#7493 WILLINGNESS TO PAY FOR DRONE TECHNOLOGY IN THE APPLICATION OF PESTICIDE FOR THE CONTROL OF FALL ARMYWORM

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ABSTRACT

In Ghana, maize is one of the major staple food crops. Since 2016, it has been plagued by fall armyworm, leaving production capacity below the national average. The introduction of drone technology is to assist farmers to reduce havoc caused by fall armyworm. The majority of research done in the area of drone technology has focused on the technical and mechanical aspects. This gap gives rise to this study, as the study seeks to ascertain the willingness to pay for drone technology in the application of pesticides for fall armyworm control. The study adopted a quantitative research approach and cross-sectional survey design to ascertain the interplay of variables, using a sample of 152 maize farmers in the Northern and North East Region of Ghana. The research used a questionnaire as the data collection tool with binary logistic regression for analysis. The majority of respondents were willing to pay for drone technology but did not have the resource to purchase. Their decision was influence by their source of income, access to credit and input. The study recommends that the cost of drone technology be reduced to make it affordable for all categories of farmers.

INTRODUCTION

The government has done little in the fight against fall armyworm (FAW) since its discovery in 2017 in Ghana (Nunda, 2018). This limitation is due to the absence of empirical data to guide the government in its policy formulation for effective control of FAW. Africa was estimated to have lost 70% of its total maize, sorghum, rice and sugarcane yield in 2016 mainly due to the activities of FAW (Prasanna *et al.*, 2018). Day *et al.* (2017) estimated that the impact of FAW in Ghana was 22% of yield in Ghana, translating to millions of dollars in losses. However, the estimates were based solely on socio-economic studies that focused on the perceptions of farmers. Despite the large-scale use of drones in agriculture in other parts of the globe, literature on Africa's agricultural use of drones for pesticide application is less to be desired. In Ghana, for instance, there have been few reports of areas of drone technology application in the control of fall armyworm, therefore this research was conducted to ascertain farmers' willingness to pay for drone technology for the control of FAW.

MATERIALS AND METHODS

A cross-sectional survey design was used for the study to ascertain the status of the variables of the study and their inter-relationships. The study was conducted in the Northern Region (Tolon and Mion) and the North East (West Mamprusi) Region of Ghana. A multistage sampling technique was used to select communities in the Tolon (2) and Mion (3) district of the Northern Region and two (2) communities from West Mamprusi in the North-East Region with the assistance of Agricultural Extension Agents in charge of the districts. The first stage used the simple random sampling technique to select the three (3) districts (Tolon, Mion, and West Mamprusi) from the two Regions (Northern Region and North-East Region). Secondly, three communities from Mion, two from Tolon, and two from West Mamprusi were

purposively selected based on knowledge on FAW infestation, sex of respondents, whether the individual farmer controls FAW or not, size of farmland cultivated in the previous year. A sample size of 152 respondents (Tolon- 55, Mion- 48, and West Mamprusi- 49) out of a population of 301 (Tolon-110, Mion- 80, and West Mamprusi- 111) was used for the study. A questionnaire was used as the data collection tool. Farmers' willingness to pay for drone technology for the control of FAW was analysed using the contingent valuation method. The maximum and minimum prices that the consumer was willing to pay was also generated and analysed. The binary logistic model was used to estimate factors that influence willingness to pay for drone technology. Data collected was analysed in StataSE 13.0.

RESULTS AND DISCUSSION

Table 1 revealed the amount maize farmers were willing to pay to obtain drone services. It was revealed that maize farmers in Tolon were more willing to pay as much as GH₵ 33.00-GH₵ 43.00 per acre for drone services. It was also revealed that farmers in Tolon were willing to pay a much higher price for drone services per acre because that's what they felt they could afford. While farmers in West Mamprusi were willing to pay the minimum of GH₵ 0.00 - GH₵10.00 per acre, with Mion farmers willing to pay GH₵ 11.00 - GH₵21.00 per acre. Mion, and West Mamprusi farmers said it was due to limited resources available to them. This is supported by the Organisation for Economic Co-operation and Development (OECD) (2001) and Gerpacio et al. (2004) that technology and services are not evenly distributed across communities due to factors like income constraints and changing demand of consumers.

Table 1. Amount maize farmers are willing to pay for drone services.

Maximum Amount (Acres)	**Tolon**			**Mion**			**West Mamprusi**		
(GH₵)	**F**	**%**	**mean**	**F**	**%**	**mean**	**F**	**%**	**mean**
0.00-10.00	4	7.5	3.79	3	6.3	2.50	22	44.9	2.06
11.00-21.00	2	3.8		26	54.2		10	20.4	
22.00-32.00	17	30.9		15	31.3		10	20.4	
33.00-43.00	18	32.7		0	0.0		6	12.2	
44.00-54.00	8	15.1		4	8.3		1	2.0	
55.00-65.00	5	9.4		0	0.0		0	0.0	
Reasons									
Effectiveness	7	13.2		9	18.8		6	12.2	
Faster	4	7.5		8	16.7		12	24.5	
Safe	2	3.6		4	8.3		2	4.1	
Less Labourious	5	9.4		6	12.5		2	4.1	
Limited Resource	16	30.2		20	41.7		24	49.0	
That's what I can afford	21	39.6		1	2.1		3	6.1	

Again, from Table 2, income source was found to be statistically significant in influencing willingness to pay but the relationship was negative. This implies that as the income of farmers increases, they stand a -17.461 chance of not being willing to pay for drone service and this directionality denies the stated hypothesis. This is consistent with Alimi *et al.* (2016) who found out that income was a very vital factor that influence farmers' willingness to pay for a service. Furthermore, access to credit was positively related to willingness to pay. Showing that if farmers have access to credit, they will stand an 18.942 chance of being willing to pay for drone services. Also, the relationship between willingness to pay and access to credit were statistically significant. This agrees with Mersha (2018) that access to credit was a significant determinant of willingness to pay. Lastly, from Table 2, access to input was inversely related to willingness to pay. As farmers gain access to input, there is -3.049 chance

of them not being willing to pay for drone service, this was significant. This is consistent with Chai *et al.* (2020) that consumer willingness to pay is not influenced by access to obtain input.

Table 2. Binary logistic regression for willingness to pay for drone services.

Variables	**Coef.**	**Robust Std. Err.**	**Z**	**P>|Z|**
Gender	.308	1.635	.19	.851
Marital Status	.980	1.652	.59	.553
Access to Credit	18.942	2.099	9.03	.000***
Access to Input	-3.049	1.560	-1.95	.051*
Access to Information	.060	1.868	.03	.974
Status	.956	.813	1.18	.240
Primary Occupation	1.659	1.446	1.15	.251
Farm size	.907	1.252	.72	.469
Income source	-17.461	1.059	-16.49	.000***
Contact with Extension Agents	.540	1.594	.34	.735
Household size	1.446	1.039	1.39	.164
Landholding	-1.170	.920	-1.27	.203
Age	.220	1.240	.18	.859
Farming Experience	.021	.017	1.20	.231
Education	-.803	1.436	-.56	.576
Constant	-23.873	6.962	-3.43	.001***
Cut1	51.774	17.422		
Number of observations	150			
Wald Chi2(17)	1083.47			
Prob> Chi2	.0000			
Pseudo R2	.3295			
Log Pseudo Likelihood	-20.942			

Source: Field Data, 2019, n= 152, *** significant at 1%, ** at 5%. * at 10%.

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