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The Gender Differential Analysis: Knowledge, Attitude, Practices and Aspirations of Pesticide Use Among Cocoa Farmers in Asamankese Cocoa District, Ghana

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***Abstract*— Attempts to attain flawless agricultural production are still hampered by a range of restrictive factors including water scarcity, climate change, plant pests and diseases. Worries about the negative and unpleasant repercussions of pesticides on health are evolving in developing countries including Ghana. Cocoa farmers' knowledge awareness, attitude, practices and skills in handling pesticides and the potential hazards it poses to them are vital in preventing pesticide exposure and hazards. This study examines the knowledge, attitudes, practices and aspirations of cocoa farmers in Ghana regarding pesticide use and the potential hazards it poses to their health. The paper highlights the importance of understanding the diverse roles and perspectives of male and female farmers in agricultural production. The study uses a quantitative approach and a cross-sectional descriptive approach to analyze data from 364 cocoa farmers in the Asamankese Cocoa District. The study found that both male and female cocoa farmers have a positive attitude towards pesticide usage, and their knowledge of pesticide handling practices is adequate. The study also found that male and female farmers have different levels of knowledge, attitudes, and practices regarding pesticide use. The findings suggest that there is a need for increased awareness and education on safe pesticide handling practices to prevent pesticide exposure and its negative health effects on farmers.**

Keywords*— *diseases, gender differential, hazards, pesticides, pests

I. INTRODUCTION

Ghana's agriculture industry accounts for most of the country's economic growth and income. Agriculture accounted for more than 20% of Ghana's Gross Domestic Product in 2020 [1]. Even though cocoa contributes over 60% of the country's foreign revenue, attempts to attain flawless agricultural production are still hampered by a range of restrictive influences including climate change, plant pests and diseases [2]. The majority of cocoa farmers in Ghana find it unavoidable to cultivate and nurture cocoa without the use of pesticides. To prevent crop losses and maintain good product quality, cocoa producers use pesticides in their operations to combat diseases, pests, weeds, and other pathogens [3]. Pesticides are mostly produced compounds designed to destroy pests, such as weeds and insects. These pesticides comprise active compounds that normally kill pests, as well as inert ingredients, usually solvents, that aid in the delivery of the active ingredients to the target insect [4].

Most pesticides tend to cause harm to non-target organisms particularly if exposed to high levels or for a longer period. Pesticide residues have varied effects on people and the environment, raising worries about their negative effects on human health, aquatic life, and the spread of pest resistance [5]. Farmers are frequently poisoned and contaminated because of hazardous handling procedures. Pesticide exposure through skin, ingestion or inhalation is associated with various diseases such as cancer, bronchitis, respiratory diseases and organ ailments [6]. Eye discomfort, headaches, dizziness and skin infections have also been reported among farmers [7]. Scantiness and inadequacy of knowledge, awareness and unintended application errors such as wrong handling of pesticides can present profound life-and-death risks to cocoa farmers. Concerns have been raised about the adverse and unpleasant health effects of pesticides in developing countries, including Ghana [8]. Cocoa farmers' knowledge awareness, attitude, practices and handling of pesticides and the potential hazard they pose to them are vital in preventing pesticide exposure. Male and female farmers play diverse and varied roles in agricultural production as each often possesses a non-identical degree of knowledge, attitude, practices and aspirations about pests and diseases [9].

Even though these pesticides are noxious and endanger farmers' lives, their use among cocoa producers in Ghana is still on the rise [3]. Owing to the exorbitant bulk of pesticide use, individual vulnerability is unavoidable. These undesiring health outcomes could be linked to a lack of in-depth knowledge in relation to the perils of pesticide vulnerability and a detrimental attitude towards well-being, specifically improper use and practices of pesticide application [10]. Okonya [10] found that males frequently use chemicals in the agricultural sector without PPE, while females collect the water to be used for pesticide application and clean the clothing worn during pesticide application. However, females do not partake in the training for the proper handling of these chemicals. In light of this, women are exposed to the dire effects of pesticides because they lack in-depth knowledge about the dangerous nature of the many chemicals employed in the production of pesticides, as well as their bad health effects and contribution to environmental degradation [11].

If women had a comprehensive understanding of the dangers related to pesticide use, they could persuade their husbands to adopt safe methods. Therefore, both genders should have access to instruction on the safe use of pesticides and related agrochemicals so that they can avoid pesticide contamination and contribute to effective crop control. Wang [12] in their investigation on the gender difference in pesticide usage knowledge, hazard awareness, and practices of farmers in China, discovered that male farmers exhibited a greater desire for pesticide usage knowledge and a greater awareness of associated health risks than female farmers. The Food and Agriculture Organization (FAO) warns that failure to know the differences and inequities between men and women poses a life-or-death threat to the viability of the agricultural blooming plan [13].

According to the KAPA theory, human behaviour comprises four (4) steps which are the acquisition of knowledge, formation of attitudes or beliefs, practice and aspiration [14]. Knowledge of pesticide application is often influenced by information. Improvement of skills through frequent training is how farmers learn about pesticide practices [15]. Awareness increases with information [15] while farmers' knowledge is vital in any attempt to increase productivity [16]. Farmers' use of cutting-edge techniques reveals how attitude, which influences the behaviour and judgement of farmers, impacts knowledge [17]. Gerbi and Megerssa [18] opined that attitudes significantly impact farmers' decisions to adopt an innovation. According to Willock [19], the process of a farmer adopting an agricultural technology involves the careful appraisal and formulation of attitudes which are either acceptable or unacceptable. Practice is a thoughtful action with an emphasis on high quality. Destruction of the environment, low levels of agricultural productivity and inappropriate farm management have significantly impacted the cocoa sector [20][21]. In light of these gender differences, research and education on pest and disease control typically focus on farmers as a whole, ignoring the particular needs of females and males [11]. This absence is especially crucial given that providing conducive assistance to female and male farmers aids in initiating farmers' vulnerability to pesticides, developing environmental quality standards, and promoting acceptance of suitable crop protection technology innovation and practices [22].

While a gender perspective has taken high cognizance in the area of agricultural extension and training [15][23][24], it is frequently inadequately accepted by agronomists and crop protection experts, who mostly give attention to bio-technical solutions and attach scarce concentration on social-economic factors and power relations among farmers in the related area and off the area. Previous studies [48][49] reported that a better understanding of gender key roles, responsibilities and relationships helps in increasing yield. A study in the Gushegu district in the Northern part of Ghana by [24] reported different gender views and language use on pesticides. The finding went on to say that understanding the knowledge, views and language use of men and women regarding pesticide control is essential in addressing concerns and convenient practices associated with gender practices and knowledge. According to [25][26][27], women do not implement agreed practices and they were not able to spray their farms per the collectively agreed protocols because of a lack of funds to purchase fungicides. An essential element seen in their studies was the corresponding learning process that tries to bring lasting solutions to existing and emerging gendered socio-institutional constraints. According to [28][29], gender matters in controlling the spread of cassava pests and diseases in the South Asia mainland. Differences gender knowledge gap were recorded by [29] in their study on men and women farmers' interest in getting clean agricultural sowing material.

To highlight pesticide hazards by gender and to advocate for more gender-inclusive programmes and tactics, it is essential to ascertain gender differences in pesticide-related knowledge, attitude, behaviour and aspirations. Previous studies [30][31][32][33][34][35][36][37] have focused on general knowledge, attitudes, and practices about the application of pesticides, with little regard for gender. There is therefore little data on gender differences in cocoa farmers' pesticide application knowledge, attitudes, and practices. This study will therefore seek to evaluate the gendered knowledge, attitude, practice and aspirations of pesticide use among cocoa farmers in the Asamankese Cocoa District. The specific objectives are to determine farmers' KAPA on pesticide use and the differences in knowledge, attitude, practice and aspiration between male and female cocoa farmers on pesticide usage

II. METHODOLOGY

A. Study Area, Sample Size and Sampling Procedure

The study was carried out in West Akim Municipal. The Municipality is one of the thirty-three (33) districts in Ghana's Eastern Region. It is located in the southern portion of the Eastern Region, with Asamankese serving as the district capital. The study used a cross-sectional descriptive approach. A quantitative approach was employed in this research. The population for this research was all cocoa farmers (males and females) in the 10 different cocoa farming communities: Nyamebekyere, Nyamenti, Small London, Atta ne Atta,

Owusiw, Asuokaw, Oworakessim, Nkorkor, Odumase and Ekoso. The sample size of the study comprised 364 cocoa farmers; 182 male and 182 female cocoa farmers and was derived from the Asamankese COCOBOD district data. A multistage sampling technique was used for this study. The first stage involved the sampling of the Asamankese Cocoa District through the simple random technique. The second stage of the sampling process saw the selection of seven cocoa farming communities within the Asamankese cocoa district purposively based on the predominance of cocoa farmers in these communities. The third stage of the sampling involved the selection of cocoa farmers through a simple random sampling technique. Primary data was gathered using a self-designed structured questionnaire containing only closed-ended questions through personal interviews (face-to-face). Stata and Microsoft Excel were used to analyze the data.

B. Analytical Framework

Knowledge was assessed using twenty-one (21) questions which were coded as not aware (0) i.e., for a wrong answer and aware (1) for a correct answer. The attitudes and aspirations on pesticide application questions consisted of twenty-one (21) questions and were categorized into disagree (1), neutral (2) and agree (3). A correct aspiration attracted a mark based on the scale attached to the options [38]. The pesticide practices-related questions were twenty-one (21) and further categorized into never (1), sometimes (2) and always (3) practised. The knowledge mean score of the knowledge statements was calculated as;

$$\frac{(fna \times 1)+(fa \times 2)}{x} \quad (1)$$

Where "fna" represents the frequency of not aware, "fa" represents the frequency of aware and x represents sample respondents in this, case cocoa farmers. The knowledge index was, therefore, calculated as

$\frac{MS}{n}$, where MS = means scores for the awareness statements, N = number of mean scores.

A three-point Likert Scale was used to assess the attitude (1 = disagree, 2=neutral and 3 = agree), practice (1 = never, 2 sometimes and 3 = always) and aspirations (1 = disagree, 2=neutral and 3 = agree) of farmers towards pesticide use. The overall attitude index was calculated using the formula

$$I = \frac{(fd\ x\ 1) + (fn\ x\ 2) + (fa\ x\ 3)}{X} \quad (2)$$

For attitude, I = Index, fd, frequency of disagree, fn, frequency of neutral, fa frequency of agree and X = number of respondents. For aspirations, I = Index, fd, frequency of disagree, fn, frequency of neutral, fa frequency of agree and X = number of respondents.

$$I = \frac{(fn\ x\ 1) + fs\ x\ 2) + fa\ x\ 3)}{X} \quad (3)$$

For practices, I = Index, fn, frequency of never, fs, frequency of sometimes, fa frequency of always and X = number of respondents. The independent sample t-test was used to test the significant difference between male and female knowledge, attitude, practice and aspiration towards pesticide use.

III. RESULTS AND DISCUSSION

A. Knowledge of Male and Female Cocoa Farmers on Pesticide Usage

Findings on the knowledge of farmers on pesticide usage (Table I) showed that both male (Mean=0.99 and SD=0.07) and female (Mean=0.99 and SD=0.10) cocoa farmers are knowledgeable of the fact that pesticides reduce diseases and pest attacks. This indicates that both genders know the purpose of pesticides. It also shows that the vast majority of farmers have a good understanding of the purpose of pesticides, regardless of their gender. The findings corroborate [39] who reported pesticide application to be indispensable in crop production in developing countries as farmers attribute higher yields to its application. Farmers know that pesticides reduce the incidence as well as the dangers of disease and pest attacks. Also, with a mean of 0.69 and 0.58, for men and women respectively, both genders indicated they know how to dispose of surplus chemicals. This indicates that both groups have a good understanding of the proper methods for disposing of surplus chemicals.

Moreover, with a mean of 0.93 for both male and female farmers, both genders know creating riparian buffers protects water bodies. This indicates that, on average, farmers, irrespective of their gender, have a good understanding of the importance of creating riparian buffers to protect water bodies. Similarly, both farmers (i.e., male and female) with a mean of 0.69 indicated that they were knowledgeable on ways to dispose of pesticide containers. The statement suggests that both male and female farmers have a relatively high level of knowledge on ways to dispose of pesticide containers. This corroborates the findings of [40] who reported that farmers are aware of the extensive impact of pesticides on the environment and hence it is not surprising cocoa farmers create riparian buffers and also properly dispose of chemical residues to reduce any adverse impact on the environment. Furthermore, farmers were knowledgeable on how to store pesticides [Mean= (men=0.95); (women=0.91)] and non-use of empty pesticide containers [Mean= (men=0.98); (women=0.97)]. The findings suggest that both male and female farmers have a high level of knowledge on how to store pesticides and the non-use of empty pesticide containers. This contradicts the findings of [47] who reported that farmers lack knowledge of pesticide storage.

Both male (Mean=0.97) and female (Mean=0.96) farmers are aware of when to apply agrochemicals to control weeds and pest attacks. The finding suggests that both male and female farmers have a high level of awareness regarding the appropriate timing of applying agrochemicals to control weeds and pest attacks. Moreover, both male and female farmers are knowledgeable about the means through which pesticides enter the human body. The findings suggest that both male and female farmers have a good level of knowledge of how pesticides can enter the human body, which is an important aspect of responsible pesticide use. Understanding how pesticides enter the human body is important for farmers since

it helps them protect their health and the health of their families. Pesticides can enter the body through various pathways, including inhalation, ingestion, and skin contact. Farmers must be aware of these pathways and take appropriate measures to minimize their exposure to pesticides. The finding contradicts [36] who reported that farmers lack knowledge of the means of pesticide entry into the human body. The overall mean of 0.95 for male and 0.90 for female cocoa farmers indicates that cocoa farmers are knowledgeable about pesticide usage. The mean score suggests that the majority of farmers have a good understanding of pesticide usage. This is a positive indication, as responsible pesticide use is crucial for ensuring the health of both farmers and consumers, as well as minimizing the environmental impact of pesticide use. This agrees with [41].

TABLE I. KNOWLEDGE OF MALE AND FEMALE COCOA FARMERS ON PESTICIDE USAGE

Statements	**Male**		**Female**	
	Mean	***Std. Dev.***	***Mean***	***Std. Dev.***
I know that pesticides reduce diseases and pest attack	0.994	0.074	0.989	0.104
I know that cocoa beans absorb moisture so the right application of pesticides is necessary	0.956	0.206	0.775	0.419
I know when to apply agrochemicals to control weeds and pest attack	0.967	0.179	0.956	0.206
I know that surplus chemicals are disposed of by diluting them with water and spreading it evenly on the treated area	0.687	0.465	0.582	0.495
I know that creating a riparian buffer protects water bodies during pesticide application	0.934	0.249	0.929	0.258
I know pesticide containers are disposed of by digging the ground and burying it	0.687	0.465	0.687	0.465
I know that agrochemicals are stored in a locked storage facility	0.951	0.217	0.912	0.284
I know it is inappropriate to reuse empty pesticide containers for other purposes in the house	0.984	0.128	0.973	0.164
I know I am not supposed to mix pesticides with raw hands	0.989	0.105	0.984	0.128
I know that pesticide enters the body by inhalation	0.995	0.074	0.967	0.179
I know that pesticide enters the body through the skin	0.995	0.074	0.967	0.179
I know that pesticide enters the body through the mouth	0.989	0.105	0.978	0.147
I know the names of the pesticides I use	0.951	0.217	0.742	0.439
I know that pesticide residues stay in the air	0.984	0.128	0.945	0.229
I know that pesticide residues stay in the soil	0.962	0.193	0.852	0.356
I know that pesticide residues stay in the groundwater	0.940	0.239	0.951	0.217
I know some pesticides are banned or restricted for use	0.973	0.164	0.868	0.339
I know the reasons for banning or restricting those pesticides	0.923	0.267	0.896	0.307
I know the safety measures to take before spraying	0.989	0.105	0.973	0.164
I know the safety measures to take during spraying	0.995	0.074	0.967	0.179
I know the safety measures to take after spraying	0.995	0.074	0.967	0.179
Overall index	0.945	0.181	0.898	0.259

Source: Field Survey, 2022

From Table II, there was a 1% significant difference in the knowledge of male and female cocoa farmers, indicating that male cocoa farmers have more knowledge of pesticide use than female cocoa farmers. The results suggest that there is a significant difference in knowledge levels between male and female cocoa farmers, with male farmers being more knowledgeable than female farmers. This implies that cocoa farmers' knowledge of pesticide usage is affected by the sex of the cocoa farmer. The finding is in line with [9], who reported that male farmers know more about pesticide usage than females.

TABLE II. INDEPENDENT SAMPLE T-TEST FOR DIFFERENCES IN KNOWLEDGE OF FEMALE AND MALE COCOA FARMERS TOWARDS PESTICIDE USAGE

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean**	**Std. Err**	**95% Conf. Int.**	
									Lower	**Upper**
Knowledge	Equal variances not assumed	60.304	0.000	-4.204	362.00	0.000	-0.203	0.048	-0.298	-0.108
	Equal variances assumed			-4.204	352.852	0.000	-0.203	0.048	-0.298	-0.108

Source: Field Survey, 2022.

B. Attitudes of Male and Female Cocoa Farmers Towards Pesticides Usage

Table III shows the attitude of male and female cocoa farmers toward pesticide usage. Overall, cocoa farmers interviewed in this study had a positive attitude towards pesticide use [Mean= (men=2.96 and women=2.93)]. This could be because they believe that it helps them to produce a higher yield and protect their crops from pests and diseases. The use of pesticides may be necessary to ensure the economic viability of the farm and support the livelihoods of farmers and their families. The findings contradict [42] who reported that farmers have a negative attitude towards adherence to safety practices. The findings also show that both male (Mean=2.95) and female (Mean=2.96) farmers agree that empty pesticide

containers cannot be washed and reused to store things at home. This suggests that farmers have a good understanding of the potential risks associated with reusing pesticide containers. Empty pesticide containers may contain residue from the pesticide, which can be harmful to humans and animals if they come into contact with it. Even after washing, it may be difficult to remove all traces of the pesticide from the container, making it unsafe for storing food, water, or other household items. This is consistent with the findings of [40] who stated that the reuse of pesticide containers is not common among farmers. Also, male and female farmers with means of 2.90 and 2.95 respectively, agree that it is inappropriate to openly burn pesticide containers since it causes damage to the environment. The agreement among both male and female farmers is important because it demonstrates their understanding of the potential environmental impacts of pesticide use and the need to dispose of pesticide containers properly. This underscores the importance of education and awareness-raising initiatives that promote safe and responsible pesticide use and disposal practices. The findings corroborate the results of [40], who found the burning of pesticide containers to be uncommon among farmers.

TABLE III. ATTITUDE OF MALE AND FEMALE COCOA FARMERS ON PESTICIDE USAGE

Statements	**Male**		**Female**	
	Mean	***Std. Dev.***	***Mean***	***Std. Dev.***
Empty containers of used chemicals cannot be washed and reused to store things at home	2.951	0.302	2.962	0.231
Open burning of pesticide containers causes damage to the environment	2.903	0.422	2.951	0.217
Washing and rinsing of pesticide residues from application equipment, mixing equipment or other items used enhances the shelf life of the equipment	2.962	0.243	2.945	0.252
Changing dress and taking a shower after spraying matters	3.000	0.000	2.973	0.164
Excessive pesticide application causes harm to the environment	3.000	0.074	2.953	0.217
Agrochemicals cannot be stored together with food	3.000	0.000	2.962	0.231
Disposing of remnants of pesticides in water bodies is dangerous	3.000	0.000	2.983	0.181
Pesticides application is the best and most efficient way to pest control	2.78	0.630	2.733	0.658
The best time for spraying is during the rainy season	2.83	0.532	2.592	0.744
Wind direction must be considered during spraying pesticides	2.978	0.209	2.934	0.270
Instructions on labels must be read and understood before being used for spraying	2.940	0.300	2.907	0.360
Pesticides are indispensable for high-crop yield	2.983	0.128	2.964	0.193
Pesticide enters the body by inhalation	2.993	0.105	2.942	0.281
Pesticide enters the body through the skin	2.992	0.105	2.964	0.254
Pesticide enters the body through the mouth	2.994	0.105	2.984	0.181
Safety measures must be taken before spraying	2.995	0.074	2.967	0.208
Safety measures must be taken during spraying	2.995	0.074	2.956	0.231
Safety measures must be taken after spraying	2.995	0.074	2.962	0.220
Proper protection can enhance the safety of the worker	2.989	0.105	2.984	0.128
Proper protection can enhance work productivity	2.995	0.074	2.984	0.128
Pesticide storage in unguarded sites is dangerous	2.984	0.128	2.978	0.147
Overall Index	2.963	0.175	2.934	0.262

Both male (Mean=3.00) and female (Mean=2.95) cocoa farmers agreed that excessive pesticide application can harm the environment. The agreement among both male and female cocoa farmers that excessive pesticide use can harm the environment is an important acknowledgement of the potential negative impacts of pesticide application. This recognition is a necessary step towards promoting sustainable and responsible agricultural practices that protect the environment and promote ecosystem health. According to [40][39], farmers are aware of the effects of excessive pesticide application on the environment and their health and hence they moderately apply them. Moreover, both male (Mean=3.00) and female (Mean=2.96) farmers had a positive attitude towards pesticide storage as they agreed that pesticides cannot be stored together with food. This suggests that farmers are aware of the potential safety risks associated with improper pesticide storage, such as

contamination of food or exposure to harmful chemicals. Proper pesticide storage is an important aspect of responsible pesticide use and can help prevent accidental poisoning or harm to humans and animals. The findings contradict [43][44] who reported that farmers have a negative attitude towards pesticide storage as they store pesticides together with food. Both male (3.00) and female (2.98) farmers agreed that disposing of remnants of pesticides in water bodies is dangerous. This suggests that farmers are aware of the potential environmental impact of pesticide use and disposal, and the risks of contaminating water bodies with harmful chemicals. This finding is supported by [40] who indicated that farmers are aware of the consequences of inappropriate pesticide disposal hence a positive attitude.

TABLE IV. INDEPENDENT SAMPLE T-TEST FOR DIFFERENCES IN ATTITUDE OF FEMALE AND MALE COCOA FARMERS TOWARDS PESTICIDE USAGE

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean	Std. Err.	95% Conf. Int.	
									Lower	Upper
Attitude	Equal variances not assumed	12.526	0.00	-1.741	362	0.082	-0.038	0.022	-0.082	0.005
	Equal variances assumed			-1.741	313.169	0.083	-0.038	0.022	-0.082	0.005

Source: Field Survey, (2022).

Both male (Mean=2.78) and female (Mean=2.73) cocoa farmers agree that pesticide application is the best and most efficient way of controlling pests, moreover, they also concur that pesticides are necessary for excellent crop yield [Mean= (male=2.98 and women=2.96)]. The findings suggest that both male and female cocoa farmers believe that pesticide application is an effective way of controlling pests and that it is necessary for achieving a good crop yield. This agrees with [39] who reported that farmers are oriented that pesticides contribute significantly to crop yields. The farmers indicated that whenever they apply pesticides, they see an increase in crop yield. Male (Mean=2.83) and female (Mean=2.59) cocoa farmers agree that the best time for pesticide application is during the rainy season. This suggests that both male and female cocoa farmers agree that the rainy season is the best time for pesticide application. The rainy season is a time when pests are more active and therefore more susceptible to control measures. Cocoa farmers agree that pesticides enter the body through inhalation [Mean= (men=2.99 and women=2.94), skin [Mean= (men=2.99 and women=2.96) and mouth [Mean= (men=2.99 and women=2.98). This suggests that both male and female cocoa farmers agree that pesticides can enter the body through multiple routes, including inhalation, skin contact, and ingestion (through the mouth). This knowledge is important for farmers to protect themselves from potential pesticide exposure and related health risks. It also highlights the need for proper protective gear and safety measures when handling and applying pesticides, as well as the importance of following recommended safety protocols and regulations.

Table IV (appendix 1) shows that there is a statistically significant difference in the attitude of male and female cocoa farmers towards pesticide application. Thus, males had a more positive attitude compared to females and this was significant at 10%. This could be due to women having less access to information and training on pesticide use and safety, leading to a more negative attitude towards it. If male cocoa farmers have a more positive attitude towards pesticide use, they may be more likely to use pesticides and rely less on alternative pest management strategies. However, farmers irrespective of their sex had a positive attitude towards pesticide use. This can be construed that the difference in the attitude of cocoa farmers towards pesticide usage is affected by the gender of the cocoa farmer. This finding is in contrast to that of [42] who found farmers to have a neutral attitude towards pesticide usage.

C. PRACTICES OF MALE AND FEMALE COCOA FARMERS ON PESTICIDE USAGE

The results from Table V reveal that male cocoa farmers always wear gloves and goggles during spraying while the females wear gloves always but sometimes wear goggles. This could be due to cultural norms i.e., agriculture and farming may be considered "men's work," leading to a greater emphasis on PPE for male farmers. On the other hand, female farmers may be expected to focus more on household duties and childcare, leading to less emphasis on PPE usage for them. Again, access to PPE may also play a role. Male cocoa farmers may have greater access to PPE due to factors such as their social status or income level, while female cocoa farmers may face barriers to accessing PPE such as cost or availability. This contradicts the results of [40] who stated that wearing gloves and goggles is an uncommon practice among farmers. Additionally, it was discovered that both male and female farmers often wear PPEs such as wide-brimmed hats, eye masks, special boots, oral and nasal masks and overalls. The use of PPE by both male and female farmers is a positive step towards promoting safer working conditions and reducing the potential health risks associated with pesticide exposure. The use of PPEs by the farmers indicates that they do not only have knowledge of when to use PPEs but they are using it. This is in agreement with the findings of [42] who found farmers to be using PPEs during pesticide application but contradicts the findings of [9][45] who reported the use of PPEs during pesticide application to be lacking among farmers due to resource constraints.

Also, both male and female cocoa farmers often create riparian buffers to protect water bodies during pesticide application. The use of riparian buffers by both male and female cocoa farmers is a positive step towards promoting sustainable and environmentally friendly farming practices. By working together to protect water bodies during pesticide application, farmers can help ensure the long-term health and viability of their farms and surrounding ecosystems. The findings agree

with [39], who reported that farmers are aware of the impact of pesticide application on the environment and therefore endeavour to protect the environment during pesticide application. According to the findings, both male and female cocoa farmers always change clothes, wash their hands and shower after pesticide application. Pesticides can stick to clothing and skin, and failure to properly clean and remove pesticides can increase the risk of exposure to farmers and their families. Changing clothes after pesticide application can help prevent the spread of pesticides to other areas of the farm or home while washing hands and showering can help remove any pesticide residues on the skin and reduce the risk of accidental ingestion or inhalation. This indicates that farmers do not only adhere to safety measures during the application of pesticides but also after spraying. Both male and female farmers do not drink, eat or smoke during pesticide application. This highlights that farmers are not only aware of how pesticides can enter their bodies, but they are also taking steps to prevent pesticides from entering their bodies. Both male and female farmers need to avoid eating, drinking, or smoking during pesticide application to reduce the risk of accidental ingestion or inhalation of pesticides. Pesticides can contaminate food and water sources, and smoking can increase the risk of inhaling pesticide particles. This corroborates the findings of [46] who reported farmers do not eat, drink and smoke during pesticide application.

TABLE V. PRACTICES OF MALE AND FEMALE COCOA FARMERS ON PESTICIDE USAGE

Statements	Male		Female	
	Mean	Std. Dev.	Mean	Std. Dev.
I wear gloves for spraying	2.775	0.584	2.692	0.519
I wear goggles for spraying	2.747	0.624	2.159	0.947
I wear a wide-brimmed hat for spraying	2.797	0.564	2.841	0.506
I wear an eye mask for spraying	2.538	0.818	2.566	0.803
I wear special boots for spraying	2.632	0.691	2.533	0.777
I wear an oral nasal mask for spraying	2.846	0.456	2.819	0.520
I wear overalls for spraying	2.753	0.612	2.753	0.594
I burn waste in an incinerator	2.418	0.848	2.538	0.777
I create riparian buffers to protect water bodies during pesticide application	2.780	0.489	2.692	0.598
I change clothes after spraying pesticides	2.923	0.356	2.929	0.279
I do not use leftover pesticide solution	2.412	0.751	2.165	0.901
I read and follow the product label	2.863	0.418	2.599	0.565
I do not store leftover pesticides in drinking containers	2.055	0.979	1.775	0.951
I wash my hands after application	2.934	0.326	2.945	0.252
I shower after spraying pesticides	2.956	0.254	2.940	0.261
I separate clothes when washing	2.962	0.220	2.945	0.252
I do not drink during the application	2.038	0.971	1.846	0.968
I do not eat during the application	1.995	0.989	1.852	0.961
I do not smoke during the application	1.967	0.997	1.791	0.946
I spray in the wind direction	2.890	0.392	2.874	0.421
I keep clothing facilities on the work site	2.236	0.943	2.330	0.842
Overall index	2.596	0.632	2.504	0.650

Source: Field Survey, 2022

From Table VI (appendix 1), both male and female cocoa farmers often adhere to safe pesticide practices to reduce the risk of polluting the environment during pesticide application as well as the health risks associated with the application of pesticides. However, a 1% significant difference in the practice was observed and this indicates that male cocoa farmers adhere to these practices more often than their female counterparts. Thus, how cocoa farmers use pesticides is affected by gender. Male cocoa farmers are more likely to apply pesticides themselves and therefore may strive to adhere to safety practices. Conversely, female cocoa farmers tend to hire labourers for spraying activities. Male farmers who apply pesticides themselves may have more direct control over the safety practices used during pesticide application, as they are directly involved in the process. They may also have a stronger personal incentive to protect themselves, as they are more directly exposed to the potential risks of pesticide exposure. This agrees with the findings of [9], who found male farmers to be more knowledgeable about safety practices during pesticide application and subsequently frequent adherence to these practices than females.

TABLE VI. INDEPENDENT SAMPLE T-TEST FOR DIFFERENCES IN PRACTICE OF FEMALE AND MALE COCOA FARMERS TOWARDS PESTICIDE USAGE

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean	Std. Err.	95% Conf. Int.	
									Lower	Upper
Practice	Equal variances not assumed	6.538	0.011	-2.722	362	0.007	-0.143	0.052	-0.246	-0.04
	Equal variances assumed			-2.722	361.395	0.007	-0.143	0.052	-0.246	-0.04

Source: Field Survey, 2022

D. Aspirations of Male and Female Cocoa Farmers on Pesticide Usage and Application

The outcome of Table VII indicates that male and female cocoa farmers agree to have a higher aspiration to access extension services. This implies that both male and female

cocoa farmers have similar levels of aspiration to access extension services because they face similar challenges and opportunities in their agricultural work. This suggests that they recognize the importance of extension services in improving their agricultural practices and increasing their yields. Extension services can provide farmers with information on new technologies, best practices, and market opportunities, as well as training on specific skills and techniques. Furthermore, farmers concur that they desire constant access to spraying equipment, a storage facility for their agrochemicals, and a proficient spraying team. The desire of farmers for constant access to spraying equipment, a storage facility for agrochemicals, and a proficient spraying team indicates their recognition of the importance of these resources and their role in ensuring the safety and effectiveness of pesticide application. Having access to spraying equipment and agrochemical storage facilities is crucial for farmers to apply pesticides safely and efficiently. Properly maintained and calibrated spraying equipment can help ensure that pesticides are applied accurately and uniformly, reducing the risk of under or over-application. A storage facility for agrochemicals can also help prevent contamination of the environment and human exposure to pesticides. In addition, having a proficient spraying team can help ensure that pesticides are applied correctly and safely. A well-trained team can help farmers avoid common mistakes that can result in pesticide drift, exposure to pesticides, or harm to the environment. Although farmers indicated they have the right attitude and good practices in the storage of agrochemicals they wish to have a facility where they can store their agrochemicals separately.

According to the study, farmers desire access to incinerators to dispose of waste, indicating their preference for environmentally friendly waste management practices. This suggests that farmers would value the opportunity to dispose of waste in a way that does not harm the environment. This implies that farmers recognize the significance of their activities on the environment and if given the opportunity, they would want to reduce this through appropriate practice [40]. Furthermore, while females had a neutral stance towards wearing goggles during spraying, both male and female farmers expressed a desire to always wear other personal protective equipment (PPE) such as gloves, wide-brimmed hats, masks, special boots, oral and nasal masks, and overalls during pesticide application. Indicating that as farmers are conscious of the health risks associated with pesticide application, they wish to always wear PPEs to reduce the incidence of being affected by the associated risk [46]. Overall, cocoa farmers were neutral in their aspirations towards pesticide usage. This indicates that farmers recognize the benefits of pesticide use, such as increased crop yields and protection against pests and diseases, and are willing to use them responsibly. Additionally, farmers may view pesticides as a necessary input for successful cocoa production and thus prioritize their use.

TABLE VII. ASPIRATIONS OF MALE AND FEMALE COCOA FARMERS ON PESTICIDE USAGE

Variable	**Male**		**Female**	
	Mean	***Std. Dev.***	***Mean***	***Std. Dev.***
I wish to always have access to extension services	2.978	0.181	2.967	0.179
I wish to always have access to an agrochemical storage facility	2.984	0.128	2.978	0.147
I wish to always have access to spraying equipment	2.989	0.105	2.984	0.128
I wish to always have access to trained spraying teams	2.951	0.263	2.973	0.195
I wish to always have access to an incinerator	2.885	0.320	2.951	0.217
I wish to always wear gloves for spraying	2.995	0.074	2.692	0.519
I wish to always wear goggles for spraying	2.978	0.181	2.159	0.947
I wish to always wear a wide-brimmed hat for spraying	2.995	0.074	2.989	0.105
I wish to always wear an eye mask for spraying	2.995	0.074	2.566	0.803
I wish to always wear special boots for spraying	2.995	0.074	2.533	0.777
I wish to always wear an oral nasal mask for spraying	2.995	0.074	2.819	0.520
I wish to always wear overalls for spraying	2.995	0.074	2.753	0.594
I wish to always change clothes after spraying pesticides	2.995	0.074	2.984	0.128
I wish to always read and follow the product label	2.995	0.074	2.978	0.147
I wish to always wash my hands and shower after spraying pesticides	2.984	0.128	2.978	0.147
I wish to always separate clothes when washing	2.989	0.105	2.967	0.179
I wish not to drink during the application	2.989	0.105	2.984	0.128
I wish not to eat during the application	2.995	0.074	2.967	0.179
I wish not to smoke during the application	2.978	0.181	2.973	0.195

I wish to always spray in the wind direction	2.995	0.074	2.962	0.220
I wish to always keep clothing facilities on the work site	2.615	0.740	2.687	0.678
Overall index	2.965	0.151	2.850	0.340

Source: Field Survey, (2022).

From Table VIII (appendix 1), there was a statistically significant difference of 1% in the aspirations of male and female cocoa farmers towards pesticide usage, with males exhibiting a greater agreement towards adhering to appropriate practices in pesticide application than females. It suggests that gender can play a role in shaping a cocoa farmer's aspiration towards pesticide application. One possible explanation for the gender-based difference in aspirations towards pesticide usage could be related to differences in exposure to information and education about safe and sustainable farming practices. Male farmers may have greater access to extension services or other sources of information about safe pesticide use, while female farmers may be more limited in their access to such resources.

TABLE VIII. INDEPENDENT SAMPLE T-TEST FOR DIFFERENCES IN ASPIRATION OF FEMALE AND MALE COCOA FARMERS TOWARDS PESTICIDE USAGE

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean	Std. Err.	95% Conf. Int.	
									Lower	Upper
Aspiration	Equal variances not assumed	88.192	0.000	-10.968	362	0.000	-0.489	0.045	-0.577	-0.401
	Equal variances assumed			-10.968	336.32	0.000	-0.489	0.045	-0.577	-0.401

Source: Field Survey, (2022).

IV. CONCLUSION

In conclusion, this study sheds light on the knowledge, attitudes, practices, and aspirations of cocoa farmers in the Asamankese Cocoa District of Ghana regarding pesticide use and the potential hazards it poses to their health. The study found that both male and female cocoa farmers have a positive attitude towards pesticide usage, and their knowledge of pesticide handling practices is adequate. However, the study also found that male and female farmers have different levels of knowledge, attitudes, practices aspirations regarding pesticide use. Therefore, there is a need for increased awareness and education on safe pesticide handling practices to prevent pesticide exposure and its negative health effects on farmers. The findings of this study emphasize the importance of considering gender differences in research and education on pest and disease control to provide suitable assistance to female and male farmers and promote acceptance of suitable crop protection technology innovation and practices.

REFERENCES

[1] O'Neill, A. (2022). Ghana: Share of economic sectors in the gross domestic product (GDP) from 2010 to 2020. https://www.statista.com/statistics/447524/share-of-economic-sectors-in-the-gdp-in-ghana/

[2] Rozaki, Z. (2020). COVID-19, Agriculture, and Food Security in Indonesia. In Reviews in Agricultural Science (Vol. 8).

[3] Denkyirah, E. K., Okoffo, E. D., Adu, D. T., Aziz, A. A., Ofori, A., & Denkyirah, E. K. (2016). Modelling Ghanaian cocoa farmers' decision to use pesticide and frequency of application: the case of Brong Ahafo Region. SpringerPlus, 5(1). https://doi.org/10.1186/s40064-016-2779-z

[4] Fishel, F. (2019). Pesticide Formulations. Journal of Environmental Quality, 3(1), 94–95. https://doi.org/10.2134/jeq1974.00472425000300010025x

[5] Damalas, C. A., & Eleftherohorinos, I. G. (2011). Pesticide exposure, safety issues, and risk assessment indicators. International Journal of Environmental Research and Public Health, 8(5), 1402–1419. https://doi.org/10.3390/ijerph8051402

[6] Shah, R. (2020). Pesticides and Human Health. In Emerging Contaminants. Intech Open.

[7] Sapbamrer, R., & Nata, S. (2014). Health symptoms related to pesticide exposure and agricultural tasks among rice farmers from northern Thailand. Environmental Health and Preventive Medicine, 19(1), 12–20. https://doi.org/10.1007/s12199-013-0349-3

[8] Akomea-Frempong, S., Ofosu, I. W., Owusu-Ansah, E. D. G. J., & Darko, G. (2017). Health risks due to consumption of pesticides in ready-to-eat vegetables (Salads) in Kumasi, Ghana. International Journal of Food Contamination, 4(1). https://doi.org/10.1186/s40550-017-0058-6

[9] Atreya, K. (2007). Pesticide use knowledge and practices: A gender differences in Nepal. Environmental Research, 104(2), 305–311,

[10] Okonya, J. S., Mudege, N. N., Rietveld, A. M., Nduwayezu, A., Kantungeko, D., Hakizimana, B. M., Nyaga, J. N., Blomme, G., Legg, J. P., & Kroschel, J. (2019). The role of women in the production and management of RTB crops in Rwanda and Burundi: Do men decide, and women work? Sustainability (Switzerland), 11(16), 1–15. https://doi.org/10.3390/su11164304

[11] Kawarazuka, N., Damtew, E., Mayanja, S., Okonya, J. S., Rietveld, A., Slavchevska, V., & Teeken, B. (2020). A Gender Perspective on Pest and Disease Management From the Cases of Roots, Tubers and Bananas in Asia and Sub-Saharan Africa. Frontiers in Agronomy, 2(July), 1–5. https://doi.org/10.3389/fagro.2020.00007

[12] Wang, W., Jin, J., He, R., & Gong, H. (2017). Gender differences in pesticide use knowledge, risk awareness and practices in Chinese farmers. Science of the Total Environment, 590–591, 22–28. https://doi.org/10.1016/j.scitotenv.2017.03.053

[13] Farhall, K., & Rickards, L. (2021). The "Gender Agenda" in Agriculture for Development and Its (Lack of) Alignment With Feminist Scholarship. Frontiers in Sustainable Food Systems, 5(February). https://doi.org/10.3389/fsufs.2021.573424

[14] Xie, Z. F., Wei, F., Q. F., & Zheng, X. L. (2017). Development of health education evaluation system for patients with colostomy based on KAP model, Chinese Journal of Health Education, 33, 544-7.

[15] Lambrecht, I., Vanlauwe, B., & Maertens, M. (2016). Integrated soil fertility management: from concept to practice in Eastern DR Congo. International Journal of Agricultural Sustainability, 14(1), 100-118.

[16] Prokopy, L. S., Floress, K., Klotthor-Weinkauf, D., & Baumgart-Getz, A. (2008). Determinants of agricultural best management practice adoption: Evidence from the literature. Journal of soil and water conservation, 63(5), 300-311.

[17] Kimmel, K. C. (2012). Shifting gears: Guiding your facility to knowledge-driven nursing. Nursing Management, 43(5), 21-23.

[18] Gerbi, S. & Megerssa, B. (2020). Effects of Farmers' Knowledge, Attitude, Skills on Highland Maize Adoption in Western Ethiopia. Agricultural Socio-Economics Journal, 20(4), pp. 265-276.
[19] Willock, J., Deary, I.J., Edwards‐Jones, G., Gibson, G.J., McGregor, M.J., Sutherland, A., Dent, J.B., Morgan, O., & Grieve, R. (1999). The role of attitudes and objectives in farmer.
[20] Uribe-Leitz, E., & Ruf, F. (2019). Cocoa certification in West Africa: The need for change. In Sustainable Global Value Chains (pp. 435-461). Springer, Cham.
[21] Vanlauwe, B., AbdelGadir, A.H., Adewopo, J., Adjei-Nsiah, S., Ampadu-Boakye, T., Asare, R., Baijukya, F., Baars, E., Bekunda, M., Coyne, D., & Dianda, M. (2017). Looking back and moving forward: 50 years of soil and soil fertility management research in sub-Saharan Africa. International Journal of Agricultural Sustainability, 15(6), 613-631.
[22] Christie, M. E., Van Houweling, E., & Zseleczky, L. (2015). Mapping gendered pest management knowledge, practices, and pesticide exposure pathways in Ghana and Mali. Agriculture and Human Values, 32, 761-775.
[23] Mudege, N. N., Chevo, T., Nyekanyeka, T., Kapalasa, E., & Demo, P. (2016). Gender norms and access to extension services and training among potato farmers in Dedza and Ntcheu in Malawi. The Journal of Agricultural Education and Extension, 22(3), 291-305.
[24] Lamontagne-Godwin, J., Williams, F., Bandara, W. M. P. T., & Appiah-Kubi, Z. (2017). Quality of extension advice: A gendered case study from Ghana and Sri Lanka. The Journal of Agricultural Education and Extension, 23(1), 7-22.
[25] Woldegiorgis, G., Gebre, E., & Lemaga, B. (2008). Potato variety development. Root and Tuber Crops, 2, 15.
[26] Tsedaley, B. (2014). Late blight of potato (Phytophthora infestans) biology, economic importance and its management approaches. Journal of Biology, Agriculture and Healthcare, 4(25), 215-225.
[27] Damtew, E., van Mierlo, B., Lie, R., Struik, P., Leeuwis, C., Lemaga, B., & Smart, C. (2020). Governing a collective bad: social learning in the management of crop diseases. Systemic Practice and Action Research, 33, 111-134.
[28] Graziosi, I., Minato, N., Alvarez, E., Ngo, D. T., Hoat, T. X., Aye, T. M., ... & Wyckhuys, K. A. (2016). Emerging pests and diseases of South‐east Asian cassava: a comprehensive evaluation of geographic priorities, management options and research needs. Pest Management Science, 72(6), 1071-1089.
[29] Minato, N., Sok, S., Chen, S., Delaquis, E., Phirun, I., Le, V. X., ... & de Haan, S. (2019). Surveillance for Sri Lankan cassava mosaic virus (SLCMV) in Cambodia and Vietnam one year after its initial detection in a single plantation in 2015. PLoS One, 14(2), e0212780.
[30] Idowu, A. A., Sowe, A., Bah, A. K., Kuyateh, M., Anthony, A., & Oyelakin, O. (2017). Knowledge, attitudes and practices associated with pesticide use among horticultural farmers of Banjulinding and Lamin of the Gambia. African Journal of Chemical Education, 7(2), 2-17.
[31] Mergia, M., Weldemariam, E. D., Eklo, O. M., & Yimer, G. T. (2021). Knowledge, attitude, and practice of farmers on pesticide use and their impacts on the environment and human health from small-scale vegetable farming along the littoral of Lake Ziway, Ethiopia.
[32] Sharafi, K., Pirsaheb, M., Maleki, S., Arfaeinia, H., Karimyan, K., Moradi, M., & Safari, Y. (2018). Knowledge, attitude and practices of farmers about pesticide use, risks, and wastes; a cross-sectional study (Kermanshah, Iran). Science of the total environment, 645, 509-517.
[33] Agmas, B., & Adugna, M. (2020). Attitudes and practices of farmers with regard to pesticide use in NorthWest Ethiopia. Cogent Environmental Science, 6(1), 1791462.
[34] Mohammed, M., EL-Din, S. A. B., Sadek, R., & Mohammed, A. (2018). Knowledge, attitude and practice about the safe use of pesticides among farmers at a village in Minia City, Egypt. J Nurs Health Sci, 7(3), 68-78.
[35] Rostami, F., Afshari, M., Rostami-Moez, M., Assari, M. J., & Soltanian, A. R. (2019). Knowledge, attitude, and practice of pesticide use among agricultural workers. Indian journal of occupational and environmental medicine, 23(1), 42.
[36] Gesesew, H. A., Woldemichael, K., Massa, D., & Mwanri, L. (2016). Farmers knowledge, attitudes, practices and health problems associated with pesticide use in rural irrigation villages, Southwest Ethiopia. PloS one, 11(9), e0162527.
[37] Khuhro, S. N., Junejo, I. A., Hullio, M. H., Hassan, M. F., Maitlo, S. A., & Shaikh, M. A. (2020). Knowledge Attitude Practice Regarding Pesticide Application among Vegetable Growers of Dadu Canal Irrigated Areas of Northern Sindh Pakistan. Pakistan Journal of Agricultural Research, 33(2).
[38] Pimentel, J. L. (2019). Some biases in Likert scaling usage and its correction. International Journal of Science: Basic and Applied Research (IJSBAR), 45(1), 183-191.
[39] Thapa, A., Tamrakar, A. S., & Subedi, I. P. (2015). Pesticide Use Practices Among Tomato Growers in Kavre District, Nepal. Nepalese Journal of Zoology, 3(1), 17–23, https://doi.org/10.3126/njz.v3i1.30861
[40] Atreya, K.; Johnse, F.H.; Sitaula, B.K. Health and environmental costs of pesticide use in vegetable farming in Nepal. Environ. Dev. Sustain. 2012, 14, 477–493.
[41] Tritipsombut, J., Gabklang, P., Boonkerd, S., & Oapsuwan, A. (2014). The study of knowledge, attitudes and pesticide usage behaviours among the agricultural workers at Huay Sam Kha village, Tub Ruang sub-district, Phra Thong Kum district, Nakhon Ratchasima province. Srinagarind Medical Journal, 29(5), 429-434.
[42] Santaweesuk, S., Boonyakawee, P., & Siriwong, W. (2020). Knowledge, attitude and practice of pesticide use and serum cholinesterase levels among rice farmers in Nakhon Nayok Province, Thailand. Journal of Health Research, 34(5), 379-387.
[43] Neupane, R. R. K., Wantamutte, A. S., Banjade, B., Kushwaha, N., & Neupane, R. (2014). Practice of Pesticides Use Among The Farmers of Kangrali Village In Belgaum-A Cross-sectional Study.
[44] Koju, P., Shakya, P. R., Shrestha, A., Karmacharya, B. M., Shrestha, S., & Jaacks, L. M. (2020). Pilot educational intervention to promote safe pesticide use practices among farmworkers in Nepal. Annals of work exposures and health, 64(8), 866-875.
[45] Khanal, G., Singh, A., & Dhungana, G. (2016). Pesticide Poisoning Among Commercial Vegetable Farmers of Chitwan, Nepal. Primary Prevention Insights, 6, 19–25, https://doi.org/10.4137/ppri.s40531
[46] Endalew, M., Gebrehiwot, M., & Dessie, A. (2022). Pesticide use knowledge, attitude, practices and practices associated factors among floriculture workers in Bahirdar city, North West, Ethiopia, 2020. Environmental Health Insights, 16, 11786302221076250
[47] Bhandari, G. (2021). Pesticide use in Nepal: The assessment of residues and risks [Wageningen University, Wageningen, the Netherlands]. https://doi.org/10.18174/536691
[48] McCampbell, M., Schut, M., Van den Bergh, I., van Schagen, B., Vanlauwe, B., Blomme, G., ... & Leeuwis, C. (2018). Xanthomonas Wilt of Banana (BXW) in Central Africa: Opportunities, challenges, and pathways for citizen science and ICT-based control and prevention strategies. NJAS-Wageningen Journal of Life Sciences, 86, 89-100.
[49] Iradukunda, F., Bullock, R., Rietveld, A., & van Schagen, B. (2019). Understanding gender roles and practices in the household and on the farm: Implications for banana disease management innovation processes in Burundi. Outlook on Agriculture, 48(1), 37-47.