing experience (years)				
≤10	91	75.83	9	4.85
11-20	28	23.33		
21-30	1	0.83		
Total	120	100.00		

Source: Field Survey, 2019.

Profitability of Catfish Marketing

Table 2 shows the estimated costs and returns of catfish marketers in the study area. The cost analysis revealed that the cost of purchases accounted for 89.41% of the total cost of marketing, transportation costs accounted for 6.06%, the tax levied (1.34%) and labour cost accounted for 2.36% of the total cost of marketing. This result is in tandem with the findings of Bassey et al. (2015) which reported that purchases constituted 95.2% and 96.2% of the total cost of marketing of fresh fish for the wholesalers and retailers, followed by transportation costs (3.7%) and security charges (0.23%) for the wholesalers and 2.6% and 0.24% for the retailers. The Gross margin analysis revealed that the raw marketing profit was ₦4,263,688 for catfish marketers; this implies that catfish marketing in the study area was profitable, as this is similar to the result of Abah (2013). The justification of this may be due to higher volumes of investment and turnover as well as better economies of scale enjoyed in the marketing process. The Net return on investment of 0.23 for the catfish marketers implies that for every ₦1 expended in the enterprise, 23 kobo is realized, hence re-confirming that the enterprise is profitable. This result supports the findings of Bassey et al. (2015) that reported 0.24 and 0.23 net return on investment by fresh fish wholesalers and retailers. Furthermore, the gross ratio measures producers' ability to maximize cost or efficiency in input utilization and other costs of production to improve profit. The lower the gross ratio the better is the business, conversely, the higher the gross ratio the worst is the business. The gross ratio of 0.77 for catfish marketers in the study area implied that 77% of the total income generated was used in offsetting marketing costs. By implication, the profit made by catfish marketers was 23% over the capital invested. This result recorded a similar finding with Bassey et al. (2015).

Table 2: Estimated Costs and Returns of Catfish Marketers per month

Marketing cost	Amount (₦)	% of TC
Variable Cost (VC)		
Cost of fish purchased	12236500	89.41%
Transportation	829800	6.06%
Tax levied	183612.32	1.34%
Labour	323400	2.36%
Total Variable Cost (TVC)	**113573312**	**99.18%**
Fixed Cost (FC)		
Depreciation on assets	111805.9	0.82%
Total Cost (TC)	**13685118**	**100%**
Total Revenue	**17837000**	
Gross Margin (GM)	**4263688**	
Gross Ratio (GR)	**0.77**	
Net Marketing Income (NMI)	**4151882**	
Net Return on Investment (NROI)	**0.23**	

Source: Field Survey, 2019.

Marketing Efficiency Level of Catfish Marketers

Table 3 shows the estimation of the marketing efficiency level of catfish marketers using Sherpherd-Futrell technique. The Shepherd-Futrell technique which has been proved to be a better method of calculating marketing efficiency (Arene, 2008), yielded coefficients of marketing efficiency of 76.72%. This result indicated that 76.72% of their sales revenue was taken up by costs. That is, the lower the coefficients of marketing efficiency the higher the level of efficiency. This result agrees with the postulation of by Ugwumba and Okoh (2010) that 92.05% and 82.33% marketing efficiency level was recorded for wholesalers and retailers of catfish marketing in Anambra State, Nigeria.

Table 3: Estimation of marketing efficiency levels- Shepherd-Futrell technique

Items	Amount
Total Revenue (TR)	17837000
Total Cost (TC)	13685118
Marketing Efficiency (ME)	76.72%

Source: Field Survey, 2019.

Determinants of Profit Efficiency among Catfish Marketers

Table 4 shows the maximum likelihood estimates (MLE) of the stochastic profit frontier model parameters for catfish marketers in the study area. The estimate of the variance parameter (σ2) 0.63 is significantly different from zero indicating a good fit and the correctness of the distributional assumption specified. The variance ratio, γ, is significantly different from zero at 5 per cent level of significance, which implies that the inefficiency effects are significant in determining the level and variability of profit. The presence of a one-sided error component in the specified model is thus confirmed, implying that the ordinary least square estimation would not be an adequate representation of the data. The variance ratio, defined by γ= σμ2 / (σv2+ σμ2) is estimated to be 0.84, meaning that 84 percent of the discrepancies between the observed profit from the frontier profit is primarily due to factors which are within the control of the catfish marketers in the study area. The table indicates that the coefficients of the estimated parameters of the normalized profit function were negative except the cost of catfish purchased and depreciation cost which was found to be positive. Furthermore, the coefficient of the normalized cost of catfish purchased with a positive value of 0.4984 was statistically significant at 1% level of significance. This means that for every ₦1 incurred on purchase of catfish, the profit obtained from catfish marketing will increase by 49.84 kobo. This result agrees with the findings of Oladeebo and Oluwaranti (2012). The coefficient of the normalized cost of transportation with a negative sign of -0.2359 was statistically significant at 1% level of significance. This implies that for every ₦1 incurred on transportation, the profit obtained from catfish marketing will reduce by 23.59 kobo. This result corroborates the findings of Oladeebo and Oluwaranti (2012). The coefficient of the normalized cost of labour with a negative sign of -0.0712 was statistically significant at 5% level of significance. This indicates that for every ₦1 incurred on labour, the profit obtained from catfish marketing will reduce by 7.12 kobo. This result is consistent with the findings of Mulie (2014) and Ogunniyi (2011). The coefficient of the normalized depreciation cost with a positive sign of 0.0825 was statistically significant at 1% level of significance. This indicates that for every ₦1 incurred on assets, the profit obtained from catfish marketing will increase by 8.25 kobo. This result is in support of the findings of Mulie (2014).

Determinants of Profit Inefficiency Model

The result of the inefficiency model revealed that marital status and credit usage were the significant determinants of inefficiency. A negative sign implied that the variable had the effect of reducing inefficiency, hence increasing profit efficiency. The coefficient of marital status revealed that married catfish marketers are more efficient than their unmarried counterparts; this is because married catfish marketers are more likely to use their family labour in catfish marketing thereby reducing cost expended on labour, this will thereby increase the profit of the catfish marketers. The coefficient of credit access implies that catfish marketers that have access to credit are more efficient than those that did not have access to credit, this is so because credit use enables the catfish marketers to increase their scale of operations as they are more likely to enjoy higher economic of scale thereby increasing their profit efficiency.

Table 4: Maximum Likelihood Estimates of Stochastic Frontier Profit Function

Variable	Parameter	Coefficient	Std. Error	t- value
Constant		0.0828566***	0.0147326	5.62
Cost of catfish purchased		0.4984341***	0.0495172	-10.07
Cost of transportation		-0.2359631***	0.025356	-9.31
Tax levied		0.0046828	0.0157272	0.30
Cost of labour		-0.0712374**	0.0309851	-2.30
Depreciation cost		0.0828566***	0.0147326	5.62
Inefficiency Effect				
Marketer's age		0.0001103	0.0003586	0.31
Level of education		0.0011172	0.0005677	1.97
Marital status		-0.0129626***	0.0028687	-4.52
Household size		0.0001827	0.0019721	0.09
Farming experience		-0.0004279	0.0008964	-0.48
Membership of cooperatives		-0.0023151	0.00251	-0.92
Credit access		-0.0094544***	0.0007172	-13.18
Diagnostic Statistic				
Sigma square	δ^2	0.63		
Lambda	γ	0.84		
Wald chi2		513.71		
Log-likelihood		53.499411		

*****, ** Significant at 1% and 5% probability level**

Source: Field Survey, 2019.

Profit Efficiency Level of Catfish Marketers

Table 5 shows the distribution of profit efficiency of catfish marketers. The mean profit efficiency level is 0.74 implying that on the average catfish marketers were able to obtain 74% profit at reduced cost. This implies that marketers are losing 26% profit as a result of inefficiency. This suggested that there is room for 26% improvement in profit of the catfish marketers by lowering their cost.

Table 5: Distribution of Profit Efficiency Level of Catfish Farmers

Efficiency	Frequency	Percentage
0.30 – 0.39	19	15.83
0.40 – 0.49	17	14.18
0.50 – 0.59	16	13.33
0.60 – 0.69	21	17.50
0.70 – 0.79	39	32.50
0.80 – 0.89	7	5.83
0.90 – 0.99	1	0.83
Total	120	
Mean	0.74	
Max.	0.92	
Min.	0.35	

Source: computed from profit frontier model

CONCLUSIONS AND RECOMMENDATIONS

The study examined the determinants of profit efficiency among catfish marketers in Lagos state, Nigeria. It was established that catfish marketing was dominated by female at the retail level. It was also established that catfish marketing was a profitable and bankable enterprise in the study area. The result showed that cost of catfish purchased and depreciation cost positively influence the profit of the catfish marketers while transportation cost and labour cost had negative effects. The implication of these results is that increase in cost of labour and transportation cost will result to decline in profit of the catfish marketers and any attempt to reduce these costs would result to increase in profit of the marketers. Credit use and marital status had negative effects on profit inefficiency of the catfish marketers; this implies any attempt to make credit accessible to the catfish marketers will improve their profit efficiency. The catfish marketers were inefficient, however, to improve the profit efficiency of the catfish marketers, policy aimed at reducing the transportation cost should be given adequate consideration, this can be achieved by providing good road networks and reducing the pump price of Premium Motor Spirit (PMS) as it is a major driver of the transportation cost. Credit facilities that will enable the marketers increase their scale of operation, acquire better marketing resources and employ capable hands in catfish marketing should be made available and accessible to the catfish marketers. This can be achieved when catfish marketers form cooperative society so that they can access credit from formal or informal sources at zero or reduced interest rates.

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SCIENTIFIC PAPER

FACTORS ASSOCIATED WITH SUSTAINABILITY OF AGRIPRENEURSHIP INTEREST AMONG GRADUATE YOUTH IN SOUTHWESTERN NIGERIA

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Abstract: *The paper examined factors associated with sustainability of agripreneurship interest of graduate youth in Southwestern Nigeria. It specifically described the socio-economic characteristics of the respondents; identified their agripreneurship activities of interest and identified factors associated with their interest. A multi-stage sampling procedure was used to select 185 respondents from the selected the Local Government Areas in Southwestern States, quantitative and qualitative data were collected using semi structured questionnaire and Focus Group Discussion (FGD) respectively. Data were analyzed using descriptive statistical tool such as frequency counts, percentages, means and standard deviation while factor analysis was used to isolate crucial factors associated with sustainability of agripreneurship interest of serving graduate youth in the study areas. Results showed that respondents had a mean age of 26.18 ± 2.74 years and majority (75.7%) were not graduates of agriculture. The agricultural enterprises of interest to the respondents were poultry farming (67.6%)' fish farming (56.5%) and snail farming (50.9%). Crucial factors found to influence sustainability of graduate youth's interest in agripreneurship were motivational, parental influence, community asset and institutional factors among other. The study concluded that these identified factors were germane to the sustainability of graduate youth's interest in agripreneurship in Southwestern Nigeria.*

Keywords: *Agripreneurship, Interest, Graduate youth, Agro-allied SAED, Sustainability*
JEL Code: D91, Q13

INTRODUCTION

Agriculture sector has been identified as an important sector due to its several job creation and income generation opportunities. Even though the general perception of people towards agriculture is negative, there has always been the belief that agriculture sector has the ability to offer a high income if operated in the right way (MAN, 2007). In the contemporary global world, the incidence of unemployment among the youths especially graduates of tertiary institutions keep on increasing on a daily basis (BAHAMAN et al., 2010). It is a challenge that most economies are facing under the current economic circumstances (OPPONG and SACHS, 2015). Even the developed nations have not been exempted from this frightful social problem, although the up-surge is more pronounced in the developing countries like Nigeria.

The commencement of entrepreneurship education in Nigeria in a bid to tackle unemployment can be dated back to the 1980s when the economy collapsed due to political instability and inconsistencies in the social-economic policies of successive governments (AROGUNDADE, 2011). Before this era, graduates of tertiary institutions were having much problem of unemployment; hence, they were not exposed to adequate entrepreneurship knowledge and skills which would make them self-reliance. The problem of unemployment led to the introduction of entrepreneurship education with the belief that its introduction into tertiary education would lead to acquisition of skills that would enable its graduates to be self-employed and invariably reduce unemployment problems (NWANGWU, 2006).

Agripreneurship refers to the various entrepreneurship opportunities embedded in the agricultural sector (LANS

et al., 2013). In addition, BAIRWA et al. (2014) defined agripreneurship as the profitable marriage of agriculture and entrepreneurship which turns a farm into entrepreneurial establishment in agriculture and allied sector. Youth agripreneurship could be the missing link to address the challenges of poverty and unemployment experienced by the youths, especially in developing countries (ILO, 2014). This is because agripreneurship has the capability to contribute to a country's economic development by creating employment for the populace in direct and indirect ways, improving nutrition, and contributing to food security and food sovereignty (BAIRWA et al., 2014).

According to NYSC Handbook (1996), the National Youth Serving Corps (NYSC) is a scheme that was established by the Nigerian government in 1973 to involve Nigerian graduates below the age of thirty in national building and the development of the country. The scheme mandates all Nigerian graduates to serve the country in assigned state for a period of one year after graduation from universities and polytechnics both within and outside Nigeria. The scheme aimed at promoting national unity, consciousness and patriotism among Nigerian youths particularly graduates of tertiary institutions. Recently, NYSC tapped into the contemporary issue of entrepreneurship in a bid to reduce unemployment among graduate youths by equipping graduate youth with the basic skills to perform optimally as agripreneurs through the introduction of the Skill Acquisition Entrepreneurship Development (SAED) in 2013 where every corps member is expected to have acquired a skill in different enterprises including agripreneurial activities by building their capacity to create wealth for them in the face of serious unemployment in the country (OKPALA, 2015).

Previous studies conducted by FATOKI (2010) among graduate youth in South Africa revealed that youth had very low intention in engaging enterprenuurial activities. Also, ABDUL AZIZ and NORHLILMATUN (2013) revealed that family support, government support, promotion through of festivals and carnivals, attitude and acceptance were the factors that influence youth interest to become entrepreneur in agriculture in Malaysia. While ALAO et al (2018) also found out that a larger proportion of the graduate youth in Osun State, Nigeria had interest in agribusiness and were ready to set up agribusiness activities due to the reality of unemployment in Nigeria. In the same vein, many of the graduate youth have been showing interest in SAED agro-allied activities since its inception some years ago through their active participation. However, factors associated with the interest of serving graduate youth in agripreneurship in the study area have not been exhaustively investigated in Southwestern Nigeria, hence this study was conceived with the aim of isolating the crucial factors associated with sustainability of graduate youth' interest in agripreneurship in Southwestern States, Nigeria. Specifically, the study were to describe the socio-economic characteristics of the respondents; identify agripreneurship activities of interest among agro-allied SAED graduate youth; and isolate factors associated with sustainability of respondents' agripreneurship interest in the study area.

MATERIAL AND METHODS

The study was conducted in Southwestern Nigeria. Southwestern Nigeria is one of the six Geo-political Zones in Nigeria, which has six States namely Osun, Ekiti, Ondo, Ogun, Oyo and Lagos States. Multi-stage sampling procedure was used to select the respondents (serving graduate youths) for the study. At the first stage, one third of the states were randomly selected namely Oyo and Osun States. At the second stage, purposive sampling technique was used to select two administrative zones each from Oyo and Osun States out of five and six administrative zones respectively based on the presence of agro-allied training centers in the zones, making a total of four zones. Ibadan North zone and Oyo zone were selected in Oyo State while in Osun State, Ilesha zone and Ife zone were selected. At the third stage, one Local Government Area (LGA) was purposively selected from each of the four zones based on the presence of agro-allied training centers, making a total of four LGAs. The selected LGAs were Ibadan North LGA and Oyo East LGA from Oyo State while Ife East LGA and Ilesha East LGA from Osun State. At the fourth stage, purposive sampling technique was also used to select one functioning agro-allied SAED training center from each of the selected LGAs making a total of four training centers. At the final stage, proportionate sampling technique was used to select 60% of the total three hundred and six (306) serving graduate youth of the agro-allied SAED group in the 2018 Batch 'A' to give a total of 185 respondents for the study. Duly pretested and validated semi- structured questionnaire was used to collect the quantitative data from the respondents while qualitative data were elicited through Focus Group Discussion (FGD). Descriptive and inferential statistics were used to analyze the data. The descriptive statistics used include frequency counts, percentages, means and standard deviation while principal component analysis was used to isolate crucial factors associated with sustainability of graduate youth's interest in agripreneurship. Respondents reacted to twenty one variables which were later subjected to factor analysis. Variables were grouped using principal component analysis with varimax rotation. Constant loading variables with the cut-off point of 0.30 and above were retained while variables with loading less than 0.30 were rejected as recommended by ANSELM and TAOFEEQ (2010); BROOKS et al., (2006) and MADUKWE, (2004). Also, Kaiser's criterion was used to determine which factor to retain in the result of the analysis, thus factors with Eigen value greater than one were retained. The factors retained were named based on the following criteria as employed by ALABI et al. (2013), FAMAKINWA et al. (2017) and FAMAKINWA et al (2019).

a. The researcher's subjective interpretation of experiences from literatures
b. Picking synonyms of the highest loaded variables on each factor
c. Retaining the name based on the similarity of the features of the variables contributing to each factor
d. Joint explanation or interpretation of the meaning of the positive and highly loaded variables on each factor.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

Table 1 reveals that majority (60%) of the respondents were males. This implies that more male graduate youth showed interest in agro-allied SAED group in the study area. This might be due to the fact that most of the activities embedded in this SAED group are often considered as being strenuous and laborious making the females to shy away from belonging to the agro-allied SAED group. More of the respondents (62.7%) were 26 years and above with the mean age of 26.18 ± 2.74 years. This indicates that most of the respondents were in their active ages as expected and still have the strength for agripreneurial activities and consequently were potential future agripreneurs. Majority (85.4 %) of the respondents were single while 14.6 percent of the respondents were married. This implies that youth's interest in agricultural enterprises could be very high while they are still single and able to concentrate on their enterprises without marriage responsibility distractions. This is in line with CHIKEZIE et al. (2012) and OGUNREMI et al. (2012) that unmarried people had latent energy in them to be engaged in entrepreneurship without distraction from family members. More than half (57.8%) of the respondents were from Yoruba ethnic group while few (17.8%) were Igbo. Based on the NYSC vision, youths from a particular ethnic group were expected to be posted to serve in the catchment area of another ethnic group outside their own. The study area is dominated by Yoruba ethnic group and particularly implies that many of the youths in the NYSC programme were being posted to their catchment area which is not in line with one of core vision of NYSC scheme which was to foster intercultural mix of youths from different ethnic groups. Majority (69.7%) of the respondents had acquired practical agricultural experiences in one way or the other before the service year while the remaining 30.3 percent did not. This implies that the higher percentage of the respondents who had agricultural experience before being posted for NYSC stand the greater chance of having interest in agro-allied SAED group which may eventually translate to having sustainable interest in taking up career opportunities in agricultural sector. Majority (76.6%) of the respondents had between 6-10 years of agricultural experience and the mean year of agricultural experience was 8.73 ± 4.51 years implying that respondents had fairly long agricultural experience which could enhance their interests in becoming agripreneurs. The following FGD excerpts buttress the above finding

"have being following my mum and also helping her to manage her oil palm and plantain plantation since when I was in secondary school. This has really enhanced my interest in agriculture and I have determined to avail myself for any practical agricultural training anywhere I find myself" **(A participant in Ilesha East agro-allied training center)**

The results in Table 1 show that majority (75.7%) of

Table 1: Socio-economic characteristics

Variables	Frequency	Percentage	Mean	Std. Dev.
Sex				
Male	111	60		
Female	74	40		
Age				
≤ 20	5	2.7		
21 – 25	64	34.6	26.18	2.74
26+	116	62.7		
Marital status				
Single	158	85.4		
Married	27	14.6		
Ethnic group				
Yoruba	107	57.8		
Igbo	33	17.8		
Hausa	28	15.1		
Others	17	9.2		
Practical agricultural experience before NYSC				
No	56	30.3		
Yes	129	69.7		
Years of agricultural experience				
≤ 5	32	17.3		
6 – 10	138	74.6	8.73	4.51
11 – 15	9	4.9		
≥16	6	3.2		
Academic field				
Graduates of agriculture	45	24.3		
Non graduates of agriculture	140	75.7		
Educational qualification				
Higher National Diploma	47	25.4		
Bachelor degree	132	71.4		
Master degree	6	3.2		
**** Sources of information on agricultural entrepreneurship**				
SAED center	144	77.8		
Internet/ social media	140	75.7		
Peer/friends	132	71.4		
Television	130	70.3		
Magazine/newspaper	129	69.7		
Radio	122	65.9		
Seminar/conference	115	62.2		
Research institute	101	54.6		
Mosque/ church	96	51.9		
Extension agents	83	44.9		
Parent/guardian involvement				
Yes	107	56.8		
No	78	43.2		
Siblings/ relatives involvement				
Yes	89	48.1		
No	96	51.9		

**** Multiple responses**
Source: Field survey, 2018

the respondents were not graduates of agriculture while the rest 24.3 percent were graduates of agriculture. Based on the finding, it is quite interesting to note that a vast majority of the respondents that showed interests in the agro-allied SAED group were non - graduates of agriculture. This invariably implies that being a graduate of agriculture does not guarantee interest and willingness to take up career opportunities in agricultural enterprises. The finding affirms that of KENNETH et al. (2013) that majority of the youths that were involved in agribusiness were non- graduates of agriculture. Majority (71.4%) of the respondents had bachelor's degree, 25.4 percent had Higher National Diploma (HND) while 3.2 percent had master degree implying that educated youths were becoming more interested in agriculture more than ever and an indication that agricultural sector in the study area will soon be dominated by literate farmers. This is contrary to the submission of ADEOGUN and AGBENIYI (2011) that reported that agricultural enterprise was dominated with those who had either non-formal or primary education. Results in Table 1 show that respondents obtained information on agricultural entrepreneurship from multiple sources with SAED training centers (77.8%), internet (75.7%), peer and friends (71.4%) and television (70.3%) being the most prominent sources. This implies that accessibility to information from several outlets could stimulate and also enhance agripreneurship interest in the respondents. The results in Table 1 show that 56.8 percent of the respondents had parents/guardians who were involved in one agricultural enterprise or the other while 48.1 percent had siblings/ relatives who were involved in agricultural enterprises. The fact that the respondents' parents or siblings were engaged in agricultural enterprises could be a source of motivation that propels their interest in harnessing the opportunities in agricultural entrepreneurship.

Agripreneurship activities of interest among agro-allied SAED graduate youth

The results in Table 2 show that respondents indicated multiple interest in their choice of proposed agricultural enterprises with poultry farming (67.6%) taking the lead followed by fish farming (56.5%), snail farming (50.9%), piggery (44.6%), cash crop production & processing (43.0%), vegetable farming (42.4%) and value addition to agricultural produce (40.3%) in that order while graduate youth showed least interest in mushroom farming (9.1%). The finding above reiterated the fact that out of all the agricultural enterprises identified, poultry farming was the most preferred among the respondents in the study areas. This is similar to the findings of ALAO et al (2018) who reported that larger percentages of undergraduate youth indicated high interest in poultry production, this could be as a result of high prospect and potentials associated with poultry production.. The implication of this finding is that efforts to sustain agricultural enterprises interest of the respondents in the study areas should focus on the most prominent enterprises however other agricultural enterprises should not be left aside.

Table 2: Distribution of respondents based on agricultural enterprises of interest

*Agricultural enterprises	Percentage	Rank
Poultry farming	67.6	1st
Fish farming	56.5	2nd
Snail farming	50.9	3rd
Piggery	44.6	4th
Cash crop production & processing	43.0	5th
Vegetable farming	42.4	6th
Value addition to agricultural produce	40.3	7th
Plantain processing	38.1	8th
Livestock feed mill	38.1	9th
Cattle rearing	37.6	10th
Rabbit rearing	37.0	11th
Soya beans processing	27.0	12th
Horticulture	26.5	13th
Sheep & goat production	25.4	14th
Quail egg farming	24.9	15th
Beekeeping and honey production	23.9	16th
Locust beans processing	23.3	17th
Agricultural equipment leasing	14.3	18th
Grass cutter farming	13.8	19th
Agricultural consultancy	13.8	20th
Arable crop production & processing	13.6	21st
Sales of agrochemicals	13.2	22nd
Groundnut processing	12.7	23rd
Shear butter processing	12.2	24th
Mushroom farming	9.1	25th

*** Multiple responses**

Source: Field survey, 2018

Factors associated with agripreneurship interest among serving graduate youth

Results in Table 3 show the results of varimax factor rotation pattern with the measures that were highly loaded on each of the eight factors extracted that influenced graduate youth interest in agripreneurship. The contribution of each of the highly loaded factors to agripreneurship interest were shown in Table 4 as follows: Factor 1- motivational factor (12.9%) followed by factor 2 -parental influence factor (10.8%), factor 3- community asset factor (8.0%), factor 4 - institutional factor (7.6%), factor 5 - perceptional factor (6.8%), factor 6 – agricultural information factor (6.4%), factor 7 - constraint factor (5.8%) and factor 8 - household strength factor (5.7%). These eight factors accounted for 64.3 percent of variance while unknown factors explained the remaining 35.7 percent of the variance as reflected in Table 3. This implies that these variables are strong enough to determine the sustainability interest of the graduate youth in agripreneurship.

Factor one: Motivational factor

Result in Table 4 shows that motivational factor was identified by seven measures of loading in which all were positively loaded. These were extrinsic variables (L = 0.789), intrinsic variables (L = 0.789), agripreneurial characteristics (L

Table 3: Result of varimax rotated component matrix showing extracted factors associated with graduate youth' interest in agricultural entrepreneurship

Variables	1	2	3	4	5	6	7	8
Extrinsic variables	0.789	-0.472						
Intrinsic variables	0.789	-0.472						
Agripreneurial characteristics	0.610	-0.337						
Social organisation membership	0.440	0.439						
Parent involvement in agricultural enterprise		0.576						
Years of experience	0.327	0.560	0.307					
Siblings involvement in agricultural enterprise		0.514	0.322					
Availability of infrastructure			0.622					
Community attitude				0.551	0.385			
Estimate of total income	0.333			-0.500			-0.333	
Role of government				0.855				
Age				0.441				
Availability of factors of production			0.366		0.376	0.380		
Perception					0.562		0.349	
Role of family member			0.428		-0.458		0.355	
Numbers of agricultural graduate						0.663		
Sources of agricultural information				0.401		0.440		-0.376
Constraints							0.447	
Household size				0.374				0.453
Cosmopoliteness	0.338			-0.327				0.391
Agricultural enterprises								0.427
Reasons for travelling					0.302			

Figures with bold fonts indicate variables with high loading on each factor
Source: Field survey, 2018.

= 0.610), social organisation membership (L = 0.440), years of experience (L = 0.327), estimate of total income (L = 0.333) and cosmopoliteness (L = 0.338). The factor was named based on criteria one and two. This finding implies that extrinsic variables and intrinsic variables which constitute motivational factors are germane in sustaining the interest of graduate youth that belong to agro-allied SAED programme group to set up agripreneurial enterprise beyond the service year.

Factor two: Parental influence factor

Results show factor two (parental influence) was identified by four measures of loading out of which four were positively loaded. These were parent involvement in agricultural enterprise (L = 0.576), social organisation membership (L = 0.439), years of experience (L = 0.560) and siblings involvement in agricultural enterprise (L = 0.514). Criteria two and four were employed to name the factor. This implies that reasonable years of practical agricultural experiences which are obtained from their parents and sibling's involvement in agricultural enterprises and peers in social organisation might have profound influence on the interest of graduate youth that belong to agro-allied SAED group in agripreneurship. Thais also conform to Abdul Aziz and Norhlilmatun (2013) report that family support could influence youth interest in agricultural entrepreneurship.

Factor three: Community asset factor

The factor was identified by eight measures of loading out of which six were positively loaded. These include availability of infrastructure (L = 0.622), years of experience (L = 0.307), siblings involvement in agricultural enterprise (L = 0.322), availability of factors of production (L = 0.366) and role of family member (L = 0.428). Criteria two and four were used to name the factor. The availability of infrastructures such as markets, motorable roads, and electricity among others coupled with the availability of factors of production such as land, capital and labour in the community could influence respondents' interest in entrepreneurship opportunities in agriculture..

Factor four: Institutional factor

Institutional factor was identified by seven measures of loading out of which five were positively loaded as illustrated by Table 4. These were community attitude (L = 0.551), role of government (L = 0.855), age (L = 0.441), sources of agricultural information (L = 0.401) and household size (L = 0.374). This factor was named based on criterion two. This implies that performance government roles as an institution or its agencies through provision of credit facilities and creation of enabling environment for young and aspiring entrepreneurs could be an impetus for sustaining their interest

in agripreneurship. This result is similar to the report of Abdul Aziz and Norhlilmatun (2013) that government support stimulate youth interest in agricultural entrepreneurship.

Factor five: Psychological factor

The factor was identified by four measures of loading out of which four were positively loaded. These were community attitude (L = 0.385), availability of factors of production (L = 0.376), perception (L = 0.562) and reasons for travelling (L = 0.302). Criterion three was employed to name the factor. A community where its members have unfavourable attitude towards agripreneurial activities would definitely have negative impact on the graduate youth interest this is similar to the findings of Abdul Aziz and Norhlilmatun (2013) that attitude is most significant factor influencing youth interest of agricultural entrepreneurship in Malaysia. And the type of perception the youth have whether positive or negative to a large extent can influence their interest in agricultural entrepreneurship. This is conform to the report of ZAKARIA et al. (2014) who reported that youth perception towards the prospects of agribusiness enterprises in Ghana significantly influence their intention to take up agribusiness in the future. Both community attitude and perception put together form psychological factor which could either sustain or dissuade the interest of graduate youth in agripreneurship.

Factor six: Agricultural information factor

Results in Table 4 shows agricultural information factor was identified by three measures of loading out of which three were positively loaded. These include availability of factors of production (L = 0.380), graduate of agriculture (L = 0.663) and sources of agricultural information (L = 0.440). Criteria one, two and four were employed to name this factor. Information as regards agricultural entrepreneurship acquired by the serving graduate youth from sources including friends/colleagues who are graduates of agriculture and providers of factors of production could assist in sustaining graduate youth' interest in agripreneurship.

Factor seven: Constraint factor

The factor was identified by three measures of loading out of which five were positively loaded. They include constraints (L = 0.447), perception (L = 0.349) and role of family members (L = 0.355). Criteria two and four were employed to name the factor. Constraints that could limit the sustainability of respondents' interest in agripreneurship could arise from their income realized from their enterprises, their perception and the roles played by their family members. Knowing this could serve as a guide to avoiding constraints from these sources.

Factor eight: Household strength factor

This factor was identified by three measures of loading out of which three were positively loaded. These were household size (L = 0.453), cosmopoliteness (L = 0.391) and agricultural enterprises (L = 0.427). Criterion two was employed to name the factor. It implies that the ability of households to contribute the necessary inputs such as manpower could sustain agripreneurship interest of graduate youth.

Table 4: Principal component analysis showing the initial eigen values and percentage variation in the interest of graduate youth in agricultural enterprises by each component/factor extracted

Factors	Name	Eigen value	% variance	Cumm. % var
1	Motivational factor	3.849	12.95	12.950
2	Parental influence factor	2.992	10.81	22.766
3	Community asset factor	2.084	8.017	31.089
4	Institutional factor	2.068	7.601	39.460
5	Psychological factor	2.022	6.876	46.337
6	Agricultural information factor	1.880	6.374	52.710
7	Constraint factor	1.697	5.833	58.544
8	Household strength factor	1.453	5.758	64.302
	Unknown factors		35.69	100.00

Source: Field survey, 2018

CONCLUSION

Based on the findings, it was concluded that the agricultural enterprises of interest to the graduate were poultry, fish farming, cash crop production, processing, snail farming and piggery while crucial factors influencing serving graduate youth's interest in agripreneurship include motivational, parental influence, community asset and institutional factor among others. It was therefore recommended that all these identified factors should be taken into consideration by relevant stakeholders such as governments and donor agencies when planning youth development programme especially agripreneurship to ensure that interest of youth are sustained so that they can key into relevant agricultural entreprises and improve their livelihood status.

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SCIENTIFIC PAPER

ESTIMATION OF ARMINGTON ELASTICITIES: CASE OF VEGETABLES IN MONGOLIA

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Abstract: *Mongolian people often consume meat more than vegetable in diet due to traditional nomadic culture. Nowadays, the Mongolian people's diet has been changing who consume more vegetables with associated urbanization (half of the population live in urban areas, mostly in the capital city). Even though vegetable consumption has been increased recently, the vegetable market is still a high reliance on imports and threatening national food security. Since 2016, the Mongolian government has especially paid attention to increasing vegetable's domestic production and substitution to import vegetables (Ministry of food and Agriculture, 2017). Therefore, this paper provided to substitution elasticity (the Armington elasticity) between import vegetables and domestic vegetables in Mongolia. Additionally, we estimated the home bias value of vegetables. The so-called Armington elasticities are widely used for computable general equilibrium (CGE) analysis, which determines a degree of substitution between import goods and domestically produced goods. Several of the authors studied Armington elasticities at the product level. We choose six vegetables (such as potato, garlic and onion, tomato, carrot and turnips, cabbage, and cucumber) related to lack of information. The empirical result shows that the Armington elasticities in the long-run higher than the short-run with exception of potato which means that products are similar in the long-run. However, our estimated Armington elasticities are quite lower than the previous studies result which means that Mongolian people indicated more prefer home growing vegetables than import vegetables. Moreover, we found that the home bias value is high in the short-run even long -run, this appears to be a higher relative weight on home vegetables.*

Keywords: *Vegetable, Armington elasticities, home bias value*
JEL Code: F13, Q17, Q18

INTRODUCTION

Vegetable has rich in vitamins and antioxidant which reduces the incidence of cardiovascular disease and improves metabolic activities. Mongolian people do not use much of vegetables in their daily diet. Based on the 2019 data from the National Statistical Office (NSO) of Mongolia, the monthly per capita consumption rates were about 2.6 kg/month for potatoes and 1.8 kg/day for vegetables, which is less than the 3.6 kg/month of potatoes and 7.2 kg/month of vegetables recommended by the national nutrition guidelines. Also, vegetable consumption is 6 times lower than the recommended intake by World Health of Organization (WHO) guidelines. However, vegetable consumption has been steadily increasing with respect to urbanization (because half of the total population lives in the urban area in Mongolia). For instance, the standard population per capita consumption has increased approximately 3 times between 1995 and 2019 (National Statistics Office of Mongolia, 2019). And vegetable consumption who live in the urban area is approximately 40 percent higher than the rural area's consumption. Mongolia has one of the highest incidences of cardiovascular disease (rank was #14 in the world, 2019), which is also the country's leading cause of death. One of the main reasons is lower fruit and vegetable consumption to increase the risk of noncommunicable diseases (www.who.org).

Mongolia is a net importer of vegetables, and government policy is focusing on import substitution and increasing domestic production (Asian Development Bank, 2020). After a political and economic transition time, the crop sector has dropped, which was causing increasing vegetables import to supply excess demand of the population. After a

massive collapse, the Mongolian government paid attention to this recession, the crop sector was substantially revived through a national program that was titled the "Third Land Rehabilitation" and implemented between 2008 and 2010. As a result of this program, we became self-sufficient in wheat and potato production. But until now, the vegetable market is a high reliance on vegetable imports such as a self-sufficient rate was approximately 50 percent (National Statistics Office of Mongolia, 2019). In recent years, many projects have been implementing in the vegetable market especially, focusing on the increase of vegetables domestic production and improving the market value chain funded by (Asian Development Bank, 2020), Japan Fund for Poverty Reduction, (2017), SDC, (2015), USAID, (2014), SECim, (2016). One of the good examples was the "Mongol potato" program implemented by the Swiss Development Cooperation (SDC). After implemented the "Mongol potato" program, in 2016, the SDC has started a new project for developing and improving the quality of vegetable seed production.

Last fifty years, international economists have modeled substitution between domestic and imported goods in consumption (called the Armington elasticity (Armington, 1969)). More specifically, Armington elasticity is a key parameter commonly used in e.g. international trade models and measures the degree of substitution between imported and domestic goods due to changes in the relative price of those goods. Most of the previous studies have made Armington elasticity estimation on industry-level data (Olekseyuk and Schürenberg-Frosch, 2016), (Gallaway, McDaniel, and Rivera, 2003), (Blonigen. A and Wilson. W, 1999), (Reinert and Roland-Holst, 1992),. But some of the authors (Wunderlich and Kohler, 2018), (Kapuscinski and Warr, 1999), (Song, 2005), carried out on sub-industry level data especially, agriculture products using the Armington model. Nowadays, the Armington elasticity is widely used for impact analysis of policy changes (McDaniel & Balistreri, 2002). The purpose of this paper is to provide estimated Armington elasticities for selected vegetables in Mongolia. Additionally, we try to estimate a home bias value using (Blonigen. A and Wilson. W, 1999) approach. The paper is organized as follows. The next section indicates material and methods (including theoretical background, econometric specification, and data), section 3 provides the result and the last section presents the conclusion.

MATERIALS AND METHODS

Theoretical background

Since the seminal work conducted by (Armington, 1969), called Armington elasticities has been widely used in international trade theory and trade policy. He formulated theory of substitution elasticity with related to consumer preference. This theory based on consumer distinguish different varieties of goods by country of origin and obtain variables satisfaction depending on the country from which is imported. In other words, the Armington elasticities provide the degree of substitution demand between homogenous products of import and domestically produced. He explained that the procedure to analyze trade elasticities in products using two kind of products such as machinery and chemicals produced in two different countries. Armington made two major assumptions. First, buyer or importing country's substitution elasticity is constant without considering the share of a product. Second, a single substitution elasticity for each product pair within a market. Also, he supposed a two-stage procedure, assuming that at the first stage, buyer or importing country decides on the total quantity to buy to maximize utility and then allocates portion of the total quantity to individual suppliers in order to minimize the costs. Armington elasticity presents a degree of substitution between products imports and produced domestically. If elasticity is higher, it indicates that domestic products are easier to substitute with import products. In other words, these two products are a fairly homogenous product for consumers. Conversely, a low value of substitution elasticity means that the two products are dissimilar and weak substitute. The traditional trade theory is indicated on the assumption of perfect substitution between import and domestically produced products. But Armington model based on imperfect substitution products that are differentiated not only by their kind, but also by their production place.

An early application of Armington model in agriculture trade analysis were Ronald A. Babula (1987), A Julian M. Alston, Colin A. Carter, Richard Green, and Daniel Pick (1990), Shoichi Ito, Dean T. Chen and E. Wesley F. Peterson (1990) et al. After that, many researchers (Wunderlich & Kohler, 2018), (Olekseyuk & Schürenberg-Frosch, 2016), (Lundmark & Shahrammehr, 2011), (Kawashima & Puspito Sari, 2010), (Welsch, 2008), (Gallaway et al., 2003), (Elena & Emilio, 2002), (Blonigen.A & Wilson.W, 1999), (Reinert & Roland-Holst, 1992) have studied to use the Armington model in comprehensive industry level. In addition, it has been used in computable general equilibrium (CGE) model such as, (Olekseyuk & Schürenberg-Frosch, 2016), (Németh, Szabó, & Ciscar, 2011), (Ha, Soo Junga, Hewings, Geoffrey, and Turner, 2009), (Kerkelä, 2008), (Zhang, 2006) et al. Therefore, sub-industry level estimates of Armington elasticities have appeared in forest and agriculture sector. For example, (Wunderlich & Kohler, 2018), (Barkaoui et al., 2011), (Lundmark & Shahrammehr, 2011), (Song, 2005), (Elena & Emilio, 2002), (Kapuscinski & Warr, 1999), et al. One of the systematic review papers has been provided by (McDaniel & Balistreri, 2002) have pointed out some findings with respect to Armington elasticities based on previous studies. They found that three robust findings from the econometric literature.

First, long-run elasticities are larger than short-run elasticities. Previous studies results showed that long-run elasticities are higher than short-run elasticities which means that there is no discrimination between domestically produced and imported goods in long-run compared to short-run.

Second, more disaggregate analyses are higher elasticity. This findings confirmed by (Németh et al., 2011), (Ha, Soo Junga, Hewings, Geoffrey, and Turner, 2009), (Welsch, 2008) et al. Most of the Armington elasticities estimates have

appeared using disaggregated data confirmed by (Gallaway et al., 2003), (Gibson, 2003), (Tourinho H.Kume, 2003), (Welsch, 2006), (Feenstra, Luck, Obstfeld, & Russ, 2016) et al.

Finally, elasticities used for time series analyses are smaller than used for cross-sectional analyses. Most of the Armington estimates are using single country and time series data and there is a few number studies of cross section data or panel data analysis such as using panel data analysis in European countries (Olekseyuk & Schürenberg-Frosch, 2016), (Welsch, 2008) et al. Armington elasticities estimation studies provide very different results depending on country, estimation method, data types (time series, cross section or panel data) and industry level (aggregation or disaggregation level).

In addition, (Olekseyuk & Schürenberg-Frosch, 2016) mentioned that one findings - micro elasticity find higher than macro elasticity. Armington macro elasticity of substitution indicates that between import and domestic products, while micro elasticity of substitution shows that between different import source (Aspalter, 2016). Macro elasticities are lower than micro elasticities such as, (Németh et al., 2011) have been to estimate the European countries industrial sectoral elasticities of the two nesting models (substitution between domestically produced products and imported products-macro elasticity; substitution between imported goods according to the country of origin-micro elasticity). They found that macro elasticities are lower than micro elasticities in European countries. The work of Robert C. Feenstra, Philip Luck, Maurice Obstfeld, and Katheryn N. Russ has identified micro and macro elasticities in U.S disaggregate data between 1992 and 2007. Also, they indicated macro elasticities are lower than micro elasticities. Indeed, (Olekseyuk & Schürenberg-Frosch, 2016) mentioned that micro elasticity is higher than macro elasticity is related to countries technology characteristics and trading partners.

Armington elasticities estimation studies provide very different results depending on country, estimation method, data types (time series, cross section or panel data) and industry level (aggregation or disaggregation level). We tried to classify Armington elasticities studies based on industry level. Table 1 shows that review results of some studies. There are including proxy studies of U.S data case, Philippines data case, South African data case, Brazilian data case and European countries cases. Interestingly, the Armington estimates for agriculture, forestry and fishery, food, beverages, tobacco, textile, wearing apparel, clothing, coke, steel, petroleum, transport vehicles and equipment's elasticities found to be import elastic (approximately average elasticity coefficient $\sigma \geq 1$), while rubber and plastic products, wood and paper products, metal and chemical products, machinery including electronical equipment's elasticities were considered moderately import sensitive (Table 15, approximately average elasticity coefficient $0.5 \leq \sigma < 1$).

A.C. Wunderlich and A. Kohler (2018) mentioned that Armington elasticity for agriculture sectors is lower than other sectors especially, investment and high-added value sectors. Therefore, they discussed that this fact might be due to home bias. Because most of the countries implement many programs to buy home produced products such as to protect for home produced production. In other word, there is might be increase differentiation between import and home produced products. A number of studies have identified explaining variables for the different elasticities across the industries. For instance, A.Blonigen and Wilson.W (1999) attempted to explaining differences in Armington elasticities across industries in U.S. The authors choose the explanatory variables using three specifications: First, variables reveal discrimination of current products second, variables that show multinational companies role in U.S market and finally, variables as a proxy for political and economic variables. They defined nine explanatory variables are ratio of industry imports from developing countries, ratio of industry shipments for final consumption, ratio of industry owned by foreign parent, ratio of downstream industrial consumers owned by foreign parent, downstream importers, median firm size, dummy variables for industry to protections and ratio of union workers in industry. Empirical results have found that one of the strong variables affecting to substitution elasticity between domestic and import products is presence of foreign-owned industries. Also, there is another U.S case of (Elena & Emilio, 2002). Authors described three variables which are advertising cost for each industry, foreign direct investment and the percentage of total output sold to final consumers. They found that foreign firms more efforts to affecting greater substitutability between foreign and domestic goods. Therefore, consumers willing to buy domestic products due to domestic firms are more spending cost on advertising.

A number of recent studies have estimated Armington elasticities at an industrial level and computable general equilibrium (CGE) related with trade terms effect. (Welsch, 2008), (Lloyd & Zhang, 2006), (Zhang, 2006), (Schürenberg-frosch, 2015), (Olekseyuk & Schürenberg-Frosch, 2016), have pointed out elasticities of substitution with respect to CGE model. Armington elasticities are widely used in computable general equilibrium (CGE) models. CGE models are a class of economic models that use actual economic data to evaluate how an economy may respond to changes in policy, technology or other external factors. CGE models have turned into a valuable instrument in analyzing a number of fluctuated trade policy issues. These models have been utilized to study the economic impacts of trade policies, such as tariffs and non-tariff barriers (NTBs), also the impact of trade liberalization on an economy, in an assortment of settings (Blonigen.A & Wilson.W, 1999). CGE models are valuable to model the economies of countries for which time series data are rare or not significant, which might be because of disturbances such as regime changes. Substitution elasticities in policy-oriented computable general equilibrium (CGE) models are key parameters for model outcomes since they define to conduct in these models. These elasticities are well known for their critical role in defining model outcomes.

Armington elasticity has become increasing popular in agricultural trade analysis (Wunderlich & Kohler, 2018), (Zeraatkish, Rashidi, & Rashidi, 2018), (Song, 2005), (Elena & Emilio, 2002), (Ito et al., 1990) and (Lundmark & Shahrammehr, 2011) for forest sector. (Wunderlich & Kohler, 2018), study aim is to provide a simple estimation method that is in line with the majority of computable general equilibrium models, and particularly one that is in accordance with the Common Agricultural Policy Regionalized Impact (CAPRI) model in Switzerland some agricultural products group, in order to improve the ex- ante predictive power of the implications of policy measures for example, free trade agreements. This study result shows that estimation of substitution elasticities of some agricultural products such as apple, pears, potatoes, tomatoes, vegetables, yogurt, curd and fresh milk products in short-run and long-run term. Some products, for example apple, tomatoes and vegetables' substitution elasticities does not define in long-run term. Overall, most of the products' elasticities lower than before studies for example elasticities ≤0.5, it means that consumers indicate more preference for domestic products than importing products in Switzerland.

Table 1. Armington elasticities range from some empirical results

Industries name	(Reinert & Roland-Holst, 1992)	(Kapuscinski & Warr, 1999)	(Gallaway et al., 2003)	(Gibson, 2003)	(Tourinho H.Kume, 2003)	(Welsch, 2008)	(Olekseyuk & Schürenberg-Frosch, 2016)
Agriculture, forestry and fishery products	0.35-1.99	0.2-3.8	-0.07-1.69	1.27	2.68-3.18	0.08-1.41	–
Manufacturing sectors (Food, beverages, tobacco)	0.02-3.49	0.03-1.07	-0.27-3.13	0.94-1.57	0.95-2.47	0.05-0.85	1.3-1.9
Manufacturing sectors (textile, clothing and leather products)	0.45-2.53	0.03-0.1	0.08-1.61	1.16-2.04	0.15-2.34	0.16-1.49	1.2-1.4
Mining, coke, petroleum, gas and fuel	0.16-1.22	3.06	0.15-1.18	0.73-2.77	0.38-0.6	0.39-0.92	0.6-0.8
Wood and paper products	0.05-1.68	0.03-0.7	0.39-1.54	0.08-1.21	0.51-1.58	0.21-0.42	0.02-2.95
Rubber and plastic products	0.01-1.71	–	0.34-1.22	0.27-1.14	1.08-1.22	0.05-3.16	0.56-0.89
Metal and fabricated metal products	0.22-3.08	0.16-0.42	0.35-1.21	0.59-0.74	0.47-0.51	0.004-0.91	0.57-1.25
Chemical products	0.4-0.67	–	0.71-1.18	0.67-0.79	0.58-1.51	0.12-1.88	0.87-0.88
Machinery and equipment	0.2-1.06	–	0.18-1.21	0.49-0.74	1.84	0.22-2.43	0.92
Electronic, computer, optical and electrical equipment	0.02-2.69	1.56-2.05	0.2-1.38	0.44-1.43	0.18-0.2	0.41-1.49	0.2-0.59
Transport vehicles and equipment	0.3-1.73	1.04-2.04	0.46-1.66	0.86	0.19-5.28	1.54-1.85	1.13-1.41

Source: Own description based on previous studies

(Zeraatkish et al., 2018) they studied substitution elasticity of Armington and transmission elasticity in fishery products in Iran. The study results showed that Armington elasticity in the long-term was greater than that in the short-term and the prices of these products have been influenced by global prices and the swings in global prices can be transported all the more effectively to the internal market for these products in the long-term than in the short-term. For the fishery products, whose import demands are elastic to import prices, it is expected that the decline of import prices by tariff reduction results in the expansion in import demands, and afterward the loss of domestic production of these products. In this way, the policies for these sectors should be the ones that help to rebuild these sectors instead of the ones bringing about the abundance supply.

(Abiodun Akintunde Ogundeji, 2007), the study was to estimate Armington elasticities for selected agricultural products in South Africa. The products considered in the study, as specified under the harmonized system, were meat of bovine animals (fresh or chilled), meat of bovine animals (frozen), meat of swine (fresh, chilled or frozen), maize or corn, wheat, soybeans (broken or not broken), and sunflower seeds (broken or not broken). The result indicates short-run elasticities range from 0.60 to 3.31 and long-run elasticities range from 0.73 to 3.21. Considering the long-run elasticity results, meat of bovine animals (frozen) is the most import-sensitive product followed by maize, meat of bovine animals (fresh or chilled) and sunflower seed, while wheat and the meat of swine (fresh, chilled or frozen) are the least import- sensitive products. Regarding short-run elasticities, soybeans are the most import- sensitive product followed by the meat of bovine animals (fresh or chilled), while the meat of swine (fresh, chilled or frozen) is the least import-sensitive product. The study also considered seasonality of agricultural products by including dummy variables in the estimated equations. Dummy variables for livestock products were found to be statistically insignificant, except for quarter four for meat of swine (fresh, chilled or frozen).

(Song, 2005), studied econometric estimates of import-demand elasticities for the agricultural sectors in Korea using the data classified following HS (Harmonized System) from five aggregated agricultural sectors (grains, livestock products, dairy products, fruits, and vegetables)

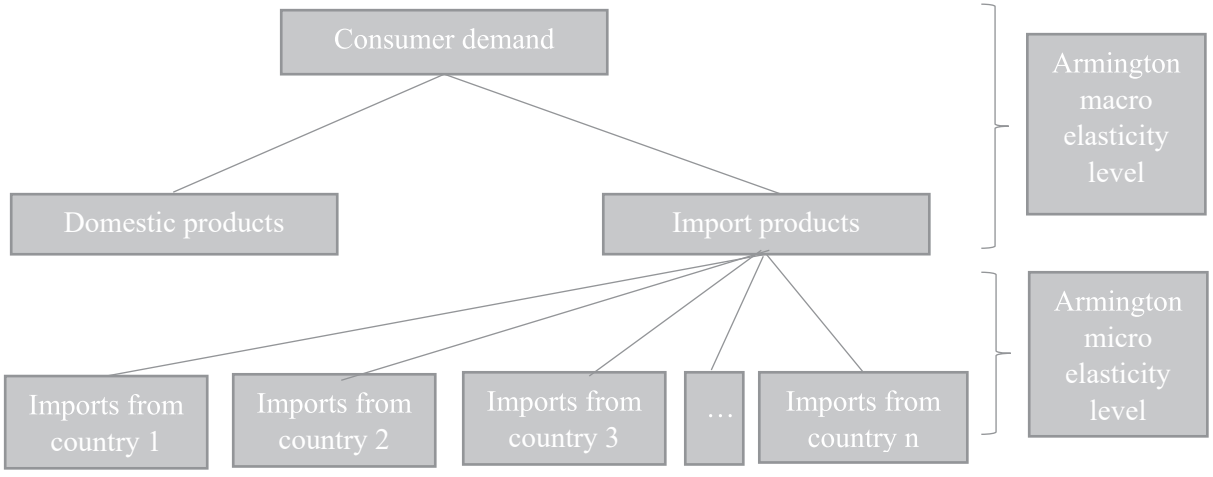
to 27 disaggregated agricultural sectors using Armington specification. This specification regarded as an adequate approximation of the functional form of import-demand equation. Based on Armington approach, it is assumed that consumers distinguish goods by their source, which means consumer differentiated between domestic goods and their imported goods. The study used two estimation methods. One was the ordinary least squares (OLS) with first-order autoregressive correction (AR (1)) and the second method was the two-stage least squares (2SLS) with first-order autoregressive correction (AR (1)). The study result showed that both domestic and import prices rarely affect import-demands in the aggregated level except in the sectors of vegetables and livestock products. In the disaggregated level, import demands of the products that are classified as livestock products tend to be highly elastic to import prices. A special feature of these products such as vegetable's domestic price elasticity smaller than import price elasticity. But disaggregate level, for garlic, import demand was highly elastic to domestic price. Thus, the difference between import price and domestic price of garlic is very significant in determining the import demand of garlic. This implies that relative price of garlic affects the import demand of it. Therefore, cabbage and onion's import price elasticity was greater than domestic price elasticity, carrot, corm's import price elasticity was smaller than domestic price elasticity.

(Elena & Emilio, 2002) estimated Armington elasticities for 40 4-digit S.I.C food manufacturing industries in U.S and explained variables affecting to difference elasticities across industries. Using time series data between 1977 and 1992, they obtained seven food manufacturing industries. Elasticities were estimated between 0.09 for wines, brandy and spirits and 5.93 for soybean oil mills. In other word, elasticities result showed that quite large. Therefore, they determined explanatory variables in differentiation elasticities across industries following Blonigen and Wilson (1999) approach. The authors concluded foreign firms efforts for downstream producers and foreign direct investments are affecting to greater substitutability between foreign and domestic goods.

Econometric specification

Based on the Armington approach, the structure of Armington demand has succinctly described by following figure 1. In other words, consumer demand constitutes domestic products and import products. In the Armington model, consumers have a two-stage budgeting process. In the first stage, consumers (or importing country) decide between domestically produced and imported products (macro elasticity), and in the second-stage, imported products are differentiated by country of origin (micro elasticity). In the following (Armington, 1969), much of the occurring literature in assuming that consumer utility is given in the form of a constant elasticity of substitution (CES) sub-utility function in order to model the demand for domestic and imported product.

Figure 1. Structure of Armington demand



Source: (Wunderlich & Kohler, 2018)

If consumers are to be satisfied, demand functions state relationships that must exist among specific variables. Consumer satisfaction depends on getting the most for their money, given the available selection of products and their prices. Demand functions may along these lines be seen as statements of conditions under which an index of consumer's satisfaction is high as restricted incomes and given prices permit (Armington, 1969).

The elasticity of substitution between home goods and import goods can be derived from the two-stage budgeting process. In the first stage, the consumer determines the total quantity to buy to maximize the utility. In the second stage, the consumer allocates a share of the total quantity to the individual supplier in order to minimize the costs. We assume that consumer maximizes sub-utility U, who use domestic products and foreign products at the same time and same products. Our CES (Constant elasticity of

substitution) sub-utility function is based on (Blonigen. A and Wilson. W, 1999) approach (also used in (Wunderlich & Kohler, 2018)) follow as:

$$U = (\beta M^{\frac{\sigma-1}{\sigma}} + (1-\beta)D^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}} \quad (1)$$

Where *U* is consumer sub-utility, *M* is *the* quantity of import goods, *D* is *the* quantity of domestic goods, β is a parameter that weights the import good relative to domestic good, π is the elasticity of substitution between imports and domestic goods. Additionally, we assumed that the CES sub utility function is homothetic that is means the share of income spent on domestic and imported goods does not change with income. Utility maximization of equation (1) yields the following first-order condition is given by:

$$\frac{M}{D} = \left[\frac{\beta}{1-\beta} \cdot \frac{P_D}{P_M}\right]^{\sigma} \quad (2)$$

Where P_D is the price of domestic goods, P_M is the price of import goods. Taking natural logarithm yields:

$$\ln(\frac{M}{D}) = \sigma \ln(\frac{\beta}{1-\beta}) + \sigma \ln(\frac{P_D}{P_M}) \text{ or } \ln(\frac{M}{D}) = a_0 + a_1 \ln(\frac{P_D}{P_M}) + \varepsilon \quad (3)$$

Equation (3) is our general econometric estimation model, where $a_0 = \sigma \ln(\frac{\beta}{1-\beta})$, a_1 is short-run substitution elasticity. We can calculate a home bias using substitution elasticity following as $1-\beta = \frac{1}{1+\exp(\frac{a_0}{a_1})}$. The short-run Armington elasticity can be derived directly from the relative price. However, long-run elasticity can be derived from three different ways (McDaniel & Balistreri, (2002), Wunderlich & Kohler, (2018)). First, our data (time series of quantity and price series) are stationary log-level data I(0), we estimate using the parsimonious geometric lag model (eq. 4) which is easy to extract short-run and long-run estimates. In other words, if $0<a_2<1$ is long-run elasticity can be estimated $\sigma^* = \frac{a_1}{1-a_2}$.

$$\ln(\frac{M}{D})_t = a_0 + a_1 \ln(\frac{P_D}{P_M})_t + a_2 \ln(\frac{M}{D})_{t-1} + \varepsilon \quad (4)$$

Second, if data are both stationary I(1) and cointegrated, we use a single-equation error correction model that determines the long-run elasticity (equation 5 is unrestricted error correction model).

$$\Delta \ln(\frac{M}{D})_t = a_0 + a_1 \Delta \ln(\frac{P_D}{P_M})_t + a_2 \ln(\frac{M}{D})_{t-1} + a_3 \ln(\frac{P_D}{P_M})_{t-1} + \varepsilon \quad (5)$$

Finally, our data are stationary I(1), but not cointegrated or one series is stationary, we able to determine only short-run Armington elasticity. However, we determine short-run elasticity using the following equation.

$$\Delta \ln(\frac{M}{D})_t = a_0 + a_1 \Delta \ln(\frac{P_D}{P_M})_t + \varepsilon \quad (6)$$

Data

We estimate the substitution macro elasticity (see figure 11) and use time-series data series. We need to require four data series which are vegetables import and domestic production and the prices of those products. We choose the following vegetables due to a lack of information. These vegetables were potato, tomato, garlic and onion, cabbage, carrot and turnips, and cucumber. We use the yearly data of the National statistical yearbook, Customs yearbook (https://customs.gov.mn/statistics/, Harmonized System (HS) code was 07 categories products), and Mongol Bank (Central bank of Mongolia) yearbook data from 1995 to 2019 (Table 17). All quantities are given in a thousand tons and prices in real (base period was chosen 2015 values) MNT (Mongolian currency tugrik) per ton. Vegetables domestic production quantity was collected from Statistical yearbook for the Agriculture sector, Mongolian Statistical yearbook, and www.1212.mn official statistical website for each product. (Wunderlich & Kohler, 2018) have estimated Armington elasticities using scanner price which measured in retail stores barcode scanner. Thus, we are able to use retail price for domestic vegetables which is published by National Statistical Offices (NSO). Furthermore, vegetable import quantity gathered from Customs yearbook for each product. The import unit price was calculated as the ratio between the customs value of these vegetables and quantity multiplied by the exchange rate. In other words, the import price for each vegetable constructed from: $P_M = \frac{\sum Customs\ value\ of\ each\ prodct}{import\ quantity\ of\ each\ product} \cdot exchange\ rate$. The annual exchange rate data is used for converting US $ to MNT. The final step is all prices converted to real prices using Laspeyres index.

RESULTS AND DISCUSSION

According to the general econometric model equation (3), we estimated Armington elasticities for vegetables in Mongolia. We choose six types of vegetables namely potato, tomato, garlic, and onion, cabbage, carrot and turnips, and cucumber with related to the lack of data. But these vegetables were commonly used in the household diet. To estimate elasticities was to check whether our time series data are stationary and integrated. Indeed, if our data are stationary or the same integrated of order log level I(0) or one I(1), it is possible to determine the relationship between these two variables in the long-run. Additionally, the cointegration relationship is defined by the Engle-Granger test. The Engle-Granger test is only valid that all variables are I(1). In other words, two variables are integrated into the same order but non-stationary (please see empirical specification).

Prior to estimation, we tested data stationery or integrated using Augmented Dickey-Fuller (ADF) test. Non-stationary variables imply the risk of spurious regression unless they are cointegrated. An ADF test for identifying the order of integration for the price and quantity ratio is conducted to determine the order of integration. Most of the series are non-stationary, but integrated of order one, excluding garlic and onion (Table 2). For the cucumber series, two variables are not cointegrated, only one variable is stationary. Indeed, there is no long-run relationship between these two variables. Also, we tested the Engle-Granger test for integrated variables, we found a cointegrating relationship in other vegetables.

Therefore, we estimate elasticities for short-run and long-run using the approach of McDaniel & Balistreri, (2002).

Table 2. ADF test result

HS code	Name of vegetables	M/D	Pd/Pm
0701	Potato	I (1)	I (1)
0702	Tomato	I (1)	I (1)
0703	Garlic and onion	I (0)	I (0)
0704	Cabbage	I (1)	I (1)
0706	Carrot and turnips	I (1)	I (1)
0707	Cucumber	I (0)	I (1)

Source: 'Stata' result

Table 3 reports the estimation result of short-run and long-run substitution elasticities derived from the models (equation 4,5,6) described in the previous section. Of the six types of vegetables short-run elasticities, five vegetable elasticities had positive and significant at 1 %, 5 %, and 10 %. Cabbage's short-run elasticity was not significant. The mean value of the estimated average short-run elasticity of substitution is 1.32, with a significant range between 0.86 and 2.57. The average long-run elasticity is 2.21, with a range between 1.34 and 3.26. Our estimation results are vegetable's long-run average substitution elasticities approximately 2 times higher than short-run average elasticities. This finding is similar to one of the emerged findings from McDaniel & Balistreri, (2002). Also, this result confirmed from other authors' results such as Elena & Emilio, (2002) obtained a coefficient between 0.09 and 5.93 for food manufacturing industries, Abiodun Akintunde Ogundeji, (2007) estimates range between 0.6 and 3.31 for agriculture some products, Kapuscinski & Warr, (1999) indicated average elasticity of 1.5 for vegetables.

In reviewing the short-run elasticities, garlic, onion, and cabbage's elasticities were ≤ 1, it appears to be a quite difference between domestic and import goods. This means that substitution is becoming harder between these products in Mongolia. This result was reported by Wunderlich and Kohler, (2018) who obtained from fruits and vegetables especially, tomato's elasticities of substitution estimates are quite lower for Switzerland's some agriculture products. In other words, they concluded Swiss people exhibit a strong tendency to buy domestically produced products.

Table 3. Armington elasticities estimation result in the short and long run

HS code	Vegetable name	Short-run elasticity	Long run elasticity	Ad.R2	DW
0701	Potato	2.571**	1.343**	0.45	1.54
0702	Tomato	1.929**	3.26**	0.45	1.52
0703	Garlic and onion	0.858**	1.808**	0.32	2.01
0704	Cabbage	0.112	2.149	0.24	2.73
0706	Carrot and turnips	1.171***	2.471***	0.18	1.93
0707	Cucumber	-0.412*	-	0.12	1.97

*****, **, * -1%, 5%, 10% significance. DW- Darwin Watson**

Potato, tomato, garlic and onion, carrot, and turnips long-run substitution elasticities were estimated excluding cucumber. For the long-run elasticity, vegetables are tomato, garlic, and onion, cabbage, carrot, and turnips, long-run elasticities are higher than short-run elasticities. The higher elasticity of substitution in the long-run leads to more substitutability between domestic vegetables and imported vegetables. In other words, a greater elasticity indicates that consumers did not discriminate between domestic and imported vegetables and the consumers considered them the same. In this case, these vegetable imports will rise in the long-run in Mongolia. The only potato, import potato will decrease because short-run elasticity is higher than long-run elasticity. In other words, consumers more prefer domestic growing potatoes to import potatoes.

Table 4 shows the home bias value for vegetables in the short-run and long-run. According to the approach of Blonigen. A and Wilson. W, (1999), we calculated to home bias value using the Armington elasticities in the short-run and long-run. We found that all the vegetable home bias value was higher ($1-\beta \geq 0.58$), which suggested a higher relative weight on the home good in the short-run and long-run. The short-run home bias value was estimated higher than the import value in the short-run. In other words, consumers express a stronger preference for domestic vegetables for the short-run in Mongolia.

Table 4. Home bias value estimation result

Vegetable name	Short-run		Long run	
	Import share	Domestic share	Import share	Domestic share
Potato	21.6	78.4	7.8	92.2
Tomato	27.5	72.5	36.1	63.9
Garlic and onion	4.5	95.5	18.9	81.1
Cabbage	10.8	89.2	24.4	75.6
Carrot and turnips	11.2	88.8	3.8	96.2
Cucumber	41.1	58.9	-	-

Source: Own calculation

The long-run home bias value was estimated lower than the short-run value of all vegetables with the exception of potato, carrot, and turnips. For example, the tomato's home bias value is decreasing from 0.73 to 0.64 (Table 3). Our home bias value result indicates lower than the home bias estimation of Blonigen. A and Wilson. W, (1999). They primarily discussed home bias value with Armington elasticities and found that 66 percent of total industries take a higher home bias value of 0.85 or higher.

CONCLUSION

The substitution elasticity (Armington elasticity) is a key parameter of trade policy and helps policymakers. This paper provides the estimation of substitution elasticity between imported and domestically produced vegetables in Mongolia. Additionally, we calculated a home bias value of these vegetables. We choose six types of HS code vegetables

(potato, tomato, garlic, onion, cabbage, carrot, turnips, and cucumber) due to data limitations. Our estimation result, most of the vegetables (excluding potato) long-run elasticity was higher than short-run elasticity which means that these products are not a perfect substitute. However, potato's substitution elasticity found that less elastic from the import. Also, we found that garlic, onion, and cabbage's elasticities were less than one in the short-run which found that these vegetables seem to be quite a heterogeneous product in the short-run. In the long-run, these indicated similar products (there is no discrimination) for consumers. Result of home bias value, consumers give weight to use domestic vegetables (average home bias value was 0.805 in the short run and 0.818 in long run). Overall, the Armington elasticity in the long-run is higher than the short-run, which means that applications of any policy are lead to support of imports in the long run.

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SCIENTIFIC PAPER

CARBON DIOXIDE EMISSION TRENDS AND ENVIRONMENTAL PROBLEMS IN CENTRAL EUROPE

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Abstract: *In this research, the effect of CO_2 emission was measured in two different land-use types (Crop and Grassland) in Central European and V4 countries. The primary aim of this study is to identify the significant output of CO_2 emissions from cropland and grassland. Secondary data collected from FAO (Food and Agriculture Organization of the United Nations) between 2010 and 2017. Mann-Whitney U test and odds ratio used to study the differences between the two country groups, and Principal Component Analysis was applied to create a performance map regarding the emission. A General Additive Panel model has analyzed the influence of area sizes and the regional differences on emissions. Results showed that the effect of grassland size is the primary factor in CO_2 emission. A significant difference can only be found between CEU and V4 countries regarding grassland size effect on CO_2 emission under grassland, which was rather small in the case of the V4 group but explained a larger part of the variance in case of CEU countries. The odds of having higher CO_2 from cropland to grassland was 2.43 times in the case of V4 compared to CEU countries.*

Keywords: *environment, carbon dioxide emission, climate change, greenhouse gas, land use*
JEL CLASSIFICATION: N54, O44, Q15, R11

INTRODUCTION

Global warming is driven overwhelmingly by carbon dioxide and other greenhouse gas emissions and is one of the world's biggest threats. The atmospheric GHG concentrations are a result of the net intensity of various drained organic soils and the decomposing of organic matters . Organic soils store around 600 gigatons of carbon globally (Yu, 2012). Besides, the biomass burning implies to natural or anthropogenic fires with organic matter combustion such as grassland, savanna, peatland, and agricultural crop residual. Most of the vigorous burning of biomass is carried out excessively on croplands (van der Werf et al., 2010). EU estimated the rise in biomass burning of 57 per cent to 110 per cent between 2010 and 2020 (Wagner et al., 2010). Many factors lead to ongoing growth in the combustion of biomass. A significant step of the European Union towards decreasing the consumption of fossil energy by increasing the usage of renewable energies, which will help to switch from the biomass burning (Fuller et al., 2013).

On the other hand, the Earth's total carbon content is approximately 0.8 X 1023 grams or 80 million petagrams (Pg), where 1 Pg is equivalent to 1015 g that represents 1 gigaton (GT) (Allison, 2016). Over the past 200 years, worldwide terrestrial carbon stocks like soils, plants, animals have received significant attention because they are known to be the largest source of CO_2 in the atmosphere (Houghton et al., 1983). The primary greenhouse gas to contribute to global warming is carbon dioxide (CO_2) (Pao & Tsai, 2011). This gas is produced in soils by roots, soil organisms and through soil respiration process and efflux, and emit to the environment. The estimated average of global CO_2 flux emission from soils that affects the ozone layer and the earth's climate based on extrapolations from biome land areas is ($\pm$S.D.) 68$\pm$4 PgC/year (Raich & Schlesinger, 1992).

But global agricultural production already has multiplied since 1970. At present, agriculture and land-use shifting are liable for 1/4 of human activities that are responsible for greenhouse gas emissions. (Bennetzen et al., 2016). On the other hand, crop productivity is linked to the atmospheric

pollution of pesticides, CO_2 and other GHG gas emissions, whereas the soil organic matter loss can reduce the carbon sequestration potential of the environment (Stoate et al., 2001).

Generally, direct energy inputs such as diesel fuel, energy, solid fuels and other energy sources and indirect energy sources such as the agricultural manufacturing sector for the production and transportation of fertilizers, pesticides and equipment generate CO_2 (Küstermann et al., 2008). Carbon dioxide emissions add to the radiative driving of Earth's changing climate by raising the temperature of its atmosphere. Crop yield and production accounts for almost 50 per cent of human activities generates CH_4 emissions and approximately 70 per cent of anthropogenic N_2O emissions but the global warming potential of these two gases is comparatively intense, while CO_2 emissions surpass both CH_4 and N_2O. Over the past Century, CO_2 contributed about 65 per cent of the combined thermodynamic effects of perennial gases; respectively, CH_4 and N_2O have added about 20 and 5 per cent (Watson; et al., 1996).

A significant source of uncertainty in grasslands is the soil management effects on greenhouse gas emissions level. Temperate grasslands make up 20 per cent of Europe's land area with carbon. Carbon concentration occurs mainly underground in grassland ecosystems and the changes in land use can impact on soil organic carbon stocks such as the conversion of arable land to grassland and its management. (Soussana et al., 2004). The organic matter consists of both organic inputs and soil organic matter. Organic contaminants to the soil consist of debris above and below ground including dead leaves, fallen rotten fruits, tree's roots and branches that maintain tissue structure, crop residues, mulches, green and animal manures, fertilizer, animals dead body and waste (Allison, 2016). Those are responsible for producing gases and ultimately affect the environment. For sustaining the consistency of the soil and its future production efficiency, soil organic matter plays a crucial role. Over the years, nearly half of the world's fertile soils have consequently deteriorated in organic matter and surface content. Tillage is dominantly responsible for the declension of agricultural soil, that accelerates organic soil decomposition. This decomposition process reduces the soil's water retention and nutrients absorption ability, which minimizes the infiltration capacity of rainfall and contributes to increased soil consolidation and biodiversity loss. Such agricultural soils cannot leverage environmental resources such as freshwater, carbon sequestration and erosion management and pest control (Pisante; & Sà, 2012).

Over the past few decades, the EU has focused on the possible minimization of environmental pollution through organic cultivation system because it consumes lower energy for production from 10 to 70 % for a unit of land (G.J./ha) and from 15 to 45 % per yield (G.J./t) (Gomiero et al., 2008). However, organic cultivation requires more land than the conventional (Lansink, 2002) and the EU is the most active participant to CO_2 emission cuts under the Kyoto Protocol as the European countries carry out model initiatives in order to mitigate global warming (European Commission, 2020). On February 16 in 2005 the 37 most industrialized countries of the 146 nations joined under the Kyoto Protocol of the "United Nations Framework Convention on Climate Change" (UNFCCC) to minimize their GHG emissions and contributing to limit CO_2-equivalent emissions. The Kyoto Protocol allows reductions in emissions of 6 'greenhouse' gases including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulphur hexafluoride (SF6). This calculates the 'global warming potential' (GWP) indices for each gas (Reilly et al., 1999).

In this study, twelve European countries were selected to investigate the effects of the most toxic greenhouse gas and to understand the environmental influence and divergent views regarding CO_2 emission. Two different land types - cropland and grassland - have been involved in the research. The twelve countries are Austria, Belgium, Croatia, the Czech Republic, Germany, Hungary, Luxembourg, Netherland, Poland, Slovakia, Slovenia, and Switzerland and all have different obligations to reduce CO_2 emissions.

Apart from that most of the central European countries signed the Kyoto Protocol, the Visegrád (V4) group including the Czech Republic, Hungary, Poland and Slovakia was established to work together to develop geographically, socially and politically. They have a long shared common ground in tradition, culture, religion, and politics. In the European strategy for 2020 Visegrásd group countries focused on five key priorities and among them Climate change and energy objectives got significant attention to reduce greenhouse gas emissions by 20% compared to 1990 levels; to raise the share of renewables in the ultimate electricity usage to 20% and to increase energy efficiency by 20% (Káposzta & Nagy, 2015).

Green House Gas (GHG) emission from agriculture and forestry are the leading causes of affecting the environment. Especially land degradation, erosion, additional water consumption in cultivation, organic matter loss and greenhouse gas emissions (Virto et al., 2015). Particularly the integrated emission of CO_2 negatively affects both cropland and grassland of Central European and the V4 group (Imer et al., 2013). This study's primary purpose is to measure the CO_2 emission of 12 central European countries' cropland and grassland and the extent of influence on the environment that fuels global warming.

The subject of this paper to answer the question: how do carbon dioxide (CO_2) emissions affect the central European countries environment? To answer this question, the effect of CO_2 emission was evaluated from C stock changes in above and below-ground biomass pool, dead organic matter, fires and drainage of organic soils on cropland and grassland regarding Central European and V4 group.

The primary contributions are the identification of the environmental influence and the assessment of their feasibility. In the first section of the article, a major emphasis was placed on the literature review distinguishing the present research from past studies. Secondly, advanced methodology and data analysis techniques are described. Finally, a summary of the results with probable mitigation strategies, recommendations,

an indication of future researches and new challenges are discussed.

MATERIALS AND METHODS

The investigation of the aggregate effect of land-based major greenhouse gas emissions was based on secondary data sources from the official database of the "Food and Agriculture Organization of the United Nations" (FAO). Relevant data for both country groups have been collected from FAO between 2010 and 2017 (FAOSTAT, n.d.) in order to quantify the land-based gases emitted by the Central European and the V4 group and to examine the country-specific effects for cropland and grassland in accordance with the Kyoto protocol and Europe 2020's greenhouse gas emissions reduction target. The areas are given in hectares and the amount of CO_2 is measured in Gigagram. The amount of CO_2 emissions under cropland and grassland was converted to tonnes and divided by areas, respectively, to measure emission production in tonnes per hectare. Principal Component Analysis (PCA) performed to create a performance map of the countries regarding the studied factors. The ratio of the total production from cropland and grassland also calculated for the two country groups. Based on this perspective, the odds ratio (OR) and its 95 per cent confidence intervals calculated according to Altman (Altman, 1997).

To measure the influence of area sizes (of cropland and grassland) and the regional differences on emissions, the ratio of variance estimated by the following General Additive Panel model (GAP):

$$\sqrt{y_{ij}} = \mu + \tau_i + B^{(1)}(x_{ij}^{(1)} - \bar{x}^{(1)}) + B^{(2)}(x_{ij}^{(2)} - \bar{x}^{(2)}) + \varepsilon_{ij}$$

where yij denotes the emission from CO_2 for the i-th country in the j-th $\bar{x}^{(1)}, \bar{x}^{(2)}$ year, denotes the global means for cropland and grassland areas, π_i measures the individual country differences, B is the parameter estimate for the given covariate and ε_{ij} is the unobserved error effect for the i-th country in the j-th year. The square root transformation of the dependent variable necessary satisfies the normality of the error terms. Statistically significant differences between the two country groups regarding the studied indicators have assessed by using the Mann–Whitney U test at a 10% significance level. R for Windows (version 4.0.0) software package was used for statistical data analysis.

RESULTS

The study design enabled to examine the ratio differences and comparative emission of Carbon dioxide in CEU and V4 country's cropland and grassland between 2010 to 2017. The statistics indicate not just the individual values but the average values over the whole period (Table 1). Among the Central European countries, Germany and Poland have the most substantial areas and emissions. Slovakia, Croatia, Luxembourg have lower areas and emissions in Gigagrams. The ratio between CO_2 emission under cropland and grassland was the lowest in the case of Slovenia, Austria and Netherlands and the highest in the case of Croatia and Slovakia (Table 1).

This studies explaining the changes in emissions based on land size. Slovenia, Hungary and Croatia are in the worst situation because of the highest CO_2 emission under grassland and cropland in tonnes/hectare (Table 1 and Figure 1). The Mann-Whitney rank test found significant differences between V4 and other Central European countries concerning the cropland area and emissions under cropland and grassland measured in tonnes per hectare. Visegrád group countries have a significantly larger size of cropland but relatively lower

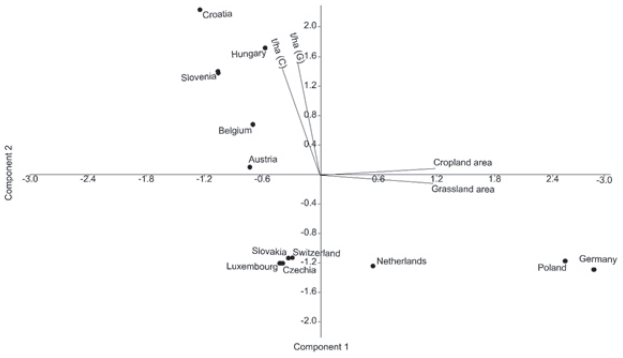
Table 1. Averages of the Examined Factors per Countries (2010-2017)

Country*	Grassland Area (hectare)	Cropland Area (hectare)	CO_2 emission under grassland (Gigagram)	CO_2 emission under cropland (Gigagram)	CO_2 emission under grassland (tonnes per hectare)	CO_2 emission under cropland (tonnes per hectare)
Austria	10101.50	2698.42	10.06	83.59	1.00	30.98
Belgium	3406.09	4568.17	11.91	148.86	3.50	32.59
Croatia	21.96	314.09	0.20	11.52	9.17	36.67
Czech Rep.*	*4326.76*	*6285.22*	*3.97*	*115.23*	*0.92*	*18.33*
Germany	597601.73	507528.45	550.78	9297.49	0.92	18.32
Hungary*	*30741.57*	*159987.52*	*251.29*	*5418.57*	*8.17*	*33.87*
Luxembourg	76.65	102.66	0.07	1.88	0.92	18.33
Netherland	207309.23	93288.48	190.59	1718.85	0.92	18.43
Poland*	*354789.26*	*691792.21*	*324.87*	*12660.99*	*0.92*	*18.30*
Slovakia*	*728.62*	*1661.50*	*0.67*	*30.46*	*0.92*	*18.33*
Slovenia	2367.99	3911.71	17.19	129.84	7.26	33.19
Switzerland	19368.07	14891.11	19.20	281.00	0.99	18.87
V4 average	97646.55	214931.61	145.20	4556.31	2.73	22.21
CEU average without V4	105031.65	78412.89	100.00	1459.13	3.08	25.92
CEU average	102569.95	123919.13	115.07	2491.52	2.97	24.68
Mann Whitney (p-value)	-1.39 (0.163)	-2.79 (0.005)	-0.931 (0.352)	-1.86 (0.063)	-3.79 (0.001)	-2.73 (0.006)

Source: authors' estimations. Notes: V4 countries indicated with* and italic style.

CO_2 emission under cropland and grassland if we consider emission in tonnes per hectare. This phenomenon can also be seen on the following performance map (Figure 1).

Figure 1. PCA Analysis of CO_2 emission by land type for Central European Countries.



C: Cropland; G: grassland; Source: authors' estimations.

There is a significant difference between the two ratios (cropland versus grassland) concerning country groups (Table 2). The odds of having higher CO_2 from cropland to grassland in the case of V4 countries is 2.43 (95 % CI: 1.88 - 3.14; $Z=6.78$; $p<0.001$) times much compared to the other Central European ones. The amount of CO_2 emission under the cropland area is significantly higher compared to grassland in the V4 group than in the Central EU. The high fluctuations also observed as individual countries have different ratios. Regarding weighted CO_2 emission 31% and 20% of CO_2 amount related to grassland in the case of Austria and the Netherlands, while 99 per cent originated from cropland in the case of Croatia, Slovakia and Hungary.

Table 2. The distribution of CO_2 Emissions (original and weighted by land area)

Country*	The original CO_2 emission (%)		Weighted CO_2 emission by land area (%)	
	Grassland	Cropland	Grassland	Cropland
Austria	11%	89%	31%	69%
Belgium	7%	93%	6%	94%
Croatia	2%	98%	1%	99%
The Czech Republic*	3%	97%	2%	98%
Germany	6%	94%	7%	93%
Hungary*	4%	96%	1%	99%
Luxembourg	4%	96%	3%	97%
Netherlands	10%	90%	20%	80%
Poland*	3%	97%	1%	99%
Slovakia*	2%	98%	1%	99%
Slovenia	12%	88%	7%	93%
Switzerland	6%	94%	8%	92%
V4 group	3%	97%	1%	99%
Central Europe without V4	7%	93%	10%	90%
Central Europe with V4	6%	94%	7%	93%

Source: authors' estimations. Notes: * V4 countries.

The effect of grassland size is the primary factor in CO_2 emission as 98-99% of the variance explained by this effect (Table 3).

The impact of grassland size on CO_2 emission under cropland is relatively smaller in the case of the V4 group and grassland size explains only 71.3 per cent of the variance of CO_2 emission under cropland compared to other CEU countries (98.2%). On the other hand, the cropland area explained a significantly higher amount of variance (28.6%) compared to the other CEU countries. Individual country differences contributed to a less explained ratio in the variance in the case of the V4 group but in the case of CEU countries, individual country differences were relatively higher with respect to CO_2 under grassland.

DISCUSSION

The present study focused on CO_2 emission proportions that vary based on country-specific land used. Research results are significantly coherent with Xiaofeng Xu (2008) who developed the biogeochemical model to estimate large-scale soil CO_2 fluxes and reported that the highest slope occurred in agricultural rice production and lowest temperate on grassland. Research result showed that grassland has a relatively higher impact on the environment than cropland.

Very few related studies have been carried out for Central European and V4 countries that affect CO_2 emission at cropland and grassland level by Dorota Wawrzyniak (2020), Jiandong Chen, Ping Wang, Lianbiao Cui, Shuo Huang and Malin Song (2018), Moutinho, Victor Madaleno, Mara Inglesi-Lotz, Roula Dogan and Eyup (2018), Madaleno and Moutinho (2017), Oertel, Cornelius Matschullat, Jörg Zurba, Kamal Zimmermann, Frank Erasmi and Stefan (2016). The majority of researchers put special emphasis on cropland rather than grassland that has a significant effect on the environment but our research has shown the opposite result. This paper explores this gap and encourages to further examine the factors influencing country-specific land-based CO_2 emission in Central Europe and the Visegarád countries.

Dorota Wawrzyniak's (2020) studies were based on data from 1993 to 2016 stating that Visegarád countries decreased their emissions by 20% achieving the Kyoto protocol and Europe 2020 target. Hungary has significantly reduced CO_2 emissions by 26% and 22% declined in the Czech Republic, 21% in Slovakia and Poland's large land size remains the largest emitter among the V4 group reducing the CO_2 emission by 18%.

In another study, O'Connor (2020) closely observed fossil-fuel and land-use change based on CO_2 emissions from 1751 to 2018 and identified the relationship between carbon dioxide (CO2) emissions and sink processes which are responsible for the climate change . Since the mid-1700s, CO_2 emissions have been increased by 370% for fossil-fuel combustion.

This study shows that grassland of both CEU and V4 countries is responsible for higher CO_2 emission as 98.2%

Table 3. Variance Analysis of the Land Type and Country Effects from the General Additive Panel Model*

Factor	Central Europe without V4			V4		
	Grassland	Cropland	Country	Grassland	Cropland	Country
CO_2 (Cropland)	98.2	1.8	0.1	***71.3***	***28.6***	0.1
CO_2 (Grassland)	98.3	0.1	***1.6***	99.8	0.1	0.1

Source: authors' estimations. Notes: *: all effects significant at 1% level.

and 71.3% of the variance of the combined CO_2 emission rates due to this factor (Table 3). The reason behind the increased emission is that the emission shifts were caused by the application of organic matter decomposition. Soil greenhouse gas (CO_2, CH_4, N_2O) flux directly affect the atmosphere by increasing emission (Yashiro et al., 2008). Besides, heterotrophic bacteria can oxidize the soil's carbon and extracting CO_2 that spreads into the environment. This respiratory cycle is one of the major fluxes of carbon (C) from the atmosphere to the terrestrial ecosystems (Schlesinger, 2011). Ideal soil respiration and organic decomposition depend entirely on abiotic factors such as soil humidity and temperature (Kirschbaum, 2004). As a result, the future climate will significantly change which correlates with the research result.

Besides, many factors are affecting this emission rate in selected central European countries. Among them, acidification of the soil mentionable and it's increased N supply decrease the thin base of the trees and turn the root area into upper layers of soil. Increased development above ground, which can be seen in many places throughout Europe. 25% of the total forested area of Poland, Slovakia, Czech Republic, and Germany had defoliation and severe damages on all trees (Matzner & Murach, 1995). Furthermore, many farmers tend to pick tropical deforestation activity for converting to the forest land into arable land which has adverse effects on the environment. However, deforestation can be critical in collective efforts to soothe the concentrations of greenhouse gas (GHG) at levels that prevent harmful intervention in the climate system (Santilli et al., 2005). These types of anthropogenic activities, such as changes to biophysical settings, biodiversity loss and unplanned usages of natural resources, had substantial influences on the global environmental system.

Soils carry the largest carbon source in terrestrial ecosystems, consisting of various materials with a wide range of various molecular structures including fresh organic matter (FOR), like litterfall, plant and leaf litter, soil litter, and root exudates and soil organic matter (SOM) (Blagodatskaya & Kuzyakov, 2008). The quality and texture of soil organic matter (SOM) are important factors that influence the mineralization of carbon (C) and nitrogen (N) under persistent soil moisture, but their impact on the mineralization of organic matter and the related biogenic gas like carbon dioxide (CO_2) vary during sequential dry and wet cycles (Harrison-Kirk et al., 2013).

The impact of temperature and the effects of the addition of fresh substrates on the decomposition of soil organic matter are based on two main elements, soil carbon dynamics under climate change and increasing CO_2 levels. Soil organic carbon composition of much more extremely complicated or low-quality carbon molecules that decompose quite slowly and is often referred to more sullen carbon pool. (Thiessen et al., 2013). Moreover, There remains a significant mystery as regards the extent to which increasing temperatures induce decomposition in Soil organic matter stores and provide positive input on global warming. The stocks of malleable and truculent substances are not comparable in most settings, with recalcitrant compounds becoming even more prevalent than readily biodegradable compounds (Davidson & Janssens, 2006). Subtle changes in Soil Organic Matter may drastically change the concentration of CO_2 in the atmosphere (Conant et al., 2011).

According to Rebecca Ryals and Silver's (2013) organic matter amendments, the carbon advantages of enhanced net primary productivity (NPP) can be compensated from a global warming viewpoint by reducing soil greenhouse gas emissions. Changes in organic matter maximize soil Carbon and nitrogen (N) concentrations and may significantly change the soil's environmental conditions including humidity, temperature and pH, thus raising potential carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) emissions. Amending grassland soils with organic waste greenhouse gas emissions can mitigate (GREGORICH et al., 2005). The results suggested complementary strategies including soil management, nitrification inhibitors and management of organic or inorganic fertilizers and directly influence the CO_2 gas emissions (Luo et al., 2010).

Also, climate change highly depends on the agriculture system, and it is the primary determinant of agriculture productivity but also fluctuates on latitude, altitude, and crop type (Adams et al., 1999). Eventually, temperature changes negatively affect overall food production and the environment. It has estimated that agricultural activities contribute approximately 30 per cent of the GHG emissions that cause anthropogenic climate change (Pete Smith & Gregory, 2013), and growth rates of the rain-fed area will be decreased by 15 per cent compared to the baseline (Rosegrant et al., 2009). However, organic cultivation increases 30 per cent of the higher richness of species like birds, insects, and plants than conventional cultivation systems, but 16% of them showed adverse biodiversity effects (Bengtsson et al., 2005).

In Europe, since the mid-1980s, policymakers, consumers, environmentalists, and farmers have focused considerable attention on organic cultivation (Stolze & Lampkin, 2009). Organic agriculture is a farming approach that represents the quality of the food and health, environmental preservation, livestock conservation, sustainable use of resources, and aims for social equality (Lampkin, 2017). According to the

Eurostat in 2018, organic farming extended to 13.4 million hectares of agriculture within the EU-28. It is 7.5 per cent of the EU-28 ‘s total agricultural land utilized as organic (Eurostat, 2020).

The organic cultivation system has a higher potentiality to climate resilience because it maintains healthy ecosystems with minimal negative impression on the environment. Thus, the cultivation of the crops agricultural GHG emissions can reduce by 20 per cent, where 10 per cent pointed reduction of energy demand (Adams et al., 1999). However, finding a way to minimize the influence of human activities on the environment changes is a growing concern (Azadi et al., 2011). Similar to this study conducted by Cristina Muñoz (Muñoz et al., 2010), suppression of CO_2 also observed from different points of view (Mikulčić et al., 2017), i.e., production cost, soils, crops, markets, and climate conditions.

This research has some unavoidable limitations. This study did not observe the risk of temperature sensitivities that evolve from CO_2 emission of cropland and grassland. The additional constraints of the research are that not only CO_2 but also other greenhouse gasses have the greater potential of global warming. Because other GHGs are created by microbial nitrification and denitrification in anoxic soil microsites and that can make a favourable environment unfavourable . (Kammann et al., 2008). The reason behind this phenomenon is that after the emission of CO_2, it increases the atmospheric concentration and remains on Earth for thousands of years. Moreover, it will take approximately 3.000 years to eradicate the current pool of CO_2 from the atmosphere in the absence of emissions from other sources (Schlesinger, 2015).

Climate-change management policy has been centralized in many European countries, including Hungary. The local interests, areas of expertise, and resources often remain dormant. This trend is incompatible with the principles and objectives of the relevant EU policies (Patkós et al., 2019). The climate-mitigation and renewable energy technologies, including biomass, lighting methane, wind, solar, geothermal, marine energy, hydropower, and energy waste, will be the long-term solutions (Dechezleprêtre et al., 2011).

The researchers, environmentalists and the policymaker concerned with the consequences of greenhouse gas (GHG) concentration in the atmosphere (Nyong et al., 2007) and can contribute to reducing the causes of global warming and bring resilience on climate change and protect the destruction of the ozone layer. CEU farmers need to understand the cultivation and environmental factors that are harming the atmosphere. However, CO_2 and N_2O mitigation practices not only support productivity but also help to cope with EU climate policy, Kyoto protocol and Europe 2020 strategy.

CONCLUSION

In nutshell, CO_2 is the core GHGs that connected with global warming. Measurement of carbon can be a crucial strategy to monitor and control CO_2 emissions in CEU. On the other hand, the CEU and Visegrád group have their own nationally defined goals and external difficulties emerging from geographical disparities. The purpose of this research was to see how much GHG emitting by the CEU and Visegrád countries and how they are coping with GHG emission-reducing strategies in meeting the target of Kyoto protocol and Europe 2020’s environmental goals. Results reflect the countries’ different level of GHG gas emission situations, making it harder to achieve cohesion.

Present analysis and policy discussion narrowed down the climate issue to a debate about CO_2 emissions from central European and Visegrád country’s cropland and grassland. In contrast, the Kyoto and Europe 2020 Agreements contained different climate policy issues including non-CO_2 greenhouse gases.

Emission results highlight the fact that Central European and V4 group countries’ cropland is responsible for more emission than emission from grassland, and therefore cropland is likely to have a more substantial influence on climate change. It is imperative to bring this issue to the forefront of biomass pool, dead organic matter, organic soils drainage to assess the collective impact to the environmental changes, and forthcoming steps should take to explore the potential mitigation and adaptation processes to fulfil and comply with the targets of Kyoto protocol and Europe 2020 strategy that need to be achieved by 2020.

Even though some mitigation strategies can adversely affect farming systems’ adaptive ability, most climate change adaptation options have a favourable impact on mitigation. For CEU countries appropriate adaptation measure applicable to lower the GHG emissions from their grassland and cropland, these are including (1) biomass can be used as a renewable energy source, which could easily replace fossil fuels from conventional cultivation systems (Urbaniec et al., 1384) . (2) The soil erosion mitigation strategies, (3) Nitrogen and phosphorus leaching control, (4) soil moisture preservation measures, (5) variety of crop rotations by choice of habitats or variations, (6) microclimate adaptation to mitigate extreme heat and provide insulation, (7) land utilization alteration including abandonment or expansion of the existing arable land, (8) Improving the efficiency of nitrogen use. (9) Improving the storage of soil carbon (P. Smith & Olesen, 2010), (10) Enhanced sequestration of carbon soil by reduced tillage, (11) Efficiency of fertilizer-N to improved crop utilization, (12) Utilization of chemical or natural nitrification inhibitors, (13) GHG emissions reductions by storing atmospheric Carbon (C) as soil organic matter (Muñoz et al., 2010), (14) increasing Switching from conventional farming system to the organic farming system.

Eventually, to mitigate outcomes of global warming by considering the adverse effects of CO_2 emissions, accurate measurement of emissions, and urgent action towards mitigating and controlling gasses is inevitable for climate resilience. Further research is necessary to clarify how these greenhouse gases play a role in mitigating the potential impacts of climate change.

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Applied Studies in Agribusiness and Commerce – APSTRACT
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SCIENTIFIC PAPER

BOARD DIVERSITY AND FIRM VALUE; MEDIATING EFFECT OF CSR OF LISTED OIL FIRMS IN NIGERIA

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Abstract: *In this empirical study, the mediating effect of corporate social responsibility (CSR) on the nexus between corporate value and board diversity is investigated. However, hypotheses developed for this study were tested with annualized panel dataset of eight (8) Nigerian listed oil and gas firms in the upstream sector spanning 2012 to 2019. Stakeholder theory was used to underpin the study. The study employed three indicators for board diversity (board professionalism, board nationality and board gender), Tobin's Q and amount spent on CSR. The panel regression results show that looking at the indirect effect in Model One; board diversity has no significant effect on firm value. However, empirical findings indicated that CSR exerts a significant and positive relationship with corporate value. Considering Model Two, the results show that CSR plays a pertinent role in establishing the nexus between corporate value and board diversity, this finding is congruent with stakeholder theory. The study recommends that environmental sensitive firms should maintain an appropriate and balance diverse board as it plays a pertinent and significant role in establishing the nexus between stakeholder relationship and the firms, which can also serve as a mechanism to mitigate manager's opportunistic tendencies behind CSR investment..*

Keywords: *Firm Value, CSR, Board Diversity*.
JEL Classification L95, M14, M41

INTRODUCTION

On a global scale, the oil and gas business has orchestrated significant transformation to world economies as a result of these entities' contribution to global energy consumption. This is substantiated by the heavy dependence of the global community on oil and gas supplies to meet present domestic consumption and future speculation (ERDEY et al, 2019). In 2019, reports from World Energy and BP Statistical Review posited that oil in the equivalent of about 583 tonnes (million) is tantamount to global primary consumption of energy. In view of this, 63 percent of global energy supplies are reciprocated by oil and gas production with corresponding global GDP estimated to be $86 trillion according to market research by IBIS World (2019). Therefore, activities of global upstream oil and gas industries cannot be contrived as an undeserved phenomenon. As posited by ZHENG et al. (2016) these entities are specifically characterized due to their technical inclination to upstream complexities.

In Nigeria, this sector alone contributes approximately 65 percent of government income and 88 percent of Nigeria's foreign exchange earnings (KPMG, 2019). Also, the current assessment of commercially viable oil estimated proved reserves to the whopping tune of 37 billion (barrels) in equivalent trillion metric cubic feet (TMC[3]); undoubtedly took Nigeria to the frontier of global oil and gas producer in the collective 10th order of most influential oil-rich nations (Organization of Petroleum Exporting Countries, 2020). Nevertheless, the menace of oil and gas exploitation has been the precipitations for ecological degradations in the species of maritime and terrestrial pollution, while among other things, oil blowout, land eruption, fire disaster, pipeline vandalization, the insurgence of militancy, hostages and abduction of foreign oil and gas investors have been consistent with peculiar diversities in domestically recorded circumstances been faced incessantly in Nigeria.

In 2010, a report by the National Oil Spill Detection & Response Agency (NOSDRA) indicates that nearly 2,400 oil spill cases have been detected between 2006 and 2010 respectively. In the same vein, 13 oil spills recorded in March 2020, in the oil region with its environmental and health implications as cited in the daily newspaper (Thedaily,

2020). The indigenes of this region are the ones taken these oil spillages, which have resulted in severe issues of environmental degradation, reduced people's economic prosperity, and livelihood for decades. In lieu of these multiplying socioeconomic fatalities such as heightened mortality rate, health decadence, and retarded corporate safety that has bedeviled the economic prosperity of Nigeria in an ignoble course, there has been intensively harmonized global uproar to mitigate the dilemma caused by the quantum of these interactions in the collective. Nigeria is mostly regarded globally as heightened environmental polluting as it is currently ranked seventh highest gas flaring country and 10th most polluted country in the world (AIRVISUAL, 2018; WORLD BANK, 2019).

Despite the negative effects of companies operating in the oil and gas sector, they pay less attention to these issues. As a result, stakeholders urge and pressurize companies to increase their transparency and adaptive capacity for the incorporation of contemporary issues bothering largely on sustainable development, environmental impacts, and corporate social responsibility practices in their framework of reporting so that shareholders are kept abreast of what may pose negative likelihood to their expectations in wealth maximization (BRAAM et al. 2016).

As posited by CARROLL (1991), CSR is perceived as a means by which companies strikes a plethora deal of harmony and collaborations with companies' top executives with the view to integrate information transparency bothering on the environment in their reporting framework as part of their statutory contributions and recourse to legacy. Accordingly, YAO et al. (2011) argue that failure by the company to discharge this societal responsibility properly and adequately may result in negative consequences. CSR changes business practices in a way that maximizes a company's benefit to society and minimizes the risks and costs to society while keeping the company focused on building business and brand value (EPSTEIN-REEVES, 2011 in CSAPÓNÉ et al., 2016).

In line with the growing importance of CSR, the functions, and duties of the boards of directors have been expanded from a traditional shareholder-centric point of view to include a different range of stakeholders. Nowadays, boards are increasingly regarded as responsible for CSR and sustainability issues. Boards of directors affect CSR in several ways, from the development of stakeholder-friendly organizational policy to the formation of committees concerned with CSR-related issues.

In 1970, Friedman perceives a firm as a distinct open system that depends on organizations external to the entity itself and contingencies peculiar to the business environment. It suggests that corporate board diversity maximizes access to critical resources through their skills, competencies, and knowledge (HILLMAN et al. 2007). Organizations with board professionalism are much more likely to have mounted sturdy CSR commitments and are better located to deliver CSR performance (CERES, 2019; MINGUEL, 2017). Furthermore, the expertise of the board members is essential to good corporate governance. Directors with advanced degrees and professional qualifications are more likely to have established strong CSR commitments and are better positioned to deliver CSR performance (CERES, 2019).

Most of the current studies have carved a uniform research direction with concentrations in assessing the nexus between foreign directorships and economic performance of the company (DANIEL et al. 2013; ESTELYI and NISAR, 2016; MILETKOV et al. 2013; OXELHEIM and TROND, 2003) however, this current study investigated divergence of directorship nationality as surrogacy for assessing both companies internal and external CSR performance. The role of women in the boardroom cannot be overlooked in this age. However, a dichotomy in gender disclosures of female directorship tends to impact CSR practices positively through moral substance attributable to corporate legitimacy (RAO and TILT, 2016). NIELSEN and HUSE (2010) argue that women could be more receptive to corporate activities such as CSR and environmental policy. In connection to gender diversity and CSR, most previous researchers found that female directors on the board improve their practice of CSR. For example, HARJOTO et al. (2015) found that boards of directors with greater gender diversity are more effective at monitoring CSR performance from the perspective of stakeholder theory. Diversity of nationalities, educational backgrounds and gender brings divergent priorities in intimacy with corporate goal congruence for decision-making.

According to WANG and BANSAL (2012) enhancing value for the firm and ensuring risk dispersion are largely intimated by strategic adoption of best practices in CSR. On the contrary, investment in CSR practices can be a constraint to a firm's dedication or precipitate potential deviation from their operational norms such as costs thresholds. Furthermore, firm value and corresponding trends in share price may appreciate as a result of the socioeconomic advantages arising from transparent disclosures (FAUZI, 2008).

According to EMMANUEL et al. (2019), firm value is broadly seen as an economic model showing the aggregate market value of firms. Moreover, it is the sum interest in aggregate of shareholders of a company especially creditors and shareholders. Many corporate leaders believe that there must be symmetry between shareholder value and corporate board diversity (Carter ET AL. 2003). On the contrary, BHAGAT and BLACK (2000) opined that "changes in corporate value (and presumably shareholder value) cannot be statistically attributed solely to the presence or absence of a small number of individuals of any background on a board of directors," and such is not substantive enough to justify processes involved in determining the bond between corporate board diversity and value creation for shareholders.

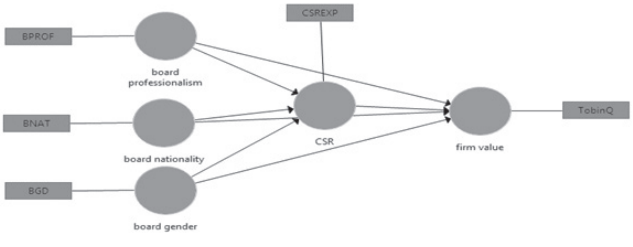
As posited by JOSEE et al. (2014); KUZEY and UYAR (2016); NOBANEE and ELLILI (2016), their empirical studies encompass capital sophistication in diversities including those with backgrounds in institutional and legal frameworks. According to NWOBU (2015), positive sustainability reporting erodes a significant correlation with shareholder funds. While BOUBAKER et al. (2014) focused on firm performance and corporate board gender dichotomy, EFFIONG et al. (2019)

on the other hand, focused on triple bottom line reporting and shareholders' value. CHEN and LEE (2017); YANG et al. (2020) focused on environmental information disclosure on the firm value. In these empirical studies, the prevalence of ambiguity arising from conceptual contradictions and non-conclusive reporting is stemmed from apparently dwindling negative and positive statistical significance. However, due to nonexistence or relatively scanty literature, this study is believed to pioneer the contemporary debates on this subject matter examining the mediating effect of CSR on the nexus between firm value and corporate board dichotomy. This study will examine the direct and indirect effect of board dichotomy on firm value where CSR mediates the relationship.

Furthermore, there have not been many arguments in the literature about the relationships between the representation of foreign directors on board and the strategic implementation of the corporate environmental, social, and ethical duty. In addition, this study use amount spent on CSR activities as a measurement of CSR which has previously received little consideration. Till now, a large number of CSR researchers have used CSR disclosure as a measurement. Previous empirical studies limited their scope to corporate board and gender dichotomy only (YASEEN et al. 2019). Therefore, this research closes this gap by using three aspects of board diversity (Gender, Professionalism and Nationality) analyzing their effect on the mediator (CSR spending) and the dependent variable (firm value).

In addition, the background of this study is premised on a theoretical framework encompassing stakeholder theory. Stakeholder theory imbibes the notion that firms should be environmentally and socially liable. Additionally, having a more diverse board with knowledge and experience will help reduce interagency conflict and ensure owner resources are managed effectively. Therefore, stakeholder theory relates with the reality that a firm's decision is influenced by interconnectedly identified groups with a proprietary interest in firm management. Likewise, FREEMAN et al. (2004) perceived that firm value creation is intimated with value creation for shareholders, this implies that business connotes the idea that creates room for all externals to the entity in achieving goals symmetrical with the performance of the firm. Therefore, this study tends to examine the mediating role of CSR on the relationship between firm value and board diversity of listed environmentally sensitive firms in Nigeria.

Figure 1: Variables Framework



Source: Own construction, 2021

The above theoretical framework (Figure 1) explains how CSR mediates the nexus between Firm Value and Board Diversity. Thus, hypotheses are stated as follows:

H_1: Board professionalism has no significant effect on firm value.

H_2: Board nationality has no significant effect on firm value.

H_3: Board gender has no significant effect on firm value.

H_4: CSR has no mediating effect on the nexus between firm value and board diversity.

MATERIALS AND METHODS

In brevity, this paper employed a correlation research design to underpin the statistical justifications. However, the baseline for the study population was premised on 12 oil and gas firms that are highly environmentally sensitive due to the nature of their operations and have long years of trading results in the Nigeria Stock Market as of 31st December 2019. However, four (4) of the firms were filtered out due to the unavailability of data in their financial statement. Annualized panel dataset was extracted from the oil and gas firms' end-of -year financial reports and the Nigerian stock exchange for a period of 2012-2019. These firms include Eterna Oil Plc, 11Oil Plc, Forte Oil Plc, Japaul Oil Plc, MRS Oil Plc, Oando Plc, Total Oil Plc and Conoil Plc (NIGERIA STOCK EXCHANGE, 2021). This sector was considered highly environmentally sensitive due to the nature of its operations and impact on biodiversity (UGOCHUKWU and ERTEL, 2008).

For data analysis, the research employed multiple regressions on the panel data. Further diagnostic tests were conducted to ensure that the analysis is the best linear unbiased estimate (BLUE) and that appropriate technique were selected for the interpretation (WOOLDRIDGE, 2012). Among the tests carried out in addition to the Multicollinearity test, Autoserial Correlation, Heteroskedasticity and Normality based on the recommendation of (WOOLDRIDGE, 2012) are the Hausman tests that make this study go by random effect since the test is insignificant. Additional tests are also performed, such as the LM test, to decide between random effect and robust OLS, then generalized least squares (GLS) and Panel Corrected Standard Error for the two models. The time frame coincided with a growing dialogue on CSR and diversity in the corporate board, accompanied by the enactment of the related regulation. The dependent variable is denoted by firm value which is proxied by Tobin's Q expressed as the aggregate sum of firm's stock values and the proportion of the firm total debt to firm's total asset in value (AL-MATARI et al., 2012), and the mediator corporate social responsibility, measured as the total expenditure spent on the CSR in the financial statement (AWODIRAN and KAREEM, 2019). The explanatory variables for this study comprised of three board diversity dimensions (board professionalism, board gender dichotomy and board nationality). However, board gender dichotomy is expressed as the proportion female director bears to the aggregate sum of all directors present in the board composition for each year of observation as

supported by Oh et al. (2019). Board professionalism is measured by the proportion of members with professional qualifications bears with the aggregate sum of all directors in the board composition (HARJOTO et al., 2015). Board nationality is expressed as the proportionate sum of all foreign directors bears to the total of all directors in the board composition (ANAZONWU et al. 2018). To this effect, the model specification compatible with all these variables is expressed below:

$$FV_{it}=\beta 0+\beta_1 CSR_{it}+\beta 2 BPROF_{it}+\beta_3 BNAT_{it}+\beta_4 BGD_{it}+E_{it} \quad (1)$$

$$CSR_i=\beta 0+\beta_1 BPROF_{it}+\beta_2 BGD_{it}+\beta_3 BNAT_{it}+E_{it} \quad (2)$$

Where:

FV	= Firm Value.
CSR	= Corporate Social Responsibility.
BPROF	= Board Professionalism.
BNAT	= Board Nationality.
BGD	= Board Gender Diversity.
ß0	= Intercept.
ß1 to ß4	= Coefficient of the independent and control variables.
Є	= Error term.
it	= Subscript for Panel Data

RESULTS AND DISCUSSION

Data collected during the study are presented and discussed in this section. The descriptive statistics, correlation matrix and inferential statistics are presented in this section. The hypothesis formulated for the study was tested to institute the degree of significance between board diversity and CSR.

Table 1: Descriptive Statistics

	Mean	Std. Dev.	min	max	Median	Skewness	kurtosis
Tobinq	.114	.28	.006	2.132	.047	6.172	43.826
Csr	27113324	48242336	0	1.734e+08	4333316.5	1.891	5.14
Bprof	.139	.113	0	.375	.125	.428	2.302
Bnat	.181	.21	0	.636	.106	1.03	2.65
Bgd	.138	.085	0	.286	.143	-.254	2.134

Source: summary of STATA output, 2021

From the table presented above (Table 1), the firm value proxied by Tobin's Q has an average mean of 0.114, which is a deviation from the mean of 0.28. This shows that the firm value variable is normally distributed due to deviation from the average mean. The median is 0.047 with a corresponding minimum and maximum of 0.06 and 2.13. This means that listed highly environmentally sensitive firms have a maximum value disclosed in the financial statement to the extent of 2.13.

Also, the average amount spent on corporate social responsibility across the environmental sensitive firms is ₦27million ($70,773.26). The standard deviation of ₦48million ($125,918.15) shows that there is large dispersion across the sampled firms regarding the extent of social responsibility involvement. The median is ₦4million ($10,493.18) with the corresponding minimum and maximum values of ₦0 and ₦17million ($44,596.01) respectively. The minimum spending of ₦0 could be as a result of the fact that some oil and gas firms spending on environmental disclosure could be insignificantly low for a particular year and therefore, may not need to be disclosed for the financial year.

The average of sampled firms' board professionalism is 13.9% with a standard deviation of 11.3%. The difference between the mean and the standard deviation is 2.6%. It means that there is low dispersion across the sampled environmental sensitive firms in Nigeria. The minimum and maximum proportions are 0% and 37.5% respectively, while the median is 12.5%. The mean value of foreign directors across the listed sensitive firms is 18.1%, while the deviation value of 21.0% indicates that there is a moderate deviation of the data from the mean. The median is 10.6%, with the corresponding maximum and minimum proportion of foreign director of the listed environmental sensitive firms in Nigeria within the period covered were 63.6% and 0% respectively. The average board of the sample firms is more diverse in terms of nationality as compared to other diversity dimensions. Finally, board gender diversity has an average of 13.8% and the low standard deviation of 8.5% as compared with the mean shows that there is low dispersion in the proportion of gender diversity that constitutes the members of the board across sampled firms. The median is 14.3%, with the corresponding minimum and maximum proportions of female directors are 0% and 28.6% respectively.

On the other hand, the values of the skewness are obtained in Table 1 therefore; it means the data is expected to be normally distributed even though it is shown as negatively skewed. The kurtosis value as seen in Table 1 also means the peakness of the distribution is expected to be normal. This is in line with the so many studies which shows how the distribution of the data should be expected through the use of skewness and kurtosis as testing the data could reveal whether the said data is skewed or the kurtosis is abnormal (BAI and NG, 2005; BARATO and SEIFERT, 2015; BLANCA et al. 2013; KOLLO, 2008; MARUYAMA, 2007; RYU, 2011).

Table 2: Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)
(1) tobinq	1.000				
(2) csrexp	-0.132	1.000			
(3) bprof	0.129	0.130	1.000		
(4) bnat	0.217	0.321	-0.034	1.000	
(5) bgd	-0.146	0.476	0.107	-0.279	1.000

Source: summary of STATA output, 2021

From Table 2, there is the existence of a positive correlation between board nationality (BNAT), board professionalism (BPROF) and Tobin's Q. However, corporate social responsibility (CSR) and board gender (BGD) have a negative relationship with Tobin's Q. considering the relationship between CSR as a mediator and explanatory variables. It was found that BPROF, BNAT and BGD are positively related to CSR. More so, a positive relationship

exists between BPROF and BGD. However, there is a negative relationship between BFROF and BNAT; BNAT and BGD respectively. On the other hand, the prevalence of multicollinearity among the variables established a nonsignificant relationship between firm value and CSR. To prove otherwise, however, comparative analysis of tolerance value and variance inflation factor (VIF) is required beyond their benchmark for the rule of thumb. To that effect, tolerance values and variance inflation factor (VIF) are an advanced statistical assessment of the prevalence of multicollinearity among the regressed variable.

Diagnostics Tests

To ensure the validity and reliability of the statistical inference of the regression model, robustness tests were conducted. The robustness tests conducted include a test for multicollinearity, vif, Hausman specification test, autocorrelation heteroskedasticity, normality of residual.

Table 3: Variance inflation factor

	VIF	1/VIF
Csrexp	1.839	.544
Bgd	1.768	.566
Bnat	1.53	.654
Bprof	1.024	.977
Mean VIF	1.54	.

Source: summary of STATA OUTPUT, 2021

From Table 3 presented, the value of variance inflation factors shows a consistent decline below 10, this implies the nonexistence of multicollinearity as a result of the value in the class boundary of 0 to 10. Furthermore, tolerance values also depicted a consistent increase exceeding the 10% benchmark. This substantiates the nonexistence of multicollinearity among the independent variables (NETER et al. 1996; TABACHNICK and FIDELL, 1996). The findings obtained in these empirical studies validate that the nonexistence of multicollinearity does not affect on the statistical inferences extracted from this study.

Table 4: Model One (Indirect Effect): FVit = ƒ(CSREXP+BPR+BNAT+BGD)

Tests	Hettest	Autocorr	SWilk	Ovtest
Chi2	4.200	1.403	0.882	1.63
P-value	0.000	0.275	0607	0.193
Mode Two (Direct Effect): $CSREXP_{it}$ = ƒ(BPR+BNAT+BGD)				
Chi2	4318.10	23.056	0.294	2.72
P-value	0.000	0.0018	0.998	0.530

Source: summary of STATA OUTPUT, 2021

The study adopted Wooldridge to test for the existence of heteroskedasticity. The study revealed that Chi-Square of 4.200 for Model One and 4318.1 for Model Two with the corresponding P-value of 0.000 for Model One and Two implies the presence of heteroskedasticity; it also means that the constant residual (homoscedastic) and the null hypothesis are rejected. The presence of auto/serial correlation violates the assumption of longitudinal data which is one key attribute of panel data. The Wooldridge test for autocorrelation was adopted to test for the presence/absence of auto/serial correlation. The criteria were to accept Ho = No Autocorrelation if P-value is greater than 5% and accept H_1 = Presence of Autocorrelation if P-value is less than 5%. The result obtained from the table above shows that there exists no issue of Auto/serial correlation in Model One as the P-value (0.275) is greater than 5%, while Autocorrelation was found in Model Two as the P-value (0.0018) is less than 5%. The results of Ovtest from Table 4 show that there was no misspecification as the P-values are greater than 5%. In addition, the Normality distribution of the data is another paramount assumption of linear regression where it is considered as a condition for parametric test analysis. This is because, one of the parametric test conditions is that, the data must be normally distributed across the variables for the test to stand for generalization (PARK, 2008). However, it was argued that the normality is to be conducted on the residuals of the model and not the data where the dependent variable determines the parametric analysis to be conducted (GHASEMI and ZAHEDIASL, 2012). Thus, this study conducted a normality test on the residuals of the model using Shapiro Wilk. Since the value is greater than 0.05 as indicated on the table at a 5% level of significance, therefore, the null hypothesis that the data is normally distributed across the model cannot be rejected.

Table 5: Model One Regression Results

	OLS	RE	FE	Hausman
Constant	-1.728**	-1.277	-0.726	
Csr→Fv	1.961**	1.227	0.549	
Bprof→Fv	-1.399	-1.429	-1.440	
Bnat→Fv	-0.055	-0.025	0.015	Chi2=1.50
Bgd→Fv	-3.150	-7.580	-1.800	P-v=0.681
Model Two	**OLS**	**RE**	**FE**	**Hausman**
Constant	0.467***	0.474***	0.529***	
Bprof→CSR→Fv	0.448**	0.309**	0.238*	
Bnat→CSR→Fv	0.028*	0.034**	0.040***	Chi2=12.06
Bgd→CSR→Fv	0.39e-09**	1.69e-09	1.41e-09	P-v=0.0024

***** P-value is less than 0.01, ** P-value is less than 0.05, * P-value is less than 0.1 %**

Source: summary of STATA OUTPUT, 2021

Table 5 shows the summary of the regression result and the Hausman specification test to ensure an appropriate technique is selected. The study conducted the Hausman specification test after fixed and random tests were carried out for the first and second models. The essence of the Hausman specification test is to choose an alternative model preferably between random and fixed-effect models. Hausman specification test conducted produced a p-value of 0.681 for Model One, which is insignificant. This implies that variation among the sampled firm is presumably random and congruent with an independent variable in

the model specification and presumably random. The result of Hausman for the second Model was in favor of fixed effect as it is statistically proved with a P-value of 0.0024. Due to the presence of heteroskedasticity, the study further conducts a generalized least square (GLS) model which overcomes the heteroskedasticity issues. Thus, this study report GLS model results as suggested by (Wooldridge, 2012) based on the issues raised for Model One and Panel Corrected Standard Error (PCSE) for Model Two.

Table 6: Model One (Firm Value Dependent Variable), Cross-sectional time-series FGLS regression

Tobinq	Coef.	St.Err.	t-value	p-value	Sig
Csrexp→Fv	1.961	.9	2.18	.029	**
Bprof→Fv	-1.38	1.206	-1.14	.253	
Bnat→Fv	-.055	.106	-0.52	.603	
Bgd→Fv	-3.15e-09	8.50e-09	-0.37	.711	
Constant	-1.729	.694	-2.49	.013	**
Mean dependent var		-0,656	SD dependent var		3.104
Number of obs		64.000	Chi-square		5.080
Prob > chi2		0.2794	Akaike crit. (AIC)		330.723

*** $p<.01$, ** $p<.05$, * $p<.1$

Source: summary of STATA OUTPUT, 2021

From Table 6, there is evidence of a significant relationship between firm value and CSR provided one considers the p-values. This indicates that the variable is statistically significant. From the result of the GLS estimations, the relationship between firm value and CSR is positive and is also statistically significant at 5%. This is a clear indication that an increase in CSR will bring about an improved firm value with the economic assumption of other things being the same. This is because high-quality CSR disclosure influences investors' as well as lenders' decisions because their risk assessment and the potential return on investment determine the placement of their fund. Furthermore, corporate transparent reporting of environmental issues justifies firm compliance with ethical and legal requirements. This agreed with the hypothesis formulated and is in line with the proposition of the stakeholder theory. This provides the basis for rejecting the null hypothesis which states that, CSR has no significant influence on firm value.

Finally, board professionalism, board nationality and board gender were found to be negative and statistically insignificant as proved by the p-values of 0.253, 0.603 and 0.711 respectively. This implies that the effect of board diversity poses no statistically and direct significance on firm value. This is against our apriori expectation and proposition of stakeholder theory that the perceived notion behind trade and value creation is in the best interest of value creation for shareholders when the board is diverse. On this basis, the study failed to reject a null hypothesis that says, the effect of board professionalism, board nationality and board gender poses no significance on firm value.

Table 7: Model Two (CSR Mediator), Correlated Panels Corrected Standard Errors (PCSEs)

Csrexp	Coef.	St.Err.	t-value	p-value	Sig
Bprof→CSR→Fv	.448	.148	3.03	.000	***
Bnat→CSR→Fv	.028	.014	1.99	.046	**
Bgd→CSR→Fv	3.39e-09	5.8e-10	5.80	.000	***
Constant	.467	.062	7.53	.000	***
Mean dependent var		0.656	SD dependent var		3.104
Number of obs		64.000	Chi-square		76.82
Prob > chi2		0.0000	R-squared		0.2978

*** $p<.01$, ** $p<.05$, * $p<.1$

Source: summary of STATA OUTPUT, 2021

The result in Table 7 shows the result obtained from the Panel Corrected Standard Error Regression (PSCE) which was interpreted after performing all relevant tests. The R-squared coefficient of determination was 0.2978, indicating that approximately 29.78% of the variation in CSR as approximated to the actual amounts of CSR was caused by variations in the independent variables explained by the model. This means that board gender diversity (BGD), board professionalism (BPROF), and board nationality (BNAT) together accounted for 29.78% of spending on CSR of Nigerian listed oil and gas companies and it is statistically significant at 1% as indicated with a p-value of 0.0000. And the remaining 70.22 percent was due to other factors not included in the equation but measured by the error term. Furthermore, the result shows that board professionalism (BPROF), board nationality (BNAT) and board gender diversity (BGD) are positively and significantly correlated with CSR as indicated by the coefficient of 0.448, 0.028 and 3.39e-09 with the p-values of 0.000, 0.046 and 0.000 respectively. This implies that all the explanatory variables significantly influence CSR and invariably will influence firm value. This is because the heterogeneous board may improve the board's monitoring function. After all, board diversity increases the independence of the board. Educational pedigree and divergent nationality pose variations in priorities affecting corporate objectives and how it translates into the firm's decision-making at the instance of board resolution. More so, a firm with a high proportion of females directly may have more tendencies to engage in CSR to portray a good image of their natural being and invariably improve the firm value. This provides evidence to reject null hypotheses which state that board professionalism (BPROF), board nationality (BNAT) and board gender diversity (BGD) have no significant effect on corporate social responsibility (CSR). This empirical result corroborates with stakeholder theory propositions.

CONCLUSIONS

The study objective aligns with the title which extends to demonstrate that there is a mediating effect of Corporate Social Responsibility on the relationship between Board Professionalism, Board Nationality, Board Gender and Firm's Value separately and collectively based on the evidence from

Nigerian highly environmentally sensitive firms from 2012 to 2019 inclusive. Thus, looking at the direct resultant effect of board diversity on corporate value, the Generalised Least Square regression result shows that Board Professionalism, Board Nationality, Board Gender have no significant impact on firm value. The study, therefore, concludes that board diversity does not significantly determine corporate value. While on the other hand, Corporate Social Responsibility was found to be statistically significant. Therefore, the study concludes that CSR significantly determines corporate value. Furthermore, considering the indirect effect using the results from Panel Corrected Standard Error showed that CSR mediates board diversity effect on corporate value. Specifically, the findings demonstrated that board diversity affects corporate value and CSR positively. In abridged expression, this empirical finding demonstrates good or bad CSR performance. Rather, board diversity gains priority when considering investment destinations by corporate investors. To this effect based on the practical implication for decision making, this study advocates that CSR is pertinent in establishing relationship nexus between corporate value and board diversity. Therefore, gross insubordination to the practical implication in the relationship between corporate value and board diversity may deter opportunity for making spurious economic decisions. It is therefore suggested that a firm's sensitivity to environmental issues will aid balance diversity in corporate board composition because it is critical for assessing stakeholder's relationship and firm commitments to environmental instrumentations.

However, this empirical study is believed to have pioneered the concept and offers a new direction for future research. Major findings established in this study will guide and provide practical implications for researchers and practitioners. The truth and fair view posited in this study will assist both non-ethically and ethically oriented investors who have proprietary interests in the firm's performance. In aversion, the likelihood of managers exploring a plethora deal of opportunities for maximizing corporate attractiveness for investors consideration is high, especially where the justification for their corporate and social programs are characterized by financial peculiarities. To this effect, this empirical investigation brings to the frontier of a new direction for scholarly debates in understanding how board diversity is imperative for overseeing and assessing management performance. However, the findings corroborate the demands for raising the bar of board diversity by regulators on a global scale.

Finally, practical implications of this study provide the wherewithal for the selection process of corporate directorship based on evidence established in this empirical highlight of the pertinent consideration of diverse pedigree of nominees for corporate board positions. And to regulators, it will expose them to board range dimensions that can impact firm's involvement in CSR and invariably firm value. Accurate practices will position the firms in the right direction, which will eventually result in a great reduction of social and environmental pressure. The study recommends that future studies may be conducted in other countries.

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SCIENTIFIC PAPER

DEVELOPMENT OF THE EUROPEAN UNION'S ENVIRONMENTAL POLICY AND ITS MEASURES FOR CLIMATE PROTECTION – A REVIEW

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Abstract: *The negative impacts of human activities on the environment and nature can be felt worldwide. Thus there is a growing focus on measurements that keep sustainability in mind. As one of the main pioneers of environmental protection and sustainability efforts, these aspects are more and more prevalent in the current environmental policy of the European Union (EU). In this review article, the development of the environmental policy of the EU is presented. After listing the main milestones, the role of the EU in the area of environmental protection, the frameworks built around the goals and the roles of the institutions are discussed. Then – with an international detour – the details of the Paris Agreement about climate change and the state of the 20/20/20 commitments are summarised. In the remaining parts of the article, the focus is on the climate protection goals of the EU for the next three decades, the expected future directions, and the agenda of the von der Leyen Commission concerning climate protection. An important step and tool for achieving the goals set until 2050 is to incorporate climate and environmental protection elements to the 2021-2027 budget of the EU. In order to achieve the expected effects, it is crucial to develop the right tools of the environmental policy, to form a widespread cooperation, to raise awareness, and incentivise and support the innovative solutions in the sustainability area.*

Keywords: *limate action; environmental strategy; Paris Agreement; sustainability*
JEL CODE: K32 Energy, Environmental, Health, and Safety Law; Q56 Environment and Development, Sustainability

INTRODUCTION

The increasing level of climate change and pollution that can be observed on Earth affects our everyday life more and more. Since the first measurements, we witnessed the 18 warmest years in the last two decades, and extreme weather events are increasingly frequent in Europe, as well as in other areas of the planet (EC, 2021a). These extreme weather events include forest fires, heatwaves and floods. Scientists warn us that if we do not act with urgency, by 2060, due to global warming, the average temperature is likely to be over 2 °C more than before industrialism, and by the end of the century, even a 3-5 °C increase is possible (REUTERS, 2018; EC, 2021a). Such a degree of global warming would have an incredibly destructive effect on nature; it would effect irreversible changes in several ecosystems, which would cause a significant decrease in biodiversity. The higher values of temperature and the more intense and more frequent weather events and extremities are expected to have an enormous impact on the economy of the EU, and to make the production of food more difficult. Although the severity varies by country and region, it is highly affected by the pollution that is a byproduct of the increasing economic production, rising population and quality of life. Despite different energy-saving measures, raising living standards requires more and more energy (BAI, 2004, BAI, 2011). The symptoms of this are the most apparent in developing countries, although it is definitely a global issue.

The EU – as one of the most important pioneers of environment protection and sustainability efforts – drew up its first version of environment protection and action programmes in the 1970s, noting the negative environmental effects that came with economic growth. The goal of this article is to explore the route of development taken by the EU, including the main milestones, frameworks, institutions, roles, the results achieved and the short, medium and long term goals.

The events of the next period, carrying out the goals is of crucial importance regarding the living conditions of the future generations.

This work was based on secondary research: the materials that have been processed include scientific articles and books about the past of the European Union, and the latest international publications, articles, and press materials dealing with the present situation and future plans. In this review article, in addition to analysing and assessing the publications on the environmental policy of the EU, the details of the development of the area, as well as the expected future directions, are covered.

1. THE ENVIRONMENTAL POLICY OF THE EU, ITS MAIN CHARACTERISTICS AND SCOPE

In the 1950s, at the time of the creation and adjustment of the Treaty of Rome, the founding member states hadn't yet thought that forming a community level environmental policy was necessary or important. However, the rapid economic growth, industrialisation and the growing energy consumption and pollution that came with those have prompted the need to start a community cooperation. The Paris summit held in October 1972, at which the heads of states and prime ministers decided to create a community level environmental policy, which was the first official moment of the environmental policy of the European Union (EU). As a result, the elaboration of the common environmental rules and the launching of action programs started. Following the first (1973) and second (1977) action programs of moderate effect, in 1983, at the third action program, the goals and fundamentals of the common environmental policy started to take shape. This policy pointed out the importance of pro-action/prevention instead of reacting to the emerging damage and results as a – still relevant – principle. Its message is the significance of intervening in time and eliminating the causes instead of focusing on the results and symptoms (HORVÁTH, 2007).

The subsequent main events (noting down the years of their signing) of the environmental policy and their significance are the following:

- 1986: The Single European Act, the first reworked version of the Treaty of Rome, in which articles regarding the protection of the environment were published, thereby the communal environmental policy and its goals were institutionalised in order to create a direct legal basis to the common environmental policy measures (HORVÁTH, 2007),
- 1992: The Maastricht Treaty, a.k.a. the "Treaty about the European Union": extending the scope of the environmental policy, turning the concept of sustainable development based on environmental aspects into a principle (HORVÁTH, 2007),
- 1997: The Amsterdam Treaty: another main principle is that during the creation of policies and determination/execution of actions, the environmental requirements and effects must be taken into account (HORVÁTH, 2007),
- 2007: Lisbon Treaty: The fight against climate change emerged as a new element; moreover, the decision to create a Union-wide energy policy was made. Through this, a direct link between the environmental policy and energy policy was formed (HORVÁTH, 2007),
- 2009: The 2020 Climate and Energy Package: the creation of additional laws that make it possible to reach the goals set for 2020 in the areas of climate change and energy policy (EU, 2009).
- 2016: Paris Agreement: the elaboration and signing of an action plan aimed at limiting climate change and global warming by all of the EU member states. A detailed layout of its aims will be supplied in the next chapter (EU, 2021a).
- 2019: European Green Agreement: A communication released by the European Commission that aims to manage the challenges in the areas of climate and nature preservation. It covers a wide range of Union policies and affects several sectors. Additionally, it foresees a series of legislatures aimed at reaching climate-neutralism by 2050 (OH, 2020).

As it can be seen from those listed above, the environmental objectives and provisions of the EU have been developing continuously since 1972, they have been drawn up in a more specific way, and their integration to various policies and operations has become more specific. The Union environmental policy aims to implement a "high-level defence". Based on the 191-193. articles of the Treaty regarding the operation of the European Union, the four related principles are the following: (1) the principle of precaution; (2) the principle of pro-action/prevention; (3) the principle of preventing natural damage at their source; (4) the principle of "the polluter pays" (BOURGUIGNON et al., 2019).

During the joint environmental protection operations, apart from the goal of achieving high-level defence, the differences between the regions of a community and their characteristics must also be taken into account. In accordance, the following additional principles can be mentioned: the principle of integrity; the principle of subsidiarity; the principle of sustainable integrity; the principle of partnership; the principle of integrating environmental protection approaches; the principle of the state taking responsibility; the principle of international cooperation; the principle of personal and collective partaking and cooperation; the principle of long-term thinking; the principle of shaping the environmental protection according to plan; the principle of maximal protection and precaution (HORVÁTH, 2007).

The role and fundamental scopes of the EU

Below are the scopes fitting the goals set by the EU in the area of environmental protection. The related main sections and their details: a. Environmental measurement/action programs; b. Horizontal strategies; c. International environmental protection collaboration; d. Environmental

protection impact assessment and the participation of the public; e. Execution, validation and tracking.

a. Environmental measurement programmes (action programmes)

Starting in 1973, the Committee released multi-year environment action programmes (EAPs), which set the current goals and legislative proposals for the joint environmental politics. In the series of EAPs, the first primary goal was to mitigate the environmental effects and damages, but starting in the 1980s, the tasks started shifting towards prevention-focused proposals and actions. So far, the EU has launched seven action programmes, each having a length of 4-10 years. The currently running action programme (titled "Well-being without consuming our planet", for the interval between 2013 and 2020) was accepted by the Committee and the Parliament. The programme lays down nine primary goals. These are the protection of nature, the stronger ecological resilience, the sustainable, resource-efficient and low carbon dioxide emission growth and the fight against the dangers related to nature that pose a risk to health (KURRER, 2020).

b. Horizontal strategies

The EU introduced the strategy concerning sustainable development in 2001, complementing the prior Lisbon strategy, which was aimed at growth related to the environment and facilitating the creation of workplaces. The aim of the strategy, which was renewed in 2006, is to consistently increase the quality of life by supporting environmental protection and the cohesion of society. In harmony with these goals, the strategy "Europe 2020" urges the implementation of "intelligent, sustainable and inclusive growth". In the strategy, the flagship initiative called "resource-effective Europe" is aimed at sustainable growth, and additionally, it supports the transition to resource-efficient, low carbon-dioxide emission agriculture (KURRER, 2020). The headline target of the EU is to harmonise the various strategies, take advantage of the synergies and continuously address the environmental aspects.

c. International environmental protection collaboration

While carrying out its own "internal" objectives, the EU also fulfils an active role in the global environmental protection conferences. It is a party to several global, regional and subregional environmental protection agreements. It takes responsibility in solving issues regarding environmental protection, biological diversity, climate change and international air and water pollution, among other things (KURRER, 2020). The EU took up an active role in creating such agreements as the sustainable development schedule regarding the interval ending at 2030 (with 17 global goals (Figure 1.) and 169 objectives) (EC, 2019a) or the Paris Agreement concerning climate change.

Figure 1. Sustainable Development Goals of the United Nations

Source: United Nations, 2015

These goals were adopted by all United Nations Member States in 2015 in the 2030 Agenda for Sustainable Development.

d. Environmental protection impact assessment and the participation of the public

In order to incorporate and take into account the environmental considerations and to avoid the negative environmental impacts, environmental impact assessments (EIAs) must be carried out on projects in the private or public sectors that are expected to have a significant impact on nature (e.g. highways, airports, constructions). Additionally, strategic environmental assessments (SEAs) must be carried out on projects in the public sector that concern land usage, travelling, energy, waste or agriculture. The importance of consulting the public and ensuring other related rights (taking part, accessibility, justice) was raised as an essential consideration (KURRER, 2020).

e. Execution, validation and tracking

The process of drawing up the environmental protection type regulations of the EU and its regulatory context has been continuous since the 1970s. As of now, there are hundreds of directives, regulations and decisions in effect. However, despite the communal principles and regulations, the state of the environmental cases is greatly affected by the – often lacking – national, regional and local level applications. Tracking is of vital importance because of the previously mentioned facts (KURRER, 2020).

The following relevant actions have been made to achieve more effective execution (and validation):

- 1990: Creating the European Environment Agency (EEA, Copenhagen), the goal of which is to support the development, execution and evaluation of the environmental policy and to inform the public about these. Through the process, the Agency supplies independent and reliable information, collects data, creates analyses, and coordinates the European Environment Information and Observation Network (Eionet).

- 1998: To support decision-makers and policy-makers, the EU has created and is operating the European Earth monitoring programme (Copernicus), the purpose of which is to monitor the changes happening on land, in the sea, atmosphere and climate. A related register is the European Pollutant Release and Transfer Register (E-PRTR), which notes down the release of industrial and other types of pollution-related data.
- 2011: The European Parliament and Council accepts the non-mandatory recommendation about the environmental analyses minimum requirements. The member states must apply effective, proportionate and dissuasive penalties and sanctions in the cases of the most severe environmental damages and actions. Additionally, the creation of IMPEL (European Union Network for the Implementation and Enforcement of Environmental Law) for effective information exchange.
- 2016: Starting to review the execution of the environmental protection policies, the primary goal of which is to contribute to the complete execution of the environmental protection laws of the Union, additionally it also includes the condition survey of the tracking and reporting obligation based on the laws in effect (KURRER, 2020).

LEGAL FRAMEWORK

To this day, the European Community, then the EU has created hundreds of environmental protection laws. The types and significance of the laws in practice in the EU (HORVÁTH, 2007):

- Directive: the most commonly used type (approximately 80% of the laws). It describes general objectives and directives. Each member state can decide how it will reach the set goals.
- Regulation: sets specific, mandatory steps for the member states. All laws that go against it have to be withdrawn by the member states.
- Decision: these are used to complement directives and regulations. Their application is mandatory.
- Recommendation: not mandatory documents.

The environmental protection laws touch on varying topics that can be categorised into the following areas (BOURGUIGNON et al., 2019):

- Air
- Chemicals
- Climate
- Nature
- Waste
- Water

THE ROLE OF THE EU INSTITUTIONS IN THE AREA OF ENVIRONMENTAL PROTECTION

Out of the Union institutions, the environmental protection policy, and in shaping the laws, the European Parliament has significant influence. As it can be seen from the points above, the area of environmental protection has been undergoing continuous development in the EU since the 1970s. In the last (8.) period, the main priorities of the Parliament were the following:

- the action plan about the circular economy (about waste, batteries, worn-out vehicles, landfills etc.),
- climate-related questions (ratificating the Paris Agreement, distributing the efforts, including land-use, land-use change and forestry in the Union's climate change-related commitments, reforming the emissions trading scheme).
- the regulation of other questions (KURRER, 2020).

Based on the resolution of the Parliament, in the future – using various incentives – more attention must be paid to better and more effective execution, and it is also crucial to finance investments supporting the environmental policy and the fight against climate change (KURRER, 2020).

The EU Council also plays an important role. It has a vital part in the negotiation process and the conclusion of the agreements related to environmental protection matters: it represents the Committee based on mandate at hearings, and even at the signing and acceptance of the Agreement(s) in the name of the EU. Apart from representing the EU, it helps the countries outside of the EU and the international organisations form and conclude agreements. In addition to accept and conclude agreements/treaties, the Council can also suspend or even terminate them (EU, 2017). The role of the European Council is to provide guidance for the EU's policies (EU, 2021b).

Prior to the negotiation and hearing process related to international agreements, the Committee gives the Council (and the Parliament) recommendations and proposals, and the EU is regularly represented by the Committee (or the Council by mandate).

The Council and the Committee are both responsible for checking if the Agreement under discussion is compatible with the current inner policies and regulations of the EU (EU, 2017).

Based on the above information and the efforts made in order to elaborate and execute the various policies and actions, it can be said that the EU is the most significant global driver of the environmental protection and climate protection areas.

2. THE PARIS AGREEMENT ABOUT CLIMATE CHANGE

The Paris Agreement was adopted at the conference of the United Nations Framework Convention on Climate Change (UNFCCC) members in 2015 and entered into force on 4 November 2016, following its signing on 22 April 2016 (Earth day) (EU, 2021a). The requirement for it to enter into force is that at least 55 countries responsible for at least 55% of the global greenhouse gas emission must ratify it. By the middle of 2021, 195 countries have signed it, and 189 countries have ratified it. The majority of the countries and all EU member states have signed and ratified it (EU, 2021a). Apart from the plans aimed at the climate-neutral goals for 2050 discussed

in the next paragraph, in the long term emission-lowering strategy, the EU has committed to lowering the net greenhouse gas emission by at least 55% by the 2030s (UNFCCC, 2021).

The case of the United States of America can be mentioned as a curiosity: The agreement entered into force on 4 November 2016, but Donald Trump, the president of the USA announced that the country would back out of the agreement on 1 June 2017. Following the rules of the agreement, the USA officially backed out of the agreement on 4 November 2020, 3+1 years after the entering into force. However, only two and a half months later, Joe Biden, the new president of the USA joined it again through a presidential decree on the day of his inauguration, 20 January 2021 (AP, 2021).

The main elements of the action plan aimed at limiting climate change and global warming are the following:

- long term objective: keeping the yearly average temperature rise below 2 °C, compared to the pre-industrialisation level, and making efforts and carrying out actions in order for the raise to only be 1.5 °C,
- contributions: creating and discussing a comprehensive national climate policy for the partaking countries in order to lower emissions,
- ambition: creating and communicating action plans with increasingly ambitious goals every five years,
- transparency: the countries continuously inform each other and the public about how the progress is to achieve the set goals,
- solidarity: the EU member states and other developed countries continue to financially support the fight against climate change in the developing countries (including emission-lowering and resilience) (EU, 2021a; EC, 2020a).

3. THE STATE OF THE EU 20/20/20 COMMITMENTS

The 2020 climate change and energy policy package of the EU – which contains the laws that complement reaching the climate change and energy policy goals – has phrased three main objectives:

Lowering the greenhouse gas emission of the EU by 20% compared to the 1990 level,

- the energy gained from renewable energy sources (wind, solar, biomass, etc.) makes up 20% of the EU's energy consumption,
- 20% energy efficiency increase in the EU.

The "20-20-20" goals were aimed at the fight against climate change, increasing energy security, and strengthening competitiveness (EU, 2009; EC, 2020b; BALOGH, 2020; ŠIRÁ, et al., 2021).

The state of completing the commitments shows a mixed picture: Two have been fulfilled, one has not. Concerning lowering the greenhouse gas emission, by 2019 the objective of 20% has been surpassed (24%), while COVID-19 made it even easier to reach the goal in 2020. The European Environment Agency (EEA) report means that the climate policy actions were effective, and even stricter emission lowering goals could be reached. The goal related to the 20% ratio of renewable energy sources is expected to be met based on the 2019 value of 19.4%. The primary renewable energy sources are water energy, biomass, wind energy and solar energy. However, the goal of increasing energy efficiency by 20% is unmet, as expectedly, only nine member states will fulfil it (GREENDEX, 2020; TAYLOR, 2020). Therefore, more actions are needed related to the latter goal, while for the other two goals, there is great further potential in increasing the situation, which is necessary to reach the longer-term climate protection goals and avoid and mitigate the adverse environmental effects.

Data regarding the goals that have been met are significantly distorted due to the COVID-19 pandemic, because of the economic downturn, and lower energy consumption and greenhouse gas emission.

4. THE CLIMATE PROTECTION GOALS OF THE EU UNTIL 2050

The climate protection goals of the EU for the period until 2050 were first noted down officially and got widely published in the Paris Agreement that entered into force on 4 November 2016. In harmony with it, the objective of the Union's countries is to set the EU on a course that makes it possible for the EU to become the first climate-neutral economy and community by 2050 (EU, 2021a; TSIROPOULOS et al., 2020; EC, 2021b). The Union leaders approved the objective in 2019 December, recognising the importance of adapting to a cost-effective, socially balanced and fair way, considering the different traits and national environment (EU, 2021a).

The Paris Agreement was followed by the European Green Agreement published by the European Commission on 11 December 2019. In the agreement document, the European Commission described the initiatives and proposals that are expected to support and guarantee the EU's goal to be climate neutral by 2050 (EU, 2020a; EC, 2019b). It also contains a series of legislatures that follow a previously recorded roadmap and covers a wide range of Union policies (OH, 2020). The Agreement stresses the importance of close cooperation with the member states and a holistic approach, which means that every Union actions and policies contribute to achieving the Green Agreement's goals and maximally utilise the opportunities. The areas include climate policy, environmental protection, energetics, travelling, industry, agriculture and sustainable financing (EU, 2020a). According to the concept, the EU will continuously and drastically lower its greenhouse gas emission until 2050. The public and private investments supporting climate protection and the spread of clean technology are mentioned as a base requirement for a successful transition, and so is the implementation of climate policy aspects in various policies. For this, the following financial framework of the EU (for 2021-2027) must be in harmony with the goals defined (EU, 2021c). In the light of the preceding, the now beginning 2021-2027 budgetary period, the execution and maintenance of actions and operations

related to climate protection have a significant role with a large budget assigned to them (EC, 2020c).

In order to give a picture of the goals, below is a list of the objectives of the European Green Agreement:

- Increasing the 2030 and 2050 climate protection efforts of the EU
- Mobilising industry for an environmentally friendly and sustainable economy
- Speeding up the adaptation to sustainable and intelligent mobility
- Clean, affordable and safe energy supply
- Protecting and restoring the biological diversity of the ecosystems
- Energy and resource-efficient building and modernisation
- The non-pollution objective for an environment without toxic substances
- Farm to Fork: the creation of a fair, healthy and environmentally-friendly food system (OH, 2020)

Further plans and tools include Sustainable Europe Investment Plan, Just Transition Mechanism, European Climate Law, European Industrial Strategy, Action Plan for the Circular Economy, Farm to Fork Strategy, Strategy for Restoring the Biological Diversity (OH, 2020).

The temporary political agreement related to the European Climate Law achieved in the spring of 2021 by the negotiators of the Committee and the European Parliament can be mentioned as a recent positive outcome. This way, the EU can define the climate neutrality and emission minimisation goals in the Paris Agreement in legislation. According to João Pedro Matos Fernandes, the climate policy minister of Portugal, the Agreement is an essential step in the life of the Union, which – apart from being a strong message to the world before the Climate conference on 22 April 2021 – allows the European Commission to propose the "Fit for 55" legislative package (EUC, 2021). Based on the aforementioned temporary agreement (1) in order to reach the 2030 target values, emission-lowering must be prioritised above absorbing, (2) it is necessary to create a European Scientific Advisory Board, the role of which is to advise and make reports related to the Union's climate policy actions, goals and budgets, and (3) hurries the European Commission to submit a proposal concerning the climate policy goal to be met by 2040 (EU, 2021c).

The agenda of the Von Der Leyen Commission regarding climate protection

The role of the EU as a pioneer of climate protection actions still seems assured after Ursula von der Leyen took office on 1 December 2019, who considers the next decade crucial in minimising CO_2 emission (EC, 2021c). The most important details that have an impact on the EU from the events of the online climate conference that took place on 22 April 2021 are the following: President Ursula von der Leyen has underlined that the EU will begin the reformation of its carbon dioxide market in June 2021 in order to make the economic sectors greener. In addition that the EU expands the carbon dioxide emission trading scheme (ETS) to the buildings and transport sector (MTI, 2021a; REUTERS & ABNETT, 2021; EURACTIV.COM & REUTERS, 2021).

The government change in the USA that took place in January 2021 can also give new impetus to one of the most crucial climate protection efforts, which includes forming stronger cooperation and partnership between the USA and the EU. Based on the statement of John Carry, special envoy of the USA for climate action, the relaunched cooperation between Washington and Brussels is an excellent chance to reform the economic models, create a greener economy, and push clean technologies forward (MTI, 2021b). Joe Biden, president of the USA, has also set out an ambitious goal at the climate conference, according to which the USA will decrease its greenhouse gas emission by 50-52% by 2030 compared to that of 2005 (VOLCOVICI et al., 2021).

The direction is therefore set; however, it is expected to be slowed, limited by prioritising the management and mitigation of the economic and social difficulties and problems caused by COVID-19. Despite this, the UN climate conference to be held this year in Glasgow is expected to be a key event for the climate and nature protection efforts, and it can be said that also for the Earth's future.

5. THE IMPLEMENTATION OF THE CLIMATE PROTECTION ASPECTS IN THE BUDGET OF THE EU FOR THE 2021-2027 PERIOD AND THE ROLE OF GREEN INNOVATION IN THE DEVELOPMENT GOALS OF THE EU

The green transition guaranteed by integrating the sustainability and climate protection aspects into various Union policies and creating a sufficient financial framework is closely related to the field of innovation.

The 2021-2027 financial framework that was accepted on 17 December 2020 – in addition to supporting getting out of the COVID-19 pandemic – the main objectives of the various policies and areas get a significant role.

The multi-year financial framework of €1,074.3 billion and the rehabilitation tool "Next Generation EU" of €750 billion (EU, 2021d) envisages a budget of €1,800 billion for the EU-27. According to the Council of the European Union, 30% of all expenditure should be for environmental issues (EU, 2021e).

One of the main objectives of the EU is supporting the research and innovation areas, which get significant resources in the new budgetary period. In the battle against environmental and air pollution, which are prioritised global challenges, strengthening the scientific and technological network of Europe is crucial. In order to achieve the goals mentioned earlier, the framework programme "European Horizon" was created (approx. €76.4 billion), which is the subsequent research and innovation programme of the Union (EU, 2021e; EC, 2020d). Its vision is handling climate change, supporting the sustainable development goals and increasing the competitiveness and growth of the Union.

The importance of the vision is shown by the fact that the third pillar of European Horizon supports the progress in innovation, and for this purpose, the European Council of Innovation was formed, which makes it possible for innovators with immense potential to have access to one-stop-shop (EU, 2020b).

SUMMARY AND CONCLUSIONS

In this article, the development of the EU's environmental protection policy, its direction and main milestones were described, mentioning the frameworks, institutional roles and scopes. It was followed up by presenting the main characteristics of the climate change-related Paris Agreement, then the 20/20/20 commitments of the EU, and their completion. In the last paragraph, the climate protection goals of the EU for the following decades and today's current issues and happenings from a policy and a public viewpoint were discussed. The importance of environment and climate protection, their connection to the area of innovation, and implementing them to the 2021-2027 budget of the Union were also included.

The EU started to prepare the legislative background related to environmental protection and sustainability in the 1970s. From the formulation of the idea of a community-level environmental policy, and the decision to develop it, events accelerated. Different agreements were prepared on average every five years from the 1980s to the present day. Among these, the first step was to measure the state of the environment and then eliminate the adverse effects, reduce the damage and make sanctions. Subsequently, besides the above, the importance of prevention also came to the fore, and the integration of environmental considerations into various policies emerged as an essential element. After the Millennium, the fight against climate change appeared as a new element in the Lisbon Treaty in 2007. After the direct connection between human activity and climate change was identified, several targets have been set at both EU and national levels; furthermore, various action plans and strategies have been drawn up.

The significant efforts made and directions laid, the connection of environment and climate protection and innovation and their prioritised role are definitely welcome in these times. In the future, environmental protection and sustainability are expected to come to the fore gradually. No question that the EU will continue to be possibly the main driver and pioneer of climate protection. However, the question arises as to what extent the outlined measures will improve the deteriorating environmental condition in recent decades and stop or possibly reverse the unfavourable environmental effects and processes. The decision-makers are in a quite complicated situation, considering that several other challenges of the 21. century – apart from the environment and climate protection – should also be solved, and if possible, fast and simultaneously. Stopping or possibly reversing the negative processes can only be done with an unprecedented degree of global collaboration.

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SCIENTIFIC PAPER

DEVELOPMENT OF LEISURE AND SPORTS CONSUMPTION AND SPORTS MOTIVATION AMONG CHILDREN WITH DISABILITIES

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Abstract: *The number of studies on the leisure and sporting habits of people with disabilities as well as the background of sports motivation is far from the focus of research on intact research. Thus, the assessment of physical habits and sports motivation factors determining the quality of life of persons with disabilities can be considered as a less researched deficit area in Hungary and internationally.*
In our research, we examine the recreational and sporting habits of the 8-18 year-olds, as well as the motivational background, and the results of this research are presented in this paper. The importance of this issue is confirmed by the fact that, according to a UN survey, 650 million people have some kind of disability, 50 million of them in Europe and nearly half a million in Hungary, 5% of the population. The questionnaire (N = 639) was filled by children with disabilities living in the North Great Plain region with the help of a teacher. We used both closed and open questions in the questionnaire, and we helped and orient children with response categories for some questions. Data were processed using SPSS software, averaged, standard deviation, median, mode, and Chi2 probe was used to examine relationships in addition to basic statistics.
Our results showed that it is a problem for young people with disabilities that they prefer passive leisure activities, which is similar to the results of studies on intact research. Boys and girls have different sports, boys are more active than girls.
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Keywords: *people with disabilities; recreation; leisure and sports; sports motivation*

INTRODUCTION

For an increasing number of people leisure is considered a basic value as leisure activities can contribute to relaxation, regeneration, keeping healthy and can also be means of prevention [38] [2][33]. These activities can help restore energy levels and the ability to work for fatigued people [21][16]. For children they are the means to relax after the study load of school [35][51]. In addition to its role played in relaxation, several studies emphasize leisure's developmental role. The preference system of leisure activities and typical leisure behaviours in various age groups have been the focus of many Hungarian and international studies [40][31][51][5]. Other researches call attention to how structured leisure, in both children and adults, can function as a protective factor against harmful habits becoming an element of lifestyle [50] [31]. Ruling trends in the areas of sports and fitness and leisure show that the entertainment function and the pursuit of experience are becoming increasingly important motivations in consumer habits [7][10]. Leisure and recreational activities are the subject of numerous national [6][24][14] and international [16] researches, as they can not only contribute to self-

fulfilment, active relaxation and entertainment but also to achieving a healthy lifestyle [41][49]. Leisure activities also play an increasingly important role in tourism as one of the key elements of competitiveness for service providers. Guests expect the constant development of recreational services that they can enjoy during their holiday. The touristic role and significance of leisure activities is also the main focus of several national [3][39][13][4] and international [25][17] researches. Recreation would be extremely important for people with disabilities, as it could improve their quality of life and their condition, however, they have limited opportunities. Leisure and recreation have been shown to contribute to the mental and physical health of both non-disabled and disabled persons [20][18][47]. Since recreational activities' relaxing and developmental role have been scientifically confirmed, medical science also uses them in complex therapies. Research has demonstrated that patients' health and quality of life improve after the therapeutic use of various recreational programs [37][32][28][29][1]. Patients require and use various recreational programs during their treatment (hiking, other sports programs, massage, wellness) to improve their condition [8][9]. Several international studies have examined the economic aspects of physical activity of people with disabilities [19] the factors supporting and inhibiting physical activity [43], the role of inclusive sport in the socialisation of the mentally disabled [12], the physical activity and daily life activities and lifestyles of people with disabilities [15] or the labour market situation of people with disabilities [44]. Sport for disabled people first appeared as a research theme in Hungary after the change of the political system. It is evidenced by the fact that there had been hardly any publications on this topic before. Disabled people's sport is a two-sided question. While the top sport of the disabled (parasport) has received remarkable support and attention from the government, recreational sports have lagged behind in both financial support and publicity [36]. Despite the changes in the legal background, the majority of people with disabilities do not regularly engage in recreational sports. Hungarian researchers also report that the lack of special institutions or services facilitating disabled sport and the lack of accessible infrastructure result in their staying away from leisure sports and recreation [26][48][11][46]. Several authors emphasize the importance of sport for disabled people [53] [30][45][42] as it can help improve their quality of life, their condition, their socialisation and experiences. Sport can assist in developing competencies that are closely related to it and through the emergence of emotional stability and positive self-esteem it has a beneficial effect on a range of other aspects of the personality and also play a significant role in developing a positive self-image and well-being. It helps the individual to somehow accept his or her disability making it become part of his or her identity and also helps to develop positive personality traits [22][27]. Sport also helps to overcome isolation from society, which is a common problem for people with disabilities [23] Sport can enhance social inclusion and integration for people with disabilities or disadvantaged groups [36].

MATERIAL AND METHOD

Description of the research

Our questionnaire survey was conducted among students with disabilities in the four counties of the Northern Great Plain and Northern Hungary (Hajdú-Bihar, Jász-Nagykun-Szolnok, Szabolcs-Szatmár-Bereg and Borsod-Abaúj-Zemplén counties). Respondents study in institutions of primary and secondary education and take part in special needs education and integrated education. We used an online questionnaire in the survey. The sample included 684 students, 639 of whom completed the questionnaires used for the statistical analysis. The survey was completely anonymous and participation was voluntary.

Preceding the questionnaire proper there was a notice that explained to the respondents that the data was to be used in completing a scientific research. The students completed the questionnaires with the help and guidance of instructors (teachers) during the data collection process. Because of this a detailed teacher's guide on the method and pace of the data collection was included with the questionnaires. After extracting the data, the results were analysed with SPSS 24 statistical program. In addition to descriptive statistics, Chi-square test was used to test the relationship between variables.

One limitation of our research is the fact that some of the respondents were mentally disabled students or students with learning disabilities, so the the limitations of their judgment and knowledge in interpreting the questions and giving the answers might affect the results.

Aim of the research

This study examines the recreational and sporting habits in an 8-18 age group of disabled students and their motivational background. It was our aim to examine the attitudes of children with disabilities towards sports, their motivational background, their sports consumption and their leisure time habits. In our research, we sought to answer the following questions: What characterizes their leisure-time related attitude? What characterizes the sports habits and sports consumption of students with disabilities? What motivates children with disabilities to do sports? Is there a gender difference in sporting habits, sports consumption and attitudes towards sport? To what extent do people with disabilities experience their disabilities as a form of hinderance in their daily lives?

RESULTS

Description of the sample

Our survey was conducted in the Northern Great Plain and Northern Hungary regions, in four counties: Hajdú-Bihar (45.4%), Jász-Nagykun-Szolnok (11.1%), Szabolcs-Szatmár-Bereg (27.4%) and Borsod- This was done in Abaúj-Zemplén County (16.1%) (Table 1).

In the survey (n = 639), 403 boys (63.1%) and 236 girls (36.9%) provided responses. The average age of the respondents (8-18 years) was 13.87 years (std = 2.805),

thus, it can be stated that the biggest number of answers were given by the higher-grade elementary school students (Table 1).

48.2% of the students live in towns, 29.6% in the county seats and 22.8% in villages. Regarding parents' educational level students provided the following data:

27.4% of mothers and 22.2% of fathers has only completed the 8th grade. 11.9% of fathers and 21.9% of mothers have a secondary school-leaving certificate. 18.5% of mothers and 29% of fathers obtained a certificate of a trade in a vocational secondary school. 13.3% of mothers and 10.3% of fathers earned tertiary degrees. Students were unable to give information about the education level of 26.6% of mothers and 18.7% of fathers in the sample. In terms of labour market status, nearly half of the students' parents (48.5%) are employed, in 27.5% of cases only the father works, in 11% of cases only the mother works and 10.3% of the parents are unemployed (neither parent work). 2.7% of the responses could not be meaningfully categorised (Table 1).

In the course of asking about demographic information, we also sought to find out what type of disability the age group of 8-18 year olds, who participated in the survey, exactly had. The highest proportion of students surveyed (49.4%) had difficulties in learning. 12.9% among the remaining percentage of students with other disabilities had autism and 11.9% suffer from other psychiatric disorders. 8.9% of students are mentally handicapped. 6.2% of students had speech disabilities, 4.7% suffered from reduced mobility and 3.1% had impaired hearing.

Table 1. Demographic characteristics

Demographic characteristics				
Gender	**Boy (%, frequency)**		**Girl (%, frequency)**	
	63,1%	403	36,9%	236
Total:	100%		639	
Counties	Hajdú-Bihar	Jász-Nagykun-Szolnok	Szabolcs-Szatmár-Bereg	Borsod-Abaúj-Zemplén
	45,4%	11,1%	27,4%	16,1%
Settelement	City	Village	county seats	
	48,2%	22,8%	29,6%	
Education of parents	Mother		Father	
Basic education	27,4%		22,2%	
Graduation certificate	21,9%		11,9%	
Skilles worker certificate	18,5%		29%	
Bachelor's degree	13,3%		10,3%	
Dont not know answer	26,6%		18,7%	
Labor market status of parents				
Both parents wprk	27,5%			
Only dad works	27,5%			
Only mom works	11%			
They don't work	10,3%			
Other	2,7%			

Source: Authors' editing

Leisure preferences

The most prevalent leisure activities among students with disabilities, similarly to their normal peers, are the passive ones including listening to music (37.5%) and watching TV (34.4%) [52]. In girls, listening to music was more dominant, while in the case of watching TV we could not detect a significant difference between the sexes (Table 2). TV habits of the surveyed students revealed that there was a significant difference between the genders in terms of watching sports channels ($p < 0.05$). Sports channels consumption is more common among boys (9.2%) than girls (1.7%). There was also a significant difference between the sexes in reading ($p < 0.05$), as this leisure activity was more characteristic of girls (7.2%) than boys (3.7%) (Table 2). The least favoured leisure activities of students were learning (1.6%), board games (5.3%) and competitive sports (3%), with no statistically significant difference in the responses of boys and girls (Table 2).

Table 2. Evolution of leisure preferences of pupils surveyed

Leisure preferences (%)	
Reading	5%
Watching tv	34,4%
Sport	3%
Party games and entertainment	5,5%
Watchingsports channel	6,4%
Listening to music	37,5%
Learning	1,6%
Total	100,0%

Source: Authors' editing

Obstacles and hinderances in the everyday life of disabled students

Young people with disabilities encounter various disadvantages or hinderances in their daily lives. Table 3 shows that after learning (mean = 3.17, std = 1.342) young people with different disabilities are most severely hindered by their disability in the process of social integration (mean = 2.48, std = 1.417). The high standard deviation indicate that the responses were not unanimous. Apparently, the type of disability is a barrier to children to a varying degree. Autist students have a particular difficulty in integration and social communication. It was found that students are also greatly hindered by their disabilities when meeting new people and making friends (mean = 2.37, std = 1.382). The two factors examined (integration and friendship) are the most restrictive for children with disabilities. Our results support international literature as people with disabilities often encounter isolation being one of their biggest problems [36][23]. Hinderance level of disabled people in sport also shows high mean and standard deviation values (mean = 2.22, std = 1.417). The type of disability determines the level of hinderance in sports (Table 3).

Table 3. Disability as a hindrance in students' daily activities

Have you ever been hindered by the disability you are living with?	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	Standard deviation
	Likert- skála						
During transport	48,1	17,9	16,3	10,8	6,9	2,10	1,299
Making friends and meeting new people	40,6	15,5	19,4	15,2	9,3	2,37	1,382
Having fun	48,3	14,3	17,7	13,2	6,4	2,15	1,322
Learning	14,3	18,3	25,4	20,3	21,6	3,17	1,342
During sports	49,2	12,4	16,1	11,7	10,6	2,22	1,425
During my integration	35,3	20,1	18,8	12,6	13,2	2,48	1,417
Daily routines	42,8	22,1	18,5	11,3	5,3	2,14	1,235

Notation: 5 = fully characteristic, 4 = highly characteristic, 3 = mostly characteristic, 2 = partly characteristic, 1 = not at all characteristic

Source: Authors' editing

Table 4. Sports habits and sports motivation

Sports habits		
Do you like doing sports?	Yes (%)	No (%)
Boy	75,7%	24,3%
Girl	62,3%	37,7%
Chi-square test ($\chi 2$)	$p < 0,05$	
Total		
Sport motivation		
Why Do You do sport?	%	
To be healthier	34,9%	
For relaxation and entertainment	25,4%	
To make me look better	24%	
For friends and acquaintances	8,7%	
To build self-confidence	3,2%	
Not to be overweight	2,1%	
For the sake of competition	1,7%	
Total	100,0%	

Source: Authors' editing

Sports consumption habits and sport motivation

75.7% (305 students) of the boys responded that they love sports, while only 62.3% (147 students) of the girls love physical exercise. The difference between the sexes was significant ($\chi 2 = 12.900$, df = 1), p = 0.000). The assessment of sports needs yielded similar results, as boys tend to have a bigger need for sports. 72% (290 students) expressed their need for sport, whereas only 61% (144 students) of girls indicated this, the difference being significant ($\chi 2 = 8.180$, df = 1, p = 0.004). Hence, among those surveyed, boys are more likely to like sports than girls. The gender ratio for out-of-school leisure sports among students was as follows: boys out-of-school sports activity was 55.8%, girls less than 45.3%. 44.2% of boys and 54.7% of girls do not exercise outside of PE lessons. Based on our results, we found a significant difference between sexes ($p < 0.05$) (Table 4).

In sports motivation for students with disabilities the following factors play a role: health (34.9%), recreation and entertainment (25.4%), outward appearance (24%), and encouragement of friends and acquaintances (8.7%). The least influential factors were: strengthening of self-confidence (3.2%), being overweight (2.1%) and the competition (1.7%) (Table 4).

SUMMARY

Similarly to their healthy peers, recreational activities of students with disabilities are dominated by passive activities. Listening to music (37.5%) and watching TV (34.4%) were found to be the most popular recreational activities. There was no significant gender difference in preferences between these two activities. In television watching habits the only difference detected was in the choice of topic ($p < 0.05$) with the boys being more interested in watching sports channels.

Young people with disabilities experience various disadvantages and hinderances in their daily lives, most relevantly in learning (mean = 3.17, std = 1.342), integration (mean = 2.48, std = 1.417), in making friends and getting acquainted (mean = 2, 37, std = 1.382) and in sports (mean = 2.22, std = 1.417). The fact that isolation is a major problem for the disabled seems to be confirmed by the results of our study. Consequently, leisure sport and competitive sport provide a good opportunity for students with disabilities to achieve social inclusion, social integration and social networking as well as having a positive impact on their condition and quality of life.

75.7% (305 students) of the boys answered that they love sports, while only 62.3% (147 students) of the girls love physical exercise, the difference being significant ($\chi 2 = 12.900$, df = 1, p = 0.000).

As a positive outcome, a very high percentage of both sexes stated that the love of sport occupies an important place in their preference system. It can serve as a basis for organizing leisure sports programs for them. The assessment of sporting needs yielded similar results with 72% of boys (290 students) and 61% of girls (144 students) expressing their need for sport, the difference in gender being significant ($\chi 2 = 8.180$, df = 1, p = 0.004). Sports motivation of students with disabilities is dominated by the following motivational factors: health (34.9%), recreation and entertainment (25.4%), outward appearance (looking good and pretty) (24%), and encouragement from friends and acquaintances (8.7) %). For students with disabilities, leisure sport is one of the most important recreational activities that can positively influence their physical, psychological and social well-being, that is, their holistic health. It is important to encourage them to participate in leisure sports by helping them with colourful program offerings and the provision of appropriate infrastructure.

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Applied Studies in Agribusiness and Commerce – APSTRACT
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SCIENTIFIC PAPER

AN AGRO-FOOD WASTE COMMERCIAL UTILISATION BEHAVIOUR LENS AMONG URBAN AGRO-PRODUCER HOUSEHOLDS IN A DEVELOPING ECONOMY

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Abstract: *Small-urban farm businesses utilise agro-food waste emanating from own production and other levels of food supply chain activities to supplement conventional inputs. Out of these, the food produce surplus from agro-producer households is offloaded to the urban market. As such, the aim of the study was to assess the determinants of agro-food waste commercial utilisation behaviour among urban agro-producer households. An electronically-designed research tool was administered to 456 agro-producer households to collect self-reported estimates of their agro-food waste utilisation behaviour. Results indicated higher budget share towards conventional inputs (0.73) compared to agro-food waste (0.27) but the observed suboptimal production intensification could be rectified with increased use of agro-food waste. Structural equation modelling results indicated that attitude, environmental awareness and concern, motivation and perceived moral obligation had positive significant influence on commercial utilisation intention. The adopted constructs for the model could explain 79.1% of the commercial utilisation behaviour variance. Furthermore, commercial utilisation intention, risk perceptions and perceived behavioural control had significant influence on the commercial utilisation behaviour. Findings are an indicator that agro-food waste commercial utilisation intentions among small-urban farm businesses would likely transition to commercial utilisation behaviour. Since behaviour can be learnt and developed, aspects that contribute to commercial utilisation intentions and behaviour would need to be stimulated. As a strategy of reducing the collectible waste, urban authorities may introduce tailor-made programs meant to stimulate commercial utilisation intention and behaviour in small-urban farm businesses. In valuation of agro-food waste, methodologies that could factor in utility would provide more precise insights in its commercial utilisation.*
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Keywords:*Agro-food waste, inputs, commercial utilisation, path, SEM, SmartPLS, Kenya*

INTRODUCTION

Whereas there is evidence that urbanization is vital in the developmental process in economies, it is further argued that urbanization is not only a result but also a cause of economic development. However, unstructured population migration to urban areas may result to underemployment and unemployment as such contributing to non-optimal development. Unstructured migration may impact on the living standards of the populace and the sustainability of the existing systems. Furthermore, even if economic growth may have a positive relationship with urbanization, the association is non-linear (Turok & Mcgranahan, 2013; Nagashima, 2018; Nguyen & Nguyen, 2018). Economic growth is majorly realized through increased consumption and production. Increasing population in urban areas may be a growth indicator but also translates into more mouths to feed and generation of waste which necessitates food production and waste management. Moreover, in urban areas, opportunities such as open unused land spaces, demand for agricultural produce, the availability of waste and (absence of) supportive policy may exist. Considering the growing population and low income, the urban populace may adopt urban agriculture as a livelihood support system (Hallett, Hoagland, & Toner, 2016; Opitz, Berges, Piorr, & Krikser, 2016; Owuor, Brown, Crush, Frayne, & Wagner, 2017; van Tuijl, Hospers, & van Denberg, 2018).

Compared to conventional rural farms, urban farms are characteristically small and are likely to be disadvantaged

in terms of their economies of scale. Due to competing needs of land in urban areas, urban farming may also face rivalry especially from real estate. Notwithstanding this, small urban agribusinesses have a better access to markets owing to shorter supply chains thus reducing transaction costs. As a result they may scoop higher returns per unit compared to rural farms. More often than not, urban farms value contribution to the overall economy particularly in developing countries is not precisely known. As such they mostly miss out on government support such as subsidies. Amidst this neglect, recent evidence shows that urban agriculture is critical in realization of United Nations Sustainable Development Goals 1, 2, 3, 8, 11, 12, 13 and 15 (Akinlade, Balogun, & Obisesan, 2016; Nicholls, Ely, Birkin, Basu, & Goulson, 2020).

The scarcity of land compels urban agro-producers to intensify production. The adoption of the intensification angle embraces commercialization whose aim is to maximize production, minimize costs so as to maximize benefits. Productivity wise, urban farms are equally productive as conventional rural farms and in many cases they may be more productive due to intensification behaviour (Nicholls *et al.*, 2020). This is particularly achieved through intercropping, continuous production (non-seasonal through irrigation), vertical (and or hanging) gardening and possibly optimal use of farm inputs. This necessitates utilisation of available inputs such as organic household waste as a supplement input. Household waste mostly of the agro-food type is often considered to have a lower cost compared to conventional inputs. As a result, there arises commercial utilisation behaviour of household waste among agro-producers (Vandermeulen, Verspecht, & Huylenbroeck, 2005; FAO, 2007).

Though utilisation behaviour is traditionally a behavioural neurology and neuropsychology field related to brain damage where the conduct of a patient is observed and analysed (Pandey & Sarma, 2015), it is applicable in other behavioural fields. As such waste utilisation behaviour ought to be an illustration of the manner (series of actions) in which households put to use or sometimes readiness to use waste which they generate or that which they may acquire from external sources (Zhang *et al.*, 2015)this study examines factors associated with waste separation behaviors by analyzing responses to questionnaires distributed in Guangzhou, China. Data drawn from 208 of 1000-field questionnaires were used to assess socio-demographic factors and the TPB constructs (i.e., attitudes, subjective norms, perceived behavioral control, intentions, and situational factors. Whereas other waste management practises such as burning, burying and dumping are critical in waste management (Adu-boahen *et al.*, 2014; Brown, 2015), perhaps utilisation is comparably more economically beneficial (Okonko *et al.*, 2009; Kassaye, 2018; Mu'azu *et al.*, 2018). Utilisation involves recovery, reuse and recycling of waste through consumption, composting, processing and energy generation. Menyuka *et al.* (2018) explored the role of urban agriculture in the management and commercial utilisation of organic waste in urban areas. The researchers identified animal feeding, soil fertilization and energy production as avenues in which organic waste could be managed. They argued that utilisation of organic waste could contribute to food security, human capital engagement and economic growth, health and sanitation. Furthermore, urban areas are characterized by large population that lives under or barely above the poverty line which makes commercialization of urban agriculture a critical shock absorber amidst household income fluctuations.

Waste utilisation has been argued to be partially determined by the farmer's degree of intensification and the competing needs of agricultural waste. Especially for smallholder farmers, it has been shown that there is competition between fuel and feed needs from crop residue mainly after harvest. Furthermore, the household and farm socioeconomic characteristics including production goals may influence agro-producers' behaviour (Nigussie, Kuyper, & De Neergaard, 2015). Depending on the type of crop being produced or livestock being reared then waste utilisation behaviour may be influenced. For instance, legumes may not require agro-food waste but cereal crops may, but again vegetable's high nitrogen requirement may need even higher organic waste. Moreover, livestock such as pigs may influence the behaviour of agro-food waste utilisation compared to other types of livestock enterprises such as poultry. According to Baudron *et al.* (2014) and Valbuena *et al.* (2014), in India, Bangladesh and Kenya over 80 per cent of crop residue are left on the farm after harvest, therefore, being integrated into soil during farm preparation or under conservation agriculture practises.

The existing public waste collection services only cover an estimated 50 percent of the households in Nairobi City, Kenya. In taking the advantage of the ineffective waste management and non-substantive feed policies, small-urban farm businesses tap into agro-food waste as a supplementary input. Upon production, they supply the surplus to the urban market. So, (a) what factors influence the agro-food waste commercial utilisation intention among small-urban farm businesses and (b) does commercial utilisation intention translate to commercial utilisation behaviour of agro-food waste?

METHODOLOGY

Study area

The Nairobi City County is the administrative capital of Kenya and has had the highest share of Gross Domestic Product (21.7 per cent) contribution to the overall economy between 2013-2017 compared to the other Kenya's 46 counties (KNBS, 2019). The study area is the most urbanized (99.8 per cent) County in Kenya whose assessment is an indicator that it was suited to offer an urban reflection. Evidently, it is among the very few Counties that have shown effort towards recognizing and streamlining urban agriculture (RoK, 2014). Whereas trade and industry are the major economic activities

in the City, agriculture is practised on road and railway reserves, public spaces, backyards, river banks, under power lines, wetlands (Kamau, 2013), balconies and other open spaces including on steep and non-constructible areas. Land under urban agriculture is estimated to be 13.9 per cent of the Nairobi City County surface area (RoK, 2018).

Approximately, 2400 tonnes of waste per day is generated in Nairobi City where 30-40 per cent of this is not collected. Only about 50 percent of urban population are served with waste collection services. Notably, an estimated 45 per cent of waste in Nairobi City is recovered (NEMA, 2015) but its destination of use is not documented. One of the beneficiaries of waste generated in the County is urban agriculture, which utilise organic waste mostly of agro-food type. Although this is indicative of the urban residents behaviour towards waste, urban agro-producers survey would provide a more precise picture since they have a greater potential in utilisation of waste compared to other waste supply chain actors. The common urban agriculture activities were projected to include vegetable and fruit, flowers and ornamental plants, cattle, goat, pig, poultry and rabbit rearing among others (Kamau, 2013; MERDA, 2015; RoK, 2018) which are meant for home use and or market (MERDA, 2015). The diverse agricultural practices among urban agro-producers may provide clues into the current commercial utilisation behaviour and how this could be enhanced to enable exploitation of agro-food waste resource.

Sampling

A total of 456 agro-producer households were sampled using a multistage sampling approach. The procedure involved clustering of the City's 85 electoral wards from which ten administrative wards were purposively selected based on their involvement in market-oriented urban agricultural activities. The study was conducted in Kahawa West, Mwiki, Ruai, Githurai, Njiru, Karura, Mugumo-ini, Karen, Uthiru/Ruthimitu and Waithaka wards. A mix of simple random sampling (in cases where there was a respondent list) and snowballing (where there was no respondent list) sampling methods were used to identify the respondents.

Research instrument and data

An electronically-structured questionnaire was designed on KoBoToolbox platform to capture self-reported commercial utilisation behaviour of agro-food waste among urban agro-producer households. The questionnaire was then administered by duly trained enumerators using KoBoCollect mobile application using smartphones. The choice of the questionnaire design was informed by the safety of data collected compared to print-out questionnaire (it was projected that there was higher sense of responsibility with own mobile gadget compared to a paper questionnaire). In addition, unlike the paper questionnaire output which involve manual keying-in of data, the electronic-design questionnaire data is automatically stored in a spreadsheet form once filled out. Questionnaires were sent to the KoBoToolbox server where they could be easily downloaded and exported to other file formats. The latter was also cost-friendly. However, the electronic-design questionnaire was longer (page wise) based on the disaggregated nature of research questions compared to the paper format which could have aggregated questions mainly using tables.

Prior to the survey, potential enumerators were invited to make applications through a network of professionals in agriculture to be enrolled for the survey. The basic application qualifications included possession of a smartphone (at least 25.4mm screen size) and power bank gadget. Additionally, the applicants were then screened for suitability based on their educational background (at least a Diploma) and experience in conducting similar surveys. The selected enumerators were involved in a two days training on the administration of the questionnaire and additional two days for pilot testing. The enumerators were then reassessed based on the training and pre-testing indicators where a team of six enumerators was selected. Whereas an electronic questionnaire was mainly used, the enumerators were trained on both paper and electronic formats. The paper questionnaire was to be used as an alternative in case of failure of the mobile gadgets. For the few instances paper questionnaire was used, the data was keyed-into the mobile application the same day by the concerned enumerators.

Introductory support to potential respondents was done by local administrators and agricultural extension officers which was aimed at improving the response rate. Once the survey was completed, the data were downloaded in a spreadsheet format and exported to Stata 15 for cleaning and pre-estimation test analysis. Analysis was carried out to obtain the research results which enabled discussion and drawing of implications of the study.

Theoretical framework and hypothesis development

In assessing behaviour, the Theory of Planned Behaviour (TPB) has been widely accepted as a basis for demonstrating the relationships that arise from behaviour constructs towards a behaviour under consideration (Ajzen, 1985, 1991). According to Ajzen (1991), intention towards performance of a behaviour can be projected using the individual attitude (AT) towards the behaviour, subjective norm (SN) and perceived behavioural control (PBC) contexts. Depending on the approval nature of an individual on their AT, SN and PBC, it is a pointer of strong intention to perform a given behaviour. As the TPB continue to be applied in different fields, new ideas for its predictive power improvement have been suggested. Being a non-static theory, additional variables to the TPB model have been successfully implemented in various studies (Taylor & Todd, 1995; Chu & Chiu, 2003; Nguyen *et al*., 2018; Loan, Takahashi, Nomura, & Yabe, 2019). Ajzen (1991) on his part felt that where warranted by significant contribution towards the behaviour, additional variables could be considered. This has made the theory more appealing to researchers thus becoming increasingly developed.

One of the major beneficiaries of TPB applications is waste generation and management (Tonglet, Phillips, & Read, 2004; Ioannou, Zampetakis, & Lasaridi, 2011; Caplescu, 2014; Russell, Young, Unsworth, & Robinson, 2017; Nguyen *et al.*, 2018). It is noteworthy that various analytical methodologies are often employed in combination with behavioural theories in explaining waste related behaviours. For instance, in empirical application of logit and ordered logit model to model home composting behaviour in Vietnam, Loan *et al.* (2019) findings indicated that motivational factors in terms of knowledge on composting, attitude and garden ownership were the basis for composting behaviour. Moreover, a general pro-environmental behaviour by a household was indicated to be a likely influence on composting. However, although training in composting was important in explaining participation decision, it did not determine the level of participation.

Unlike Loan *et al.* (2019), Philippsen (2015) employed an extended TPB and multiple regression to assess students' intention to recycle waste. Perceived moral obligation, past behaviour and inconvenience had a significant prediction of behaviour to recycle. Similarly, Nduneseokwu *et al.* (2017) and Nguyen *et al.*, (2018) used the TPB in the assessment of e-waste recycling intention in Nigeria and Vietnam respectively. However, the former study extended the analytical framework with infrastructure and economic incentives and used hierarchical regression for analysis. Infrastructure was a moderating variable for attitude and subjective norm which meant that establishment of appropriate infrastructure would result to weaker influence by attitude and subjective norm on intention to recycle. Conversely, Nguyen *et al.* (2018) applied Structural Equation Modelling (SEM). The findings indicated that environmental awareness, attitude, social-pressure, regulations and laws, recycling cost and inconvenience had significant prediction on e-waste recycling intention.

As a form of utilisation, recycling behaviour of waste is key in environmental quality. Using SEM, Jekria & Daud (2016) research findings on environmental concern and recycling behaviour in Malaysia showed that attitude on recycling was determined by environmental concern whereas attitude enhanced concern thereby resulting to improvement in the recycling behaviour. Earlier, Chu & Chiu (2003) extended and applied the TPB constructs in the assessment of household waste recycling behaviour. Beyond the usual AT, SN and PBC, they added perceived moral obligations (MO). The findings of the study indicated that the extended TPB constructs PBC, AT, SN and MO consecutively had significant influence on the recycling behaviour.

Similar to TPB, SEM has become widely accepted in assessment of human behaviour in waste related issues (Si *et al.*, 2019). Most often, SEM has been employed to assess and predict the structural relationships depicted by TPB thus making the two almost synonymous. Generally, SEM consists of two parts; the structural portion establishing the relationships between latent variables through simultaneous equations and the measurement part that shows associations between latent variables and observed variables (Bentler, 1980). According to Bentler (1980) and Kaplan (2001), the structural portion is basically written as;

$$\eta = B\eta + \Gamma\xi + \zeta \quad (1)$$

Where η is the vector of endogeneous latent variables (criterion), B is the matrix of coefficients of regressions of η variables on other η variables, Γ is the matrix that contains regression coefficients of η's on ξ's. In addition, ξ is the vector of exogenous latent variables (predictors), and ζ is the vector of residual terms (specification errors). Notably, the B matrix has zeros on the diagonal, an implication that a variable cannot cause itself, in this case η.

The measurement portion of SEM can be written as;

$$y = \Lambda\_y\, \eta + \varepsilon \quad (2)$$

$$x = \Lambda\_x\, \xi + \delta \quad (3)$$

Where y is explained variable, x are the explanatory variables, Λ_x and Λ_y are matrices for factor loadings, and ε and δ are vectors of uniqueness.

In this respect, variances and covariances for the variables, multipliers and disturbance terms are specified. Since SEM is meant to validate theories in regard to constructs, possibilities exist on absence of effect of constructs on others and certain variables failing to load on others. Therefore, through hypothesis formulation some elements that are used in SEM may be fixed to zero whereas the rest of the parameters are estimated. Also possibilities of discarding some indicators for inadequate validity and relevance exist. The covariance matrix of the fixed and non-fixed parameters portrays a specific structure defined as;

$$\Sigma = \Sigma(\Omega) \quad (4)$$

Where Σ is the population covariance matrix, and $\Sigma(\Omega)$ is Ω matrix valued function containing all the parameters of the SEM.

Considering that (a) waste is generally filthy and unpleasant if mismanaged, (b) public authorities are responsible for waste generated in urban areas, and (c) the respondent sample were farmers, additional constructs were incorporated into the TPB. Environmental awareness and concern, motivation, moral obligation and risk perceptions were hypothesised to have an additional stake in determining the commercial utilisation behaviour of agro-food waste beyond (Ajzen, 1985, 1991) constructs.

Attitude (AT): Refers to positive or negative evaluation about a behaviour which is formed through behavioural beliefs (Ajzen, 1985). Basically, individuals form behavioural attitudes based on what they know or something they have experienced before. Therefore, the judgement rendered on a behaviour is essentially based on older beliefs. In forming attitudes, individuals may amalgamate five to ten beliefs (Fishbein & Ajzen, 1975). This implies that a given attitude towards a behaviour is a summation of relevant behavioural beliefs. As a result, a positive or negative preference arises towards the behaviour (Ajzen, 1991). Of course, if the individual perceive the behaviour as disruptive, tiring, or does not fit to the established personal arena then they will

form a negative attitude and if otherwise positive. Biased and irrational attitudes cannot be ruled out (Ajzen, 2015) which implies objectivity may miss out in forming attitudes. An individual will most likely engage in a behaviour if his/her attitude towards it is positive whereas the opposite is true (Ajzen & Fishbein, 2005) people, institutions, or events are found to correlate well with behavioral patterns but not with specific behaviors; to predict specific actions requires a measure of attitude toward the behavior itself. The processes whereby general attitudes may influence performance of specific behaviors are currently the subject matter of one major line of theorizing and research best represented by Fazios (1990a. Considering commercial utilisation behaviour intention of agro-food waste, what is the likely attitude towards it? Therefore, it is hypothesised that;

H1a: AT has positive significant relationship with agro-food waste commercial utilisation intention (CUI).

H1b: AT has positive significant relationship with risk perception (RP)

Subjective Norms (SN): Refers to beliefs of an individual or household about whether people they look up to would approve or disapprove on their specific behaviour. It extends to performing behaviours that the people they hold in high regard or the society approves. The behavioural construct comes with social pressures in performing a behaviour (Zhang *et al.*, 2015this study examines factors associated with waste separation behaviors by analyzing responses to questionnaires distributed in Guangzhou, China. Data drawn from 208 of 1000-field questionnaires were used to assess socio-demographic factors and the TPB constructs (i.e., attitudes, subjective norms, perceived behavioral control, intentions, and situational factors; Aktas *et al.*, 2018)this study examines factors associated with waste separation behaviors by analyzing responses to questionnaires distributed in Guangzhou, China. Data drawn from 208 of 1000-field questionnaires were used to assess socio-demographic factors and the TPB constructs (i.e., attitudes, subjective norms, perceived behavioral control, intentions, and situational factors. Under the current study, it is a belief about other people's (other households, social groups and or community) standard behaviour in regard to commercial utilisation intention/behaviour of agro-food waste in urban agriculture. As such subjective norm is likely to influence household agro-food waste commercial utilisation intention positively. Then, it is hypothesized that;

H2: SN on agro-food waste has positive significant relationship with agro-food waste CUI.

Perceived Behavioural Control (PBC): Refers to perception of ease or difficulty of performing a behaviour. In instances where they feel certain (strong conviction), intention alone is projected to predict behaviour to be performed. Conversely, when there is uncertainty about the control ability towards the behaviour performance then PBC has a direct link with behaviour. Depending on the situation, individuals or households may feel adequately or inadequately equipped to perform a behaviour. Based on experience (past performance of the same or similar behaviour) or resources (monetary or knowledge) a household has, the scenario may affect (enables or hinders) their ability to perform an intended behaviour (Stancu, Haugaard, & Lähteenmäki, 2016; Werf, Seabrook, & Gilliland, 2019) such as commercial utilisation of agro-food waste. Therefore, it is hypothesised that;

H3a: PBC has positive significant relationship with CUI.

H3b: PBC has positive significant relationship with commercial utilisation behaviour (CUB).

Risk perceptions (RP): Refers to beliefs of a potential loss or harm which is subjective of an individual's evaluation of a situation or performing a behaviour. Whereas it may seem to be based on the level of ignorance, the degree of risk perception (RP) assigned to a behaviour may be entirely or partially influenced by an individual's reference. The level of risk of a behaviour is a representation of its probability and consequences of harm arising from the behaviour; perceived likelihood, sustainability and severity (Darker, 2013; Brown, 2014). Thus, it is hypothesised that;

H4a: RP have negative significant relationship with CUB

H4b: RP have negative significant relationship with CUI.

Environmental awareness and concern (EAC): Refers to knowledge, positivity and sensitivity towards ecological matters. The construct is an indicator of willingness to protect the environment. Intention of utilising agro-food waste commercially in urban areas may be indirectly taken to mean protective nature of a household towards effects of such waste on the environment. Environmental knowledge was positively associated with the intention to purchase energy efficient appliances (Li, Li, Jin, & Wang, 2019). Jekria & Daud (2016) and Nguyen *et al*. (2018) established a positive influence of environmental awareness towards intention to perform a behaviour. Therefore, it is hypothesised that;

H5a: EAC has positive significant relationship with AT

H5b: EAC has positive significant relationship with CUI

Motivation (MT): Refers to what causes individual households to conduct agro-food waste commercial utilisation. The reasons may emanate internally (environmental beliefs, guilt, intrinsic goals and attitudes) or externally (monetary benefits and social pressure related to laid down rules and laws)(Johansson, 2016; Nguyen & Watanabe, 2020)waste volumes are increasing rapidly and the World Bank estimates a 70% global increase in municipal solid waste up to 2025. Waste may have serious environmental consequences and there is a strong correlation between solid waste generation rates and greenhouse gas emissions. These two observations alone indicate that this development is not sustainable. Recycling is one of the most important actions currently available to reduce the environmental impact of waste. While, waste recycling in OECD countries is reported to be approximately 22% on average, many developing countries have recycling rates in the range of 1–3%. A key aspect in succeeding with any recycling effort is how authorities and other actors relate to

both informal and formal waste workers. This paper reports on the findings of a systematic literature study with the aim of exploring waste recycling behavior, with a special focus on motivational factors, both physical and psychological, behind recycling. Three levels of descending importance for recycling have been identified, where two are vital for success, and the third is desirable; 1. The motivators may affect intentions of an individual household (Johansson, 2016)waste volumes are increasing rapidly and the World Bank estimates a 70% global increase in municipal solid waste up to 2025. Waste may have serious environmental consequences and there is a strong correlation between solid waste generation rates and greenhouse gas emissions. These two observations alone indicate that this development is not sustainable. Recycling is one of the most important actions currently available to reduce the environmental impact of waste. While, waste recycling in OECD countries is reported to be approximately 22% on average, many developing countries have recycling rates in the range of 1–3%. A key aspect in succeeding with any recycling effort is how authorities and other actors relate to both informal and formal waste workers. This paper reports on the findings of a systematic literature study with the aim of exploring waste recycling behavior, with a special focus on motivational factors, both physical and psychological, behind recycling. Three levels of descending importance for recycling have been identified, where two are vital for success, and the third is desirable; 1. Cecere, Mancinelli, & Mazzanti (2014) indicated that waste prevention behaviour was dependent on intrinsic motivation. Nguyen & Watanabe (2020) was of the view that motivation could be initiated on an individual/household's confidence on the ability to perform a behaviour. Additionally, high PBC was associated with low motivation and vice versa. The argument was that those who exhibit high PBC are likely to be complacent. As a result they lack the motivation (low if any) to participate in effortful reasoning process towards the intention of performing a behaviour. Ajzen (2012) went further to indicate that intention is influenced by motivation. Therefore, it is hypothesised that;

H6a: MT has positive significant relationship with PBC

H6b: MT has positive significant relationship with CUI

Perceived moral obligations (MO): Refers to non-legally binding duty that a household may feel it owes and ought to perform which gives rise to moral responsibility. Therefore, the performance of a behaviour is gauged in terms of the perceived correctness or incorrectness (Ajzen, 1991). MO is generally based on self-expectation informed by personal values, which is internal unlike SN that arises from social (external) pressure. However, one's values or personal norms could be easily diffused to the society as such becoming part of subjective norms. Beck & Ajzen (1991) indicated a potentially significant association between MO and SN. Considering a household, its MO is its moral standing towards commercial utilisation intention. Chu & Chiu (2003) findings indicated that MO had positive influence on the intention to recycling waste in Taiwan households. In concurrence, MO was found to positively influence the intention to sort solid waste among the youth in China (Shen, Si, Yu, & Si, 2019). In predicting climate change mitigation behavioural intentions in Taiwan, Chen (2020) findings showed that MO had critical effect.

H7a: MO have positive significant relationship with SN

H7b: MO have positive significant relationship with CUI

Commercial utilisation intention (CUI): Refers to conscious plans that commercial utilisation will be undertaken in an urban agro-producer household. This may also be associated with the probability in performing CUB or the effort thereof (Fishbein & Ajzen, 1975; Ajzen, 1991). Unclear plans, low probability or low efforts would be expected to result to low CUB whereas the vice versa is true (Konerding, 1999). The link between CUI and CUB would be an indicator of transformation of intentions to behaviour. Thus, it is hypothesised that;

H8: CUI has positive significant relationship with CUB

Contextual factors (CF): Refers to factors that characterize the settings in which urban households operate in, other than the TPB constructs. In numerous TPB studies, contextual (background) characteristics are often not considered (Miao, 2015; Shen et al., 2019). They may include socio-economic and institutional factors, personality, intelligence, emotions, general attitudes, and life values among other factors. They are generally assumed to have a stake in developing intention (Ajzen, 1991; Ioannou et al., 2011; Ajzen, 2015). Although Ajzen (2015) was of the view that CF are only expected to indirectly influence behavioural intentions, this argument does not stand since Zhang (2014) established a direct association between CF and behavioural intentions to policy changes. Thus, it is hypothesised that;

H9: CF have positive significant relationship with CUI

The indicators that were used to build the study constructs are as presented on Table 1 and Appendices. However, the picked indicators are only a synthesised form of the original after undergoing a rigorous validity and reliability assessment; collinearity, composite reliability, average variances extracted, cross loadings and cross-validated redundancy tests were executed as shown in the results and discussion section. The indicators that did not meet the established criteria (0.70 indicator loading) were dropped as shown in Table 1 and Figure 1. In implementing the selection of indicators used, SmartPLS which is popularly known as PLS-SEM or PLS path (Ringle, Wende, & Becker, 2015) was employed. The software choice was based on its ability to estimate complex models without a pre-imposed distributional requirement. It is also appealing to due to its causal-predictive ability and user-friendliness. As such it enables relational estimation with much ease without advance technical knowledge compared to other SEM software such as CB-SEM (Hair, Risher, Sarstedt, & Ringle, 2019) and Stata-SEM. The CF construct included employment status of the woman of the household (employed=1; housewife=0) and urban agriculture knowledge (1=very low, 2=low, 3=moderate, 4=high, 5=very high).

Table 1: Indicators used to estimate the model constructs

Construct	Measurement item/indicator	Status
	I am interested in agricultural and food waste commercial utilisation	Dropped
	I think agricultural and food waste utilisation is cost friendly	Dropped
AT	Agro-food waste utilisation ought to be promoted	Picked
	Agro-food waste utilisation is an appropriate way to manage solid waste in urban areas	Picked
	When utilised properly agricultural and food waste is beneficial	Dropped
	Agricultural and food waste is unsafe for utilisation	Dropped
	The County government and landlords should be solely responsible for the management of agricultural and food waste	Dropped
SN	Most of the people I look to in terms of values utilise agro-food waste	Picked
	It is a common practise for people to utilise agro-food waste in urban agriculture	Picked
PBC	I have made it a routine to utilise agro-food waste upon generation	Picked
	It is quite effortless for me to utilise agro-food waste	Picked
	Inadequate knowledge makes agricultural and food waste utilisation very difficult for me	Dropped
EAC	Agro-food waste has economic value	Picked
	The little agricultural and food waste generated by every household if left unmanaged could potentially ruin the environmental quality	Dropped
	Failure to properly manage agricultural and food waste could contribute to negative health effects	Dropped
	I feel disgusted when I see or pass near agricultural and food waste that has been improperly disposed	Dropped
	I feel freshened and satisfied when my surroundings are clean	Picked
	I feel guilty if I dispose off the agricultural and food waste without utilising it	Dropped
PMO	I take it as my duty to utilise agro-food waste emanating from my household	Picked
	I feel if every household was to utilise its agricultural and food waste we would have a better environment	Dropped
	Everybody within a household has a role to play in managing agro-food waste especially through utilisation	Picked
	My religion encourages prudent utilisation of resources	Dropped
	I usually feel at peace when I utilise waste beneficially	Picked
MT	In my household, agro-food waste utilisation is a waste management strategy	Picked
	By utilising agricultural and food waste we set a good example to others	Dropped
	Having had faced food inadequacy in the past I ensure that whenever agricultural and food waste is generated I put it to good use	Dropped
	My household has some land space where we utilise agricultural and food waste	Dropped
	My household utilises agro-food waste as a cost-saving mechanism	Picked
RP	I would associate agro-food waste utilisation with pests and pathogen risk	Dropped
	I would associate agro-food waste utilisation with injurious elements risk	Picked
	I would associate agro-food waste utilisation with health and poisoning risk	Dropped
	I would associate agro-food waste utilisation with death and or investment loss risk	Dropped
	I would associate agro-food waste utilisation with pollution risk	Dropped
	I would associate agro-food waste utilisation with costly treatment of the affected risk	Picked
CUI	I plan to utilise agro-food waste on a regular basis in order to manage waste emanating from my household	Picked
	I plan to participate in waste management drives in my neighbourhood	Picked
	I plan to encourage others to utilise agro-food waste in order to improve waste management	Picked
	I intend to properly dispose off agricultural and food waste emanating from my household if am not able to use it	Dropped
	I always segregate agricultural and food waste before using it	Dropped
CUB	I regularly utilise agro-food waste from my household	Picked
	I regularly outsource agro-food waste for use in my household	Picked
	I always ensure I disinfect agricultural and food waste before utilising it	Dropped
	I sometimes sell agricultural and food waste to others who can use it	Dropped
	I sometimes give away agricultural and food waste to others who can use it	Dropped

Indicators scale: 1=strongly disagree (very low), 2= disagree (low), 3=moderately agree (moderate), 4=agree (high), 5=strongly agree (very high)

RESULTS AND DISCUSSION

Agro-food waste utilisation and produce sales

Kales enterprise was the most popular enterprise (86%) among urban agro-producer households for the three months period under consideration. Cereals as well as spinach indicated high production participation at 64% and 60% respectively. Notably, legumes, indigenous vegetables, poultry and banana enterprises had over 50% production participation rate. Value of agro-food waste used was highest in the vegetable group of enterprises followed by livestock, and tree and flower propagation. However, the highest mean produce sales were from the livestock enterprise followed by poultry, vegetables, and tree and flower propagation consecutively. The mean total value of waste utilised in urban agro-producer households was Kes9,724.15[1]. This implied that the budget share value of waste utilised was 27% in relation to conventional inputs (see the section that follows). This proportion presents a tangible contribution of agro-food waste in urban agriculture thus having a role in the urban food supply chain.

Average garden size used was 311m^2 although the range was 10m^2 (especially for roadside tree and flower propagators) to 6,000m^2. The agro-producers indicated that garden size under use fluctuated seasonally. Some agro-producers had up to 12,000m2 garden size during some production periods (especially during dry weather) to maximize on the value of produce during the time. However, Ogendi, Mukundi, & Orege (2019) findings had indicated that city producer had garden sizes of 0.5 to 1.0 acres; approximately 2,000-4,000m^2. The disparity could be explained by seasonal fluctuations but use of wetlands also increased farm sizes in urban areas.

Majority of the agro-producers sourced animal feeds (especially fodder) outside their homes. Whereas crop enterprises were practiced beyond the home boundaries, livestock and poultry enterprises were carried out within the home compound. This was associated with the high insecurity associated with livestock and poultry compared to crops although regular management required on animals could be a reason. During the study, it was observed that producers dried, sieved and fed poultry manure to cattle and pigs. Some producers indicated that they harvested rabbit waste (especially urine) and was a high value product but the claims could not be substantiated since some refuted them. Agro-food waste was also commonly boiled before feeding it to pigs. However, some producers indicated that they could not feed waste to their pigs since they had been contracted to supply pork to sausage manufacturers/processors who were against the practice. This notion could be associated with Choe et al. (2017) findings that pig fed on food waste had inferior meat quality although Márquez & Ramos (2007) had indicated that food waste has only minor effects on the carcass quality thus could be fed to pigs.

CONVENTIONAL INPUTS UTILISATION

In utilisation of other inputs (other than labour), the results indicated that livestock commercial feeds had the highest share of conventional inputs budget. During the three months period under consideration, urban agro-producers spent an average of Kes21,842.35 followed by fertilizer at Kes658.40. Expenditure on livestock veterinary services was estimated at Kes632.13 while fodder and pesticides were Kes576.14 and 574.60 respectively. Whereas a chunk of agro-producers did not spend on either one or more of these conventional inputs, livestock feeds recorded the highest upper expenditure at Kes480,000 while expenditure on other inputs had highs of under Kes50,000. The overall mean value of conventional inputs used in urban agro-producer households was estimated at Kes25,978.84. This translated to 73% of the total budget share for inputs used in urban agro-producer households. This is an indicator that agro-producers are largely inclined towards conventional inputs but with noteworthy contribution of agro-food waste in urban agriculture commercialization. During the survey, it was observed that there was a likely suboptimal level of production intensification. Therefore, enhanced support towards production intensification would be expected to propel agro-producers to transition to a higher level of agro-food waste commercialization.

Assessment of measurement model

Based on Hair *et al*. (2019)yet concise, overview of the considerations and metrics required for partial least squares structural equation modeling (PLS-SEM evaluation of the measurement model procedure, the results of the study revealed that indicator loadings of 0.691 to 0.927 were registered, as shown in Table 3. The assessment criterion advocates a minimum of 0.70 for indicator loadings which would imply acceptable level of reliability of the item under consideration. However, as a rule of thumb, Hair *et al*. (2019)yet concise, overview of the considerations and metrics required for partial least squares structural equation modeling (PLS-SEM indicated that a minimum of 0.60 indicator loading was a sufficient basis for gauging the reliability of the indicators and data generated thereof if it is not for confirmatory purposes. According to Chin (1998"abstract":"Provides a nontechnical introduction to the partial least squares (PLS) and Hair *et al*. (2019) yet concise, overview of the considerations and metrics required for partial least squares structural equation modeling (PLS-SEM, any indicator that does not meet the set criterion is considered unreliable, as such should be deleted. Therefore, discarding of indicators that did not meet the set criterion was implemented during the modelling process. As a result, some of the indicators of AT, EAC, RP, MT, PMO, CUI, CUB and CF constructs were dropped. Consequently, the overall explanatory power of model improved. The aforementioned loadings of the improved model were a pointer that more than 50 percent of the variance of the indicators could be explained. Hair *et al*. (2019)yet concise, overview of the considerations and metrics required for partial least squares structural equation modeling (PLS-SEM argued

1 The exchange rate at the time of the survey was KES107.707 = 1$USD

Table 2: Agricultural production, waste utilisation and sale of surplus produce among urban agro-producer households

	Production participation	Value of waste utilised				Value of produce sold			
		Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Vegetables	-	3,121.40	4,117.24	0	45,000.00	26,219.18	50,731.08	0	450,000.00
Kales	86%								
Amaranth	22%								
Spinach	60%								
Cabbage	23%								
Tomato	20%								
Pumpkin	33%								
Indigenous vegetables	55%								
Fruits	-	1,310.75	1,675.72	0	30,000.00	6,257.79	18,891.09	0	150,000.00
Banana	52%								
Other fruits	42%								
Legumes: Beans	55%	177.32	968.36	0	20,000.00	482.68	3,863.35	0	58,000.00
Cereals: Maize	64%	174.98	1,204.40	0	20,000.00	2,070.07	10,197.25	0	115,000.00
Tubers	-	24.52	163.47	0	2,700.00	1,640.57	16,077.68	0	270,000.00
Irish potatoes	25%								
Arrow root	19%								
Sweet potato	21%								
Fodder	38%	1,092.00	728.37	0	12,500.00	768.2	6,143.86	0	90,000.00
Livestock	-	2,438.16	12,524.24	0	200,000.00	40,012.57	99,038.94	0	1,000,000.00
Cattle	41%								
Goat/sheep	13%								
Pig	20%								
Rabbit	6%								
Poultry	54%					31,335.79	108,213.30	0	1,200,000.00
Tree and flower propagation	11%	1,385.02	16,682.67	0	350,000.00	18,782.89	78,471.77	0	600,000.00

that indicator loadings of 0.70 to 0.90 were evidence of 'satisfactoriness to goodness' of the indicators, as long as they were less than 0.95. Therefore, all the indicators used for the measurement model in agro-food waste commercial utilisation were reliable.

Although Cronbach's alpha and rho-A could have been used to check for internal consistency, composite reliability has been argued to be a better method given that it largely retains the standardized loadings of constructs (Fornell & Larcker, 1981). Composite approach has low sensitivity to variations and is considered to be compensatory unlike other methods of measuring internal consistency. The internal consistency of the measurement model using composite reliability (CR) indicated scores ranging from 0.698 to 0.890 (Table 3). The convergent validity of the constructs based on average variance extracted (AVE) indicated a range of 0.536 to 0.801. These indications revealed that the constructs used in modelling agro-food waste commercial utilisation model were acceptable since they had more than 0.50 scores. This implied that at least 50 percent of variance of the indicator items used could be explained by the constructs selected for the model (Hair et al., 2019). Therefore, convergent validity was attained for the study model.

Table 3: Construct reliability and validity

	Indicator	Mean	Std. Dev.	Indicator Loadings	CR	AVE
AT	at_1	4.353	0.833	0.751	0.792	0.656
	at_2	4.268	0.959	0.865		
CUI	bi_1	4.362	0.826	0.823	0.784	0.549
	bi_2	3.732	1.4	0.691		
	bi_3	3.967	1.2	0.703		
CF	cf_1	0.17	0.375	0.702	0.698	0.536
	cf_2	3.314	0.994	0.762		
EAC	eac_1	4.529	0.71	0.762	0.739	0.586
	eac_2	4.649	0.642	0.768		
MO	mo_1	4.279	0.982	0.808	0.825	0.611
	mo_2	4.215	0.949	0.768		
	mo_3	4.445	0.857	0.768		
MT	mt_1	3.996	1.16	0.889	0.890	0.801
	mt_2	3.939	1.232	0.901		
PBC	pbc_1	3.831	1.177	0.902	0.798	0.666
	pbc_2	3.351	1.467	0.721		
RP	rp_1	3.342	1.448	0.916	0.807	0.679
	rp_2	3.352	1.273	0.720		
SN	sn_1	3.642	1.273	0.874	0.838	0.722
	sn_2	3.307	1.071	0.824		
CUB	ub_1	3.342	1.448	0.927	0.882	0.790
	ub_2	3.908	1.185	0.849		

To establish the distinctiveness of the constructs adopted for the agro-food waste commercial utilisation model, the assessment of discriminant validity were implemented (Table 4). Based on Fornell-Larcker criterion that shared variance for all model constructs should not exceed their AVEs, the study results indicated that all the shared variances were smaller than their respective AVEs (diagonal). However, Henseler & Sarstedt (2013)namely goodness-of-fit indices. In order to illustrate the behavior of the goodness-of-fit index (GoF argued that Fornell-Larcker criterion was not a good measure for assessing discriminant validity since it is sensitive to slight indicator loading disparities. Therefore, to confirm the reliability of the current study findings the cross-loadings were assessed (Table 4). The cross loadings were comparably higher than the inter-correlations of the construct of all the other observed variables (Hussain, Fangwei, Siddiqi, Ali, & Shabbir, 2018) in the agro-food waste commercial utilisation model. This confirmed that the constructs adopted for the study model were discriminately valid.

Table 4: Fornell-Larcker criterion and cross-loadings

C/I*	AT	CF	CUB	CUI	EAC	MO	MT	PBC	RP	SN
AT	**0.810**									
CF	0.060	**0.732**								
CUB	0.289	0.178	**0.889**							
CUI	0.382	0.168	0.315	**0.741**						
EAC	0.343	0.197	0.320	0.403	**0.765**					
MO	0.270	0.148	0.523	0.370	0.359	**0.782**				
MT	0.431	0.186	0.600	0.446	0.359	0.594	**0.895**			
PBC	0.383	0.101	0.561	0.299	0.349	0.599	0.646	**0.816**		
RP	0.353	0.189	0.883	0.268	0.302	0.449	0.547	0.559	**0.824**	
SN	0.385	0.131	0.436	0.237	0.320	0.384	0.463	0.544	0.676	**0.850**
at_1	**0.751**	0.025	0.215	0.253	0.240	0.221	0.325	0.306	0.253	0.294
at_2	**0.865**	0.068	0.251	0.357	0.310	0.219	0.372	0.317	0.315	0.329
cf_1	-0.025	**0.702**	0.002	0.117	0.044	0.033	0.055	0.016	-0.010	-0.040
cf_2	0.107	**0.762**	0.247	0.129	0.236	0.177	0.211	0.127	0.275	0.220
ub_1	0.263	0.167	**0.927**	0.242	0.267	0.390	0.463	0.445	0.916	0.396
ub_2	0.252	0.148	**0.849**	0.337	0.315	0.577	0.641	0.582	0.612	0.382
bi_1	0.322	0.164	0.408	**0.823**	0.327	0.394	0.443	0.300	0.327	0.209
bi_2	0.282	0.057	0.037	**0.691**	0.280	0.139	0.266	0.145	0.045	0.135
bi_3	0.237	0.126	0.113	**0.703**	0.291	0.201	0.209	0.167	0.120	0.167
eac_1	0.270	0.175	0.342	0.299	**0.762**	0.320	0.337	0.284	0.314	0.283
eac_2	0.255	0.128	0.150	0.318	**0.768**	0.230	0.213	0.250	0.149	0.208
mo_1	0.222	0.088	0.520	0.292	0.271	**0.808**	0.582	0.561	0.455	0.350
mo_2	0.209	0.127	0.307	0.287	0.246	**0.768**	0.355	0.396	0.283	0.297
mo_3	0.201	0.135	0.386	0.290	0.332	**0.768**	0.443	0.436	0.300	0.245
mt_1	0.320	0.144	0.562	0.355	0.277	0.534	**0.889**	0.586	0.502	0.409
mt_2	0.449	0.189	0.514	0.441	0.364	0.529	**0.901**	0.570	0.478	0.421
pbc_1	0.306	0.108	0.594	0.220	0.266	0.549	0.619	**0.902**	0.585	0.504
pbc_2	0.340	0.047	0.263	0.295	0.330	0.417	0.406	**0.721**	0.274	0.369
rp_1	0.263	0.167	0.927	0.242	0.267	0.390	0.463	0.445	**0.916**	0.396
rp_2	0.361	0.149	0.433	0.199	0.235	0.361	0.461	0.521	**0.720**	0.714
sn_1	0.307	0.138	0.411	0.175	0.201	0.317	0.321	0.501	0.712	**0.874**
sn_2	0.289	0.069	0.300	0.204	0.317	0.288	0.317	0.395	0.407	**0.824**

***C/I refers to construct or indicators**

Evaluation of the Structural Model

Whereas the measurement model had been established to be reliable and valid, these aspects are not considered adequate in determining the suitability of a structural model (Hussain et al., 2018; Hair et al., 2019)yet concise, overview of the considerations and metrics required for partial least squares structural equation modeling (PLS-SEM. Therefore, structural assessments are requisite. According to Hussain et al. (2018), the assessment involve establishing the predictive relevancy and constructs relationship of the model. Often coefficient of determination (R2), goodness of fit index, path coefficients (), p-values/T statistics, effect size (f2) and the predictive relevance of the model indicators (Q2) are considered. In comparison, Hair et al. (2019)yet concise, overview of the considerations and metrics required for partial least squares structural equation modeling (PLS-SEM considered the

coefficient of determination (R2), the blindfolding-based cross-validated redundancy measure (Q2), and the statistical significance and relevance of the path coefficients portrayed by the constructs as the basis for assessing the structural conduct of a model.

Whereas the standard assessment criteria outlined by Hussain et al. (2018) and Hair et al. (2019) Structural Equation Modeling (SEMare critical, assessment of collinearity is important as well (Hair et al., 2019)yet concise, overview of the considerations and metrics required for partial least squares structural equation modeling (PLS-SEM before commencing the structural evaluation of the model. The results of the collinearity test indicated variance inflation factors range of 1.005 to 1.570 which meant that the model did not have collinearity problems (Becker, Ringle, Sarstedt, & Völckner, 2015). The R2 for the agro-food waste commercial utilisation behaviour was established to be 0.791 as shown in Table 5 and Figure 1. This implied that 79.1% of the commercial utilisation behaviour variance could be explained by the model's constructs. This would be considered substantial in-sample explanatory power for the behaviour depicted among urban agro-producer households. The R2 for PBC and CUI were second and third largest at 0.417 and 0.309 which indicated their strength in explaining the commercial utilisation behaviour variance was higher than the other constructs.

Bootstrapping procedure revealed the path coefficients as presented in Table 5 and Figure 1. Considering the H1a hypothesis, it was established that AT had significant and positive influence on CUI. As such, the hypothesis was supported. The findings implied that household attitudes were critical in forming intentions towards agro-food waste commercial utilisation considerations. As such positive attitudes were expected to contribute to increased agro-food waste commercialization intentions. The findings coincided with those of Ayob, Sheau-Ting, Abdul Jalil, & Chin (2017) subjective norm (SN towards waste separation intention among students in Malaysia. Heidari et al. (2018)Iran, using questionnaires, and analyzed by cluster analysis, discriminant analysis and structural equation modelling techniques (SEM showed similar findings towards waste separation at source in Iran. Similarly, hypothesis H1b was supported based on the positive and significant effect of AT on RP. The findings implied that the overall attitude of agro-producer households towards agro-food waste commercialization had a stake in the level of risk perception towards waste utilisation. Williams & Noyes (2007)risk perception can be understood as an individual's assessment of risk, and the adequacy of any risk assessment is reliant on the adequacy of the accessible risk information. Consequently, one way to understand the effect of risk perception on decision-making, and the approach taken in this literature review, is to understand how risk information is communicated and received by an individual. A number of factors are identified that have been found to influence perceptions of risk, which are related to the design of risk messages: the message (colour, signal word, surround shape, and the framing effect also noted that attitudes had effect on trust, risk perception and the likelihood of information acceptance. As such increased positivity in attitude towards agro-food waste utilisation would alter their level of risk perception.

Table 5: Path coefficients

Hypothesis	Path	Coefficient	Standard Deviation	T Statistics
H1a	AT -> CUI	0.204**	0.051	4.023
H1b	AT -> RP	0.353**	0.043	8.276
H2	SN -> CUI	-0.041	0.058	0.700
H3a	PBC -> CUI	-0.091	0.064	1.431
H3b	PBC -> CUB	0.083*	0.035	2.340
H4a	RP -> CUB	0.818**	0.020	40.027
H4b	RP -> CUI	-0.015	0.072	0.203
H5a	EAC -> AT	0.343**	0.045	7.558
H5b	EAC -> CUI	0.223**	0.051	4.346
H6a	MT -> PBC	0.646**	0.033	19.832
H6b	MT -> CUI	0.267**	0.077	3.457
H7a	MO -> SN	0.384**	0.038	10.057
H7b	MO -> CUI	0.144*	0.073	1.979
H8	CUI -> CUB	0.071*	0.028	2.534
H9	CF -> CUI	0.058	0.042	1.399

***5% significance and **1% significance**

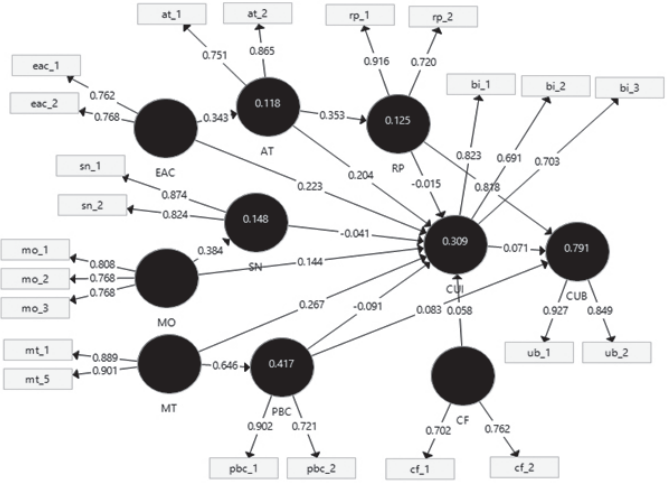

Figure 1: Indicator/factor loadings and path coefficients

Hypothesis H2 and H3a showed insignificant effects of both SN and PBC on CUI thus they were rejected. The findings contradicted with Ayob *et al.* (2017)subjective norm (SN on the PBC aspect but coincided with the insignificant effect of SN on CUI. This study findings went against Ajzen (1985, 1991) projections that PBC and SN were likely to influence behavioural intentions. Nystrand & Olsen (2020) with an extension of self-efficacy and descriptive norms and, as well, hedonic and utilitarian eating values, is used as a conceptual framework. Structural equation modeling (SEM also established insignificant association between PBC and

intention towards consuming functional foods. The H3b hypothesis was confirmed by the positive significant effect portrayed by PBC on CUB. This implied that PBC of the agro-producer household influenced the agro-food waste commercial utilisation behaviour but not its intentions. Similar PBC and CUB association was also established in Heidari et al. (2018)Iran, using questionnaires, and analyzed by cluster analysis, discriminant analysis and structural equation modelling techniques (SEM in source separation of waste intention and behaviour.

Hypothesis H4a showed significant influence of RP on CUB although it was not negative as it was expected. However, this may imply that farmers who had higher level of risk perceptions were likely to form commercial utilisation behaviour. This may also be interpreted as increased interest in agro-food waste as a supplementary input in urban agriculture would likely establish higher inherent risk issues but agro-producers would address them and utilise it due to expected benefits. This path also had the highest effect towards the commercial utilisation behaviour of agro-food waste. This meant that RP had the topmost influence on the ultimate decision to commercialize using agro-food waste. Kummeneje & Rundmo (2020)risk perception, worry, risk tolerance, safety priority, and accident involvement are associated with cyclists' risk-taking behaviour. Two types of cyclists' risk-taking behaviour were studied: (1 findings indicated that risk perceptions among cyclists in Norway had influence on their traffic behaviour. However, RP had negative but insignificant influence on CUI.

EAC relationships with AT and CUI indicated strong positive significant association. The results supported hypothesis H5a and H5b. The association indicated that the agro-producer awareness and concern towards the environment had a stake in determining the household's attitude on agro-food waste commercialization. The findings were similar to those of Li et al. (2019) that both environmental concern and environmental knowledge had significant influence on attitude towards purchase of energy efficient appliances. The EAC as well affected the intentions of commercial utilisation of waste. This may have implied that agro-producer households considered commercial utilisation of agro-food waste as a strategy of managing likely negative environmental effects while tapping the benefits. Li et al. (2019) also established a positive influence of environmental knowledge on intention to purchase. Further, the t-statistic of the path coefficients showed significant positive influence of agro-producer households' MT on their perceived ability to control the commercial aspect of agro-food waste as well as the intentions to commercialize. This meant that motivation among household members in utilising agro-food waste beneficially from a commercialization aspect was important in developing the overall behaviour. Similarly, Ajzen (2012) and Johansson (2016)waste volumes are increasing rapidly and the World Bank estimates a 70% global increase in municipal solid waste up to 2025. Waste may have serious environmental consequences and there is a strong correlation between solid waste generation rates and greenhouse gas emissions. These two observations alone indicate that this development is not sustainable. Recycling is one of the most important actions currently available to reduce the environmental impact of waste. While, waste recycling in OECD countries is reported to be approximately 22% on average, many developing countries have recycling rates in the range of 1–3%. A key aspect in succeeding with any recycling effort is how authorities and other actors relate to both informal and formal waste workers. This paper reports on the findings of a systematic literature study with the aim of exploring waste recycling behavior, with a special focus on motivational factors, both physical and psychological, behind recycling. Three levels of descending importance for recycling have been identified, where two are vital for success, and the third is desirable; 1 associated motivation to development of behavioural intentions.

MO of the urban agro-producer households had positive significant effect on SN and CUI. This implied that MO influenced the social pressures as such MO of an individual household was likely to be diffused to other households who would embrace it as a norm thus becoming part of the SN in a community/society. MO also initiated the inner push of agro-producer households in developing the commercial utilisation intentions for agro-food waste. This was a confirmation for the hypotheses H7a and H7b. Similarly, software piracy intentions were shown to have positive relationship with perceived moral obligation (Hashim, Kannan, & Wegener, 2018).

CUI had positive significant influence on CUB. This indicated that once an agro-producer household developed intentions to commercialize agricultural production using agro-food waste then they were likely to end up commercializing. This implies once urban agro-producer households developed agro-food waste commercialization intentions, they were likely to transition to actual commercialization. The association was supported by Foltz, Newkirk, & Schwager (2016) findings that the intention towards amending social networking security credentials influenced the ultimate behaviour.

The blindfolding-based cross-validated redundancy measure (Q^2) results were as presented in Table 6. Application of the rule of thumb as suggested by Hair et al. (2019)yet concise, overview of the considerations and metrics required for partial least squares structural equation modeling (PLS-SEM showed that the adopted constructs were relevant in their predictive accuracy of the structural model. The relevance ranged from small to large as shown in Table 6.

Table 6: Construct Cross-validated Redundancy

Construct	Q^2	Predictive relevance
AT	0.074	Small
CUB	0.601	Large
CUI	0.146	Small to moderate
PBC	0.268	Moderate
RP	0.088	Small
SN	0.103	Small to moderate

The specific indirect effects of the commercial utilisation model were as shown in Table 7. The coefficients are indication

of the mediation role played out by various constructs in the model.

Table 7: Specific indirect effects

Path	Coefficient	Std. Dev.	T Statistics
AT -> CUI -> CUB	0.014*	0.006	2.478
EAC -> AT -> CUI -> CUB	0.005*	0.002	2.485
CF -> CUI -> CUB	0.004	0.003	1.186
EAC -> CUI -> CUB	0.016*	0.006	2.464
MO -> CUI -> CUB	0.010	0.008	1.354
MT -> CUI -> CUB	0.019	0.010	1.821
PBC -> CUI -> CUB	-0.006	0.005	1.259
MT -> PBC -> CUI -> CUB	-0.004	0.003	1.265
RP -> CUI -> CUB	-0.001	0.005	0.201
AT -> RP -> CUI -> CUB	0.000	0.002	0.200
EAC -> AT -> RP -> CUI -> CUB	0.000	0.001	0.196
SN -> CUI -> CUB	-0.003	0.005	0.582
MO -> SN -> CUI -> CUB	-0.001	0.002	0.572
MT -> PBC -> CUB	0.053*	0.024	2.239
AT -> RP -> CUB	0.289**	0.034	8.565
EAC -> AT -> RP -> CUB	0.099**	0.020	4.928
EAC -> AT -> CUI	0.070**	0.019	3.759
MT -> PBC -> CUI	-0.059	0.041	1.436
AT -> RP -> CUI	-0.005	0.026	0.200
EAC -> AT -> RP -> CUI	-0.002	0.009	0.195
MO -> SN -> CUI	-0.016	0.023	0.686
EAC -> AT -> RP	0.121**	0.025	4.825

****significant at 1% and *significant at 5%**

CONCLUSION

The study had sought to understand what drives agro-food waste commercial utilisation intention and its transition to behaviour. First, descriptive analysis of production participation across numerous enterprises, utilisation of agro-food waste as well as the produce sales was conducted. The results indicated high production participation in Kales enterprise although the highest use of agro-food waste was recorded in vegetables while the highest produce sales were in tree and flower propagation enterprise. Higher expenditure share was recorded for conventional inputs (73%) compared to agro-food waste (27%). In order to explore what drove commercial utilisation, validity and reliability procedures and conduct of the adopted model were carried out. Results indicated requisite validity and reliability of the indicators used to build constructs. The model's in-sample explanatory power was substantial as well as its predictive accuracy and relevance. The resultant structural model path coefficients indicated that attitude, environmental awareness and concern, motivation and perceived moral obligation had positive significant influence on commercial utilisation intention. Furthermore, commercial utilisation intentions, risk perceptions and perceived behavioural control had significant influence on the commercial utilisation behaviour. This implied that the commercialization intentions formed in an urban agro-producer household were likely to transition to agro-food waste commercial utilisation behaviour. A further implication is that if small-urban farm businesses could be empowered through agro-food waste management and utilisation programs, they would likely develop interest in commercial utilisation of waste and may result to actionable commercialization.

Limitations and suggestions for further research

There was a considerable challenge in attaching value to agro-food waste. In some cases, the value attached to waste was the price associated. Considering this was not the real value for waste, better methodological basis could be employed, the utility of waste could be factored in.

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APPENDICES

Constructs used in the SEM model

Variable	Mean	Standard deviation	Minimum	Maximum
Attitude	3.6826	0.4260	1.7143	4.8571
Subjective norm	3.3246	0.9989	1.0000	5.0000
Perceived behavioural control	3.3757	0.8901	1.6667	5.0000
Environmental awareness and concern	4.4531	0.5041	2.4000	5.0000
Moral obligation	4.1488	0.6203	1.1667	5.0000
Motivation	4.0031	0.7548	1.2000	5.0000
Commercial intentions	4.1201	0.7360	1.7500	5.0000
Commercial utilisation behaviour	2.5892	0.7145	1.0000	5.0000
Risk perceptions	2.3118	0.5612	1.1667	4.1667

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SCIENTIFIC PAPER

THE ECONOMIC SITUATION OF HUNGARIAN CROP PRODUCTION ENTERPRISES, ESPECIALLY IN HAJDÚ-BIHAR COUNTY

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Abstract: *Increasing the competitiveness of Hungarian crop production plays a key role in moving forward at the international level. However, improving efficiency and profitability is essential in this regard. The natural resources in Hungary provide an excellent opportunity for crop production. About 8% of the arable land in Hungary (a total of 4.3 million hectares) belongs to farmers in Hajdú-Bihar County. This research is based on secondary data that can be found in the HCSO and EMIS databases. HCSO data was used for the comparison of national and county data characterising crop production, while the EMIS database was used to process the financial data of enterprises dealing with field crop production. The Hungarian sample size is 853, of which 69 enterprises are from Hajdú-Bihar County. The aim of this study is to assess the profitability, assets and financial situation of arable crop production enterprises operating in Hajdú-Bihar County as a function of national average data. Based on the examined profitability indicators (operating ROS and ROA), it was established that the enterprises in Hajdú-Bihar County are profitable, even in a national context. In terms of operating ROS, the farms in the examined county were able to achieve a 3.6 percentage point higher value due to their more efficient cost management, despite having a similar level of technology compared to businesses spanning across the entire country. The proportion of farms with the lowest leverage ratio (<20%) is 16 percentage points higher at the county level than at the national level. In addition, almost 70% of the enterprises operating in Hajdú-Bihar County have excellent liquidity. This rate is 50% at the national level.*

Keywords:*crop production, enterprises, economic situation, profitability, liquidity*
JEL code: M11; Q12

INTRODUCTION

In 2019, Hungary accounted for 2.1% of the European Union's crop production. 4.4% of cereals and 5.4% of industrial crops grown in the European Union were produced in Hungary. These crop products represented a significant share of the country's total gross output (cereals: 26%, industrial crops: 12%) (HCSO, 2020b).

An increasing number of researchers started to examine the role of competitiveness recently, which is a must for the Hungarian crop production sector in order to be able to move forward in international terms. According to Takácsné György (2020), farm size does not necessarily determine whether a company will be competitive or not. Instead, it is possible for small- or large-scale farms to perform precision farming and sustainability in addition to competitive production. Felkai et al. (2013) suggest that, within economic efficiency, the purchase prices of plant products may represent the main efficiency reserves. In addition, expertise should also be improved.

In Hungary, the income situation of farmers is improved by subsidies. For this reason, farmers consider the opportunities offered by the Common Agricultural Policy to be of key significance. Based on a survey conducted in the European Union ("Europeans, Agriculture and the CAP"), 25% of Hungarian enterprises consider the number of subsidies currently available to be too low. Also, the number of respondents was 6 percentage points higher than between

2017-2020. In addition, 44% of respondents think that further increases should be made during the next 10 years (EC, 2020).

However, income generation is affected not only by subsidies but also by natural resources. Hungary is in a favourable position with regard to the quality of arable land, weather conditions and soil fertility. At a national level, the approximately 325 thousand hectares of arable land in Hajdú-Bihar County is considered to have one of the highest quality (Vinogradov – Takácsné György, 2019; HCSO, 2020a). For this reason, the study focuses on the assessment of the national economic situation of enterprises producing cereals (except for rice), legumes and oilseeds in Hajdú-Bihar County.

The aim of this paper is to analyse the profitability, asset and financial situation of arable crop production companies operating in Hajdú-Bihar County as a function of national average data.

MATERIALS AND METHODS

Secondary databases were used to prepare the study. General data (national and county average yields, changes in input and output prices, etc.) and statistical data which describes the situation of agriculture were collected from the HCSO database. The financial data included in the reports of Hungarian field crop companies were retrieved from the EMIS database. The scope of activities of the examined enterprises (as their main activity) was limited to the cultivation of cereals (except for rice), legumes and oilseeds in accordance with the International Standard Classification of All Economic Activities. In addition, only data from companies that could be found in the database each year were included in the analysis. Additional filtering methods were also identified, such as the fixed asset ratio of at least 20%, which also contributed to the removal of outliers. Accordingly, the sample number is 853. After the establishment of the county classification, the authors examined the economic situation of farmers operating in Hajdú-Bihar County. The number of enterprises in the county is 69, which we also placed as a function of national average data. Descriptive statistical methods (mean, standard deviation, relative standard deviation, inter-class distribution) were used to process the data. In addition, correlation analysis was used to examine the relationship between each efficiency indicator and the total assets and net sales revenue.

Various efficiency indicators were derived from the financial data, using the results of operating activities to analyse the operation of enterprises. The calculated efficiency indicators were used to assess the profitability (operating ROS, ROA and assets (fixed assets ratio), as well as the financial situation (leverage, quick liquidity ratio) of the examined companies.

The ROA and quick liquidity ratio were measured by Malik et al. (2016). While the former expresses operating profit at unit value of assets, the latter expresses short-term solvency. In calculating this efficiency indicator, the value of accrued expenses was also taken into account. Operating ROS was also used by Maziarczyk (2020), as it determines the profit of operation that can be achieved with unit revenue. Fixed assets ratio – as an important efficiency indicator of the asset situation of an enterprise – was based on the study of Nguyen – Nguyen (2020). The leverage ratio determines the debt stock per total assets, which was also applied by Fenyves et al. (2020). Similarly to Nguyen – Nguyen (2020) and Fenyves et al. (2020), farm scale was based on total assets. In addition we also determined the farm scale by net sales revenue.

RESULTS AND DISCUSSION

Factors affecting production value and production cost

A distinction is made between income factors which can be directly influenced by companies and those which cannot be influenced. The former group of factors mostly concern intensity (changes in production costs), while the latter refer to the increase in yield and its selling price (changes in production value), as well as weather extremities (e.g. drought, hail). It should be emphasised that subsidies play a significant role as an income supplement for enterprises (Apáti et al., 2018). Before presenting the obtained results, we consider it necessary to examine the changes in the sales prices and price indices of the main crop products, as well as the changes in the price levels of the most important expenditures. In addition, specific yields to be obtained in Hajdú-Bihar County are also presented.

Figure 1 shows the sales prices of the most important crop products in field crop production. The highest average price was shown in the case of sunflower seeds (32.68 eurocents/kg) between 2015 and 2019. There was no significant difference between the sales prices of wheat, maize and barley during the examined period.

Figure 1. Changes in the prices of the main crop products (2015-2019)
Source: HCSO, 2020a

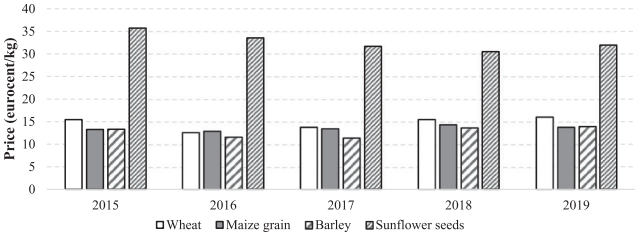
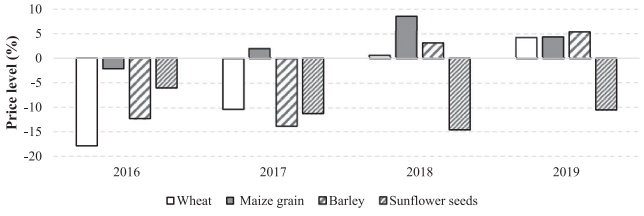


Figure 2 shows the yearly change in the prices of the main crop products. Compared to the base year of 2015, the price of maize increased the most in 2018 (by almost 9%). In contrast, in the same year, the price of sunflower seeds decreased by almost 15%. However, it should be noted that the selling price of sunflower showed a significant decrease during the examined period. The most unfavourable wheat price level was observed in 2016.

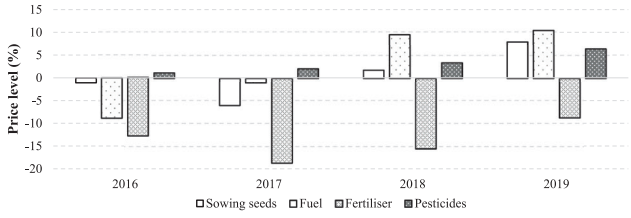
Figure 2. Changes in the price level of the main crop products (2015-2019) (2015=100%)



Source: HCSO, 2020a

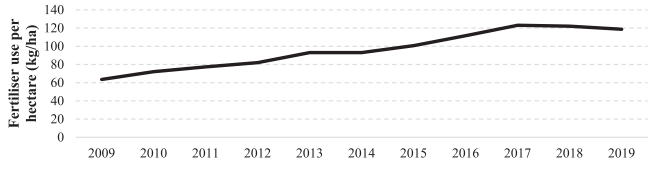
In crop production, appropriate intensification (i.e. proper input levels) plays a key role in increasing yields per unit area (Apáti et al., 2018). The most important expenditures include seeds, fertilisers and pesticides, the price indices of which varied during the examined period. While fertiliser use per hectare has steadily increased (nearly doubled) over the past period (Figure 4), the price level of fertiliser has shown a significant decline compared to 2015. An increasing trend was observed in the price index of plant protection products compared to the base year. In the case of sowing seeds, the most favourable change in the price level was observed in 2016 compared to 2015 (Figure 3).

Figure 3. Changes in the price level of the main expenditures 2015-2019 (2015=100%)



Source: HCSO, 2020a

Figure 4. Specific fertiliser use in Hungary (2015-2019)



Source: HCSO, 2020a

Hungary has excellent soil conditions (especially in Hajdú-Bihar County), good productivity and weather for crop production. In addition, Hungary also has the highest land prices. In 2019, one hectare of arable land cost nearly 7.2 thousand EUR, which was an increase of about 8% compared to 2018. In comparison with the national average (5 thousand EUR/ha), the price of arable land was 42% higher in this county (HCSO, 2020c). When comparing the yield averages of Hungary and Hajdú-Bihar County between 2015-2019, the largest difference is shown in the specific yield of maize. The county average value (8.3 t/ha) was 3 tons higher per hectare than the national average. The average yield of sunflower (3.25 t/ha) in Hajdú-Bihar County was slightly higher than the national value (2.89 t/ha) (HCSO, 2020a).

The total assets and net sales revenue of the examined enterprises

Data on the arable land of the examined enterprises were not available, i.e. their size was determined on the basis of the total assets and sales revenue. For this reason, the economic situation of these companies will be assessed accordingly.

The farm size of the enterprises is classified into three categories by Act XXXIV of 2004 (expressed in EUR): micro, small and medium. The different inter-class distribution were designed accordingly. The financial data expressed in HUF were converted into EUR on the basis of the Hungarian National Bank's (HNB) average HUF/EUR exchange rate between 2015-2019 (314.94 HUF/EUR). Enterprises with a total assets or net sales of less than 2 million EUR are considered to be micro-enterprises. Small businesses include enterprises with a total assets and net sales between 2 million – 10 million EUR. Companies with assets between 10 million – 50 million EUR or sales between 10 million and 43 million EUR are medium-sized enterprises. Companies above this category are large corporations that were not included in this research, i.e. this class interval was not even indicated.

In Hungary, the proportion of companies with assets below 2 million EUR was 52%. This value was similar in Hajdú-Bihar County. The proportion of small farms is 43% at the national level and 7% lower at the county level. While almost 6% of Hungarian farms can be classified in the medium-sized category, their proportion is 10% in Hajdú-Bihar County. Based on the average values, the enterprises in Hajdú-Bihar County had 7% higher amount of assets during the examined period in comparison with the national average.

Table 1. The total assets of enterprises in Hungary and Hajdú-Bihar County (averaged over the period between 2015-2019)

SME category	Total assets (thousand EUR)	Hungary		Hajdú-Bihar County	
		Number of enterprises	Distribution (%)	Number of enterprises	Distribution (%)
Micro	**0 - 1 999**	442	51.8	37	53.6
Small	**2 000 - 3 999**	226	26.5	20	29.0
	4 000 - 5 999	80	9.4	1	1.4
	6 000 - 7 999	41	4.8	2	2.9
	8 000 - 9 999	16	1.9	2	2.9
Medium	**10 000 < =**	48	5.6	7	10.1
Total		853	100.0	69	100.0
Mean (thousand EUR)		3 164	-	3 379	-
Relative standard deviation (%)		122	-	123	-

Source: Own calculations based on EMIS data, 2020

While almost 75% of the examined companies have a revenue of less than 2 million EUR on a national scale, this proportion is 81% in Hajdú-Bihar County. Thus, these farms belong to the micro-sized category. Farms with a higher average value are small, accounting for 24% at the

national level and 19% at the county level. At the national level, 1% of farms belong to the top category, with no farm from Hajdú-Bihar County.

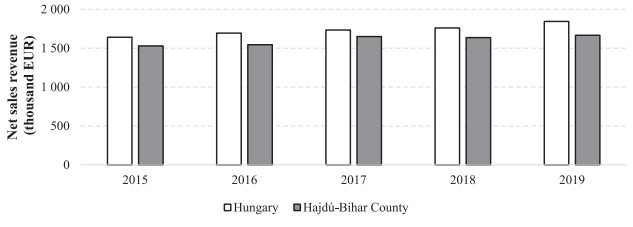
Table 2. Net sales revenue of the enterprises of Hungary and Hajdú-Bihar County (averaged over the period between 2015-2019)

SME category	Net sales revenue (thousand EUR)	Hungary		Hajdú-Bihar County	
		Number of enterprises	Distribution (%)	Number of enterprises	Distribution (%)
Micro	**0 - 1 999**	636	74.6	56	81.2
Small	**2 000 - 3 999**	140	16.4	8	11.6
	4 000 - 5 999	43	5.0	2	2.9
	6 000 - 7 999	17	2.0	3	4.3
	8 000 - 9 999	6	0.7	0	0.0
Medium	**10 000 <=**	11	1.3	0	0.0
Total		853	100.0	69	100.0
Mean (thousand EUR)		1 735	-	1 606	-
Relative standard deviation (%)		118	-	93	-

Source: Own calculations based on EMIS data, 2020

Figure 5 shows sales revenue. It can be observed that the enterprises in Hajdú-Bihar County achieved a slightly lower value (by 8% on average) each year, which can be attributed to the higher proportion of micro-enterprises at the county level.

Figure 5. Net sales revenue of the examined enterprises on a yearly basis



Source: Own calculations based on EMIS data, 2020

The proportion of micro-enterprises is almost similar at a national level and in Hajdú-Bihar County. In addition, within Hajdú-Bihar County, the proportion of small enterprises is higher (54%) than at the national level (48%).

There are 158 enterprises with the highest income (over 250 EUR) in Hungary, 10 of which are located in Hajdú-Bihar County. Based on the consolidated assessment of the period between 2015-2019, farms in Hajdú-Bihar County realized 11% lower incomes (Table 3).

Based on the yearly income data, it can be seen that in 2015 and 2016, enterprises in Hajdú-Bihar County had significantly (25 and 38%, respectively) lower EBIT compared to the national average values. In 2017, due to more favourable economic and weather conditions, the average income at the county level was higher than the national average.

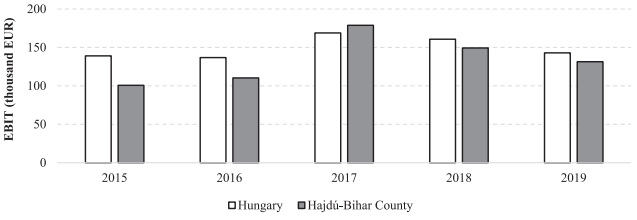
Table 3. Income of enterprises in Hungary and Hajdú-Bihar County based on their operational results (EBIT) (averaged over the period between 2015-2019)

EBIT (thousand EUR)	Hungary		Hajdú-Bihar County	
	Number of enterprises	Distribution (%)	Number of enterprises	Distribution (%)
0 - 49	290	34.0	22	31.9
50 - 99	170	19.9	18	26.1
100 - 149	110	12.9	10	14.5
150 - 199	64	7.5	6	8.7
200 - 249	61	7.2	3	4.3
250 <=	158	18.5	10	14.5
Total	853	100.0	69	100.0
Mean (thousand EUR)	150	-	134	-
Relative standard deviation (%)	156	-	197	-

Source: Own calculations based on EMIS data, 2020

Subsequently, in 2018 and 2019, farms in Hajdú-Bihar County achieved less favourable income compared to the national averages (Figure 6).

Figure 6. Yearly income of the examined enterprises



Source: Own calculations based on EMIS data, 2020

Of the various profitability indicators, the development of the operating ROS is examined first. Nearly two thirds of the farms in Hungary and Hajdú-Bihar County reached a ROS value between 0-15%. In addition, the proportion of farms with operating ROS below 0% and above 20%, both at the county and the national level. Most of the companies in Hungary and Hajdú-Bihar County belonging to the top category are small in size, but the amount of assets of each farm is almost twice as high at the county level than at the national level. During the examined period, county farms achieved 3.6 percentage points higher operating ROS on average, which can be explained by their more efficient cost management (Table 4). No significant correlation was found between the operating ROS and the total assets ($r = 0.040$; $p = 0.243$). The same refers to the correlation between operating ROS and revenue ($r = 0.045$; $p = 0.190$).

In the first two years, Hungarian companies were able to produce more cost-effectively, but from 2017, the farms of Hajdú-Bihar County had a higher operating ROS. The most significant difference could be shown in 2019, when the national average was negative, while the county-level average was 7.5%. As a result, there was an increasing proportion of farms that were able to achieve low incomes due to high

Table 4. Operating ROS of enterprises in Hungary and Hajdú-Bihar County (averaged over the period between 2015-2019)

Operating ROS (%)	Hungary		Hajdú-Bihar County	
	Number of enterprises	Distribution (%)	Number of enterprises	Distribution (%)
<0	106	12.4	8	11.6
0 - 4,9	187	21.9	17	24.6
5 - 9,9	218	25.6	20	29.0
10 - 14,9	132	15.5	8	11.6
15 - 19,9	90	10.6	7	10.1
20 < =	120	14.1	9	13.0
Total	853	100.0	69	100.0
Mean (%)	5.3	-	8.9	-
Relative standard deviation (%)	1148	-	168	-

Source: Own calculations based on EMIS data, 2020

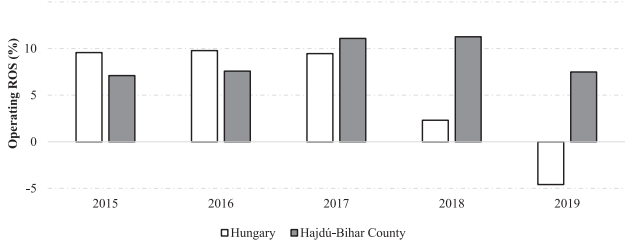
Table 5. ROA values of enterprises in Hungary and Hajdú-Bihar county (averaged over the period between 2015-2019)

ROA (%)	Hungary		Hajdú-Bihar County	
	Number of enterprises	Distribution (%)	Number of enterprises	Distribution (%)
<0	99	11.6	8	11.6
0 - 4.9	334	39.2	31	44.9
5 - 9.9	270	31.7	20	29.0
10 - 14.9	102	12.0	7	10.1
15 - 19.9	26	3.0	2	2.9
20 < =	22	2.6	1	1.4
Total	853	100.0	69	100.0
Mean (%)	5.6	-	4.6	-
Relative standard deviation (%)	161	-	146	-

Source: Own calculations based on EMIS data, 2020

costs, thereby significantly affecting the arithmetic mean (Figure 7).

Figure 7. Yearly operating ROS of the examined enterprises

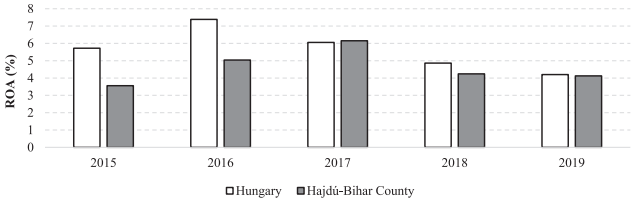


Source: Own calculations based on EMIS data, 2020

Examining the ROA values of the enterprises in Hungary and Hajdú-Bihar County, the proportion of national and county-level farms was similar between those below 0% (12%) and those between 0-15% (83-84%). The most profitable category involves 26 companies nationwide, of which one farm is located in Hajdú-Bihar County. The most profitable farms in Hungary are mostly micro-enterprises, while the farms in Hajdú-Bihar County can be considered small farms. During the examined period, enterprises operating in the given county achieved one percentage point lower value on average (Table 5). The performed correlation analysis showed a weak negative, but significant ($r = -0.060$; $p = 0.080$) correlation between ROA and the total assets. This correlation shows that lower capital efficiency (lower ROA) can be achieved in parallel with the increase in farm size. In contrast, Takácsné György (2020) pointed to the opposite. In order to improve competitiveness, in addition to plant size, it is also necessary to increase capital efficiency and technological standards. No statistically significant correlation was found between ROA and sales ($r = 0.001$; $p = 0.965$).

The ROA of the examined enterprises varied in each year. While the national averages were significantly higher in 2015, the examined farms reached a nearly similar ROA value both at the county and the national level by 2019. However, this change in the ROA value may also be due to area-based payments withdrawn from farms operating on more than 1200 hectares. In addition, the amount of basic subsidies has increased at a lower rate in recent years than at the beginning of the examined period (Keszthelyi, 2017; Keszthelyi – Kis Csatári, 2018; 2019; 2020).

Figure 8. Yearly ROA values of the examined enterprises



Source: Own calculations based on EMIS data, 2020

When comparing the fixed assets ratio of the examined enterprises, the county average is similar to the national average. The distribution of farms with a 20-60% share of fixed assets is higher in Hajdú-Bihar county (83%) than at the national level (75%). In addition, the average value of assets invested at the county level is about 97 thousand EUR higher than the national average. There is a minimal difference between the national and Hajdú-Bihar county average values with regard to the proportion of fixed assets above 80%. Mostly small enterprises belong to this category. As a result, it can be concluded that the farms in Hajdú-Bihar County have similarly modern fixed assets as an average farm at the national level. There is a weak, but statistically significant ($r = 0.114$; $p = 0.001$) positive relationship between the fixed assets ratio and the total assets. As a result, the higher total assets, and the concomitant larger farm size are slightly related to fixed assets ratio, whose higher value is in connection with the use of newer and more modern technology. In contrast, no such correlation can be established between fixed assets ratio and revenue ($r = 0.026$; $p = 0.444$).

Table 6. Fixed assets ratio of enterprises in Hungary and Hajdú-Bihar County (averaged over the period between 2015-2019)

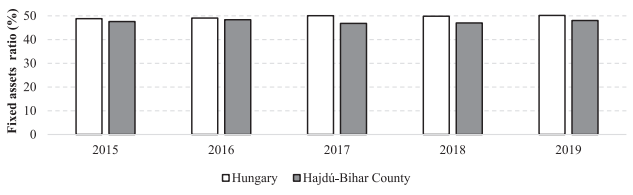
Fixed assets ratio (%)	Hungary		Hajdú-Bihar County	
	Number of enterprises	Distribution (%)	Number of enterprises	Distribution (%)
< 40	245	28.7	22	31.9
40 – 59.9	393	46.1	35	50.7
60 – 79.9	194	22.7	11	15.9
80 < =	21	2.5	1	1.4
Total	853	100.0	69	100.0
Mean (%)	49.6	-	47.6	-
Relative standard deviation (%)	30	-	31	-

Notes: Based on the methodology used, enterprises with a fixed assets ratio of less than 20% are not included in the analysis.

Source: Own calculations based on EMIS data, 2020

Taking into account the changes each year, no magnitude difference can be shown between the national and county average. For this reason, the authors maintain the above statement, i.e. the examined enterprises have similarly modern tools (Figure 9).

Figure 9. Fixed assets ratio of the examined enterprises on a yearly basis



Source: Own calculations based on EMIS data, 2020

When examining the leverage indicator, it was found that the enterprises in Hajdú-Bihar County are in a more favourable situation. While more than half of the county's enterprises have an leverage ratio of 0-20%, the national proportion of enterprises classified the same way is about 16 percentage points lower. The proportion of enterprises with the highest leverage ratio (70% <=) in Hungary is about 6%, while it is 1.5% at the county level, however, this group only involves one farm. Enterprises with the lowest leverage are mostly small at both the national and county levels. On average, the enterprises of Hajdú-Bihar County achieved a 6 percentage point lower leverage ratio during the examined period. As a result, these farms can be considered more capital-intensive. There is a weak negative relationship between the leverage ratio and the total assets ($r = -0.068$; $p = 0.047$). With the increase of farm size, businesses have increased own resources. As a result, external sources are involved to a lesser extent. Other factors more significantly influence the leverage ratio. In addition, Fenyves et al. (2020) did not find a correlation between farm size and leverage ratio for Hungarian enterprises. There is no significant correlation between the leverage ratio and sales revenue ($r = -0.032$; $p = 0.348$).

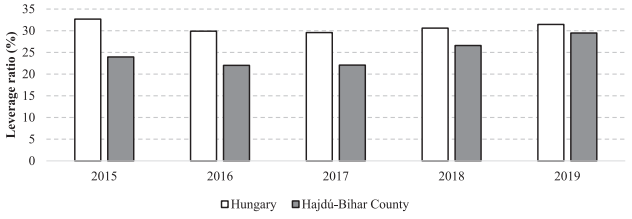
Table 7. Leverage ratio of enterprises in Hungary and Hajdú-Bihar county (averaged over the period between 2015-2019)

Leverage (%)	Hungary		Hajdú-Bihar County	
	Number of enterprises	Distribution (%)	Number of enterprises	Distribution (%)
0 - 19,9	348	40.8	39	56.5
20 – 39.9	262	30.7	22	31.9
40 – 59.9	152	17.8	5	7.2
60 – 69.9	42	4.9	2	2.9
70 < =	49	5.7	1	1.4
Total	853	100.0	69	100.0
Mean (%)	30.9	-	24.8	-
Relative standard deviation (%)	117	-	141	-

Source: Own calculations based on EMIS data, 2020

With regard to the leverage factor each year, it can be seen that the farms of Hajdú-Bihar county are in a more favourable position than the enterprises examined at the national level.

Figure 10. The leverage ratio of the examined enterprises on a yearly basis



Source: Own calculations based on EMIS data, 2020

In addition to the above methods, farms were examined at the county and national level also based on the quick liquidity ratio. In Hungary, 30% of farms reached a value below 1. In Hajdú-Bihar county, this proportion was half the national average value. The proportion of farms with a value between 1-2 was almost similar as the national and the county level. The distribution of enterprises with the most favourable liquidity (2 <=) proved to be 20 percentage points higher in Hajdú-Bihar county than the national value. When examining the relationship between the quick liquidity ratio and the total assets, no significant correlation could be observed ($r = -0.024$; $p = 0.479$). In contrast, there is a weak negative significant correlation between the quick liquidity ratio and sales revenue ($r = -0.083$; $p = 0.015$). With the increase in sales revenue, liquidity becomes more unfavourable. However, due to the weak correlation, other factors also influence liquidity (Table 8).

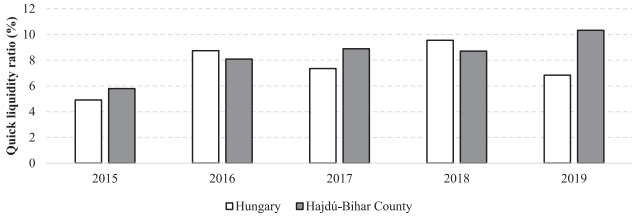
The value of the quick liquidity ratio analysed on a yearly basis varied both at the county and the national level. For farms in Hajdú-Bihar county, 2019 was the most favourable year, when they were able to reach a value 1.5 times higher than the national average. Subsidies also make a significant contribution to the favourable short-term solvency of the examined farms (Figure 11).

Table 8. Quick liquidity ratio of enterprises in Hungary and Hajdú-Bihar County (averaged over the period between 2015-2019)

Quick liquidity ratio (%)	Hungary		Hajdú-Bihar County	
	Number of enterprises	Distribution (%)	Number of enterprises	Distribution (%)
<1	255	29.9	10	14.5
1 – 1.9	187	21.9	12	17.4
2 < =	411	48.2	47	68.1
Total	853	100.0	69	100.0
Mean (%)	7.5	-	8.3	-
Relative standard deviation (%)	307	-	177	-

Source: Own calculations based on EMIS data, 2020

Figure 11. The quick liquidity ratio of the examined enterprises on a yearly basis



Source: Own calculations based on EMIS data, 2020

CONCLUSIONS

Altogether, similarly to farms examined at the national level, the enterprises of Hajdú-Bihar county produce profitably. However, it must be taken into account that the examined farms had different sizes. While enterprises in the county had a higher amount of assets during the examined period, those of the farms examined at the county level was shown to be higher in terms of sales revenue and income. Of the different profitability indicators, in the case of operating ROS, county farms achieved a higher value (by 3.6 percentage points), which can be explained by more efficient cost management. The enterprises belonging to the most profitable category are mostly considered to be small companies, similarly to the national level. Hungarian farms achieved a one percentage point lower value in terms of averaged ROA than in Hajdú-Bihar County. On county level farms with a profitability of more than 20% mainly considered to be small enterprises, while on the national level, they are micro-enterprises. When examining fixed assets ratio, it was found that county- and national-level enterprises have a similar level of technology, however, the farms of Hajdú-Bihar county can achieve 1.7 times the value of operating ROS. As a result, county-level enterprises have more efficient management and more favourable cost management. In Hajdú-Bihar county, enterprises with the lowest values can mainly be considered small businesses. Based on the values of the quick liquidity ratio, it was found that 30% of the examined farms may have short-term solvency problems on a national scale, however, this ratio is 15% in Hajdú-Bihar county. In addition, at the county level, 70% of the examined enterprises operate with excellent liquidity, while in the case of national-level enterprises, this value is almost 50%.

In addition, the relationship between each efficiency indicator and the total assets and net sales revenue was examined. Based on the obtained results, correlations were found in some cases. There was a statistically significant weak negative relationship between ROA and the total assets. Consequently, capital efficiency decreases as farm size increases. A weak positive significant correlation was shown between the fixed assets ratio and the total assets. As a result, farm size is slightly correlated with the fixed assets ratio. The higher proportion can be attributed to the use of more modern technology. There was a weak negative significant relationship between the leverage ratio and the total assets, which is due to the higher proportion of own resources available for larger farms. As a result, the proportion of external sources is typically lower. A weak negative correlation was found between the quick liquidity ratio and sales revenue. As a consequence, companies with higher farm size cannot be considered more liquid. However, due to the weak correlation between the examined variables, there are other influencing factors that require further statistical analysis.

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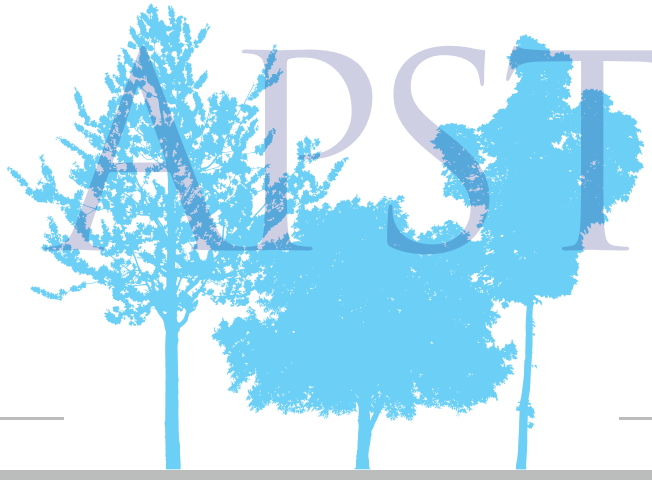

ABSTRACT

Contents

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