

Full Length Research Paper

Analysis of agricultural extension experts' competencies on pineapple production in Central Ghana

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This study assessed the competencies of Agricultural Extension professionals on commercial pineapple production in Central Ghana. A census technique was used to collect data from 86 extension professionals from eight selected districts within the central region of Ghana using a survey approach. Data was analysed using frequency, mean, percentage, standard deviation, correlation analysis, and Multivariate Analysis of Variance (MANOVA). Extension professionals possess moderate knowledge ($M = 3.0 \pm 0.8$), with high perception and attitude towards commercial pineapple production ($M = 4.1 \pm 0.7$) and demonstrated moderate skills ($M = 3.0 \pm 0.6$) in commercial pineapple production. The competency assessment results revealed that extension professionals collectively demonstrated a moderate level of competency (Mean = 3.2 ± 0.8) in commercial pineapple production. The study recommends that the Ministry of Food and Agriculture, alongside other pivotal stakeholders within the horticultural sub-sector should institute robust in-service training initiatives tailored specifically to enhance extension agents' competencies in the domain of pineapple production. Such programs are envisioned to fortify their competencies in pineapple production, thereby enabling them to better assist farmers in the region in realizing their commercialization aspirations and meeting the increasing demand for fresh pineapple.

Key words: Skill competency, agricultural extension, pineapple production.

INTRODUCTION

Pineapple (*Ananas comosus*) is one of the most important and economically beneficial tropical fruits with enormous significant nutritional as well as commercial and industrial potential (Ali et al., 2020). Bonna and Akter (2023) highlighted its considerable economic impact in tropical regions and globally. Since the early 2000s,

pineapple has been the leading horticultural product in Ghana, contributing 36 to 38% of horticultural output and a significant proportion of export earnings (Asamoah et al., 2023). Osei and Aluah (2021) remarked that Ghana's pineapple industry is one of the most developed in its agricultural sector.

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Pineapple production holds significant promise and economic potential for income generation and poverty alleviation (Gbedemah et al., 2021). However, the horticultural sector is dominated by smallholder farmers, particularly in Ghana, making their production efforts inadequate. Consequently, past policymakers and the Government of Ghana (GoG), often in collaboration with foreign donors, have introduced innovative programs and policies to drive the development of this industry (Asamoah et al., 2023). These efforts were to scale up pineapple production among smallholder farmers and to increase the overall gain farmers derive from its production through commercialisation. It is worth noting that, to scale up the production of pineapple, the role of agricultural extension cannot be over-emphasised as it is key in supporting farmers in adjusting to new trends and technologies.

Equipping smallholder farmers with the necessary skills to commercialise pineapple production will be a great way to provide farmers the opportunity to expand their production capacity which will lead to increased income. Commercialization of agriculture is a deliberate strategy employed by producers to optimize profit from crop production for income generation (Kirimi et al., 2022). This entails carefully using land, labour, tools, modern technology, and inputs. Agricultural commercialisation is a farming system where households shift from a subsistence production model to a market-oriented one, driven by consumer tastes and preferences (Cazzuffi et al., 2020). Therefore, to commercialise pineapple production effectively, it is essential to employ innovative technologies that can boost yield and output, and reduce production costs, while addressing consumer preferences.

Extension experts working with farmers require the necessary skills and knowledge to effectively convey pineapple production technologies to enable farmers to commercialise their production activities. The change in production goals from subsistence production to commercial production depends on the skills and abilities of both extension agents and smallholder farmers which translate into the farming efforts (Getahun, 2020). Kamanda et al. (2022) highlighted the crucial role of farmers in adopting appropriate technologies and obtaining new scientific advisory services to enhance agricultural productivity and yield. Extension agents are essential in facilitating the dissemination of technology and information (Omoregbee et al., 2019).

Theoretical framework/review

The competency theory proposed by Durand (1988) served as the theoretical framework for the study. The theory elucidates the development of competencies at both the organizational and individual levels (Durand, 1988). The theory suggests that an individual's

knowledge, attitude, and skills are interdependent and reinforce each other during the learning process (Durand, 1988). The relationship between knowledge, attitude, and skills is defined as competency. Each dimension is developed through a series of distinct learning activities referred to as competency-building activities. Durand (1988) elaborated on the concept of knowledge dimensions as a progression of information that individuals assimilate and organize to comprehend the "world," which is accumulated throughout a lifetime. Knowledge is acquired through participation in learning activities, including formal training, application of existing knowledge, and experiential learning (Durand, 1988). Durand emphasized that skills are acquired through components such as instructional support, application of existing abilities, and experiential learning. The skill dimension depends on the ability to apply and utilize acquired knowledge in actions aimed at achieving specific objectives. Skill involves the identification of suitable techniques and information derived from facts before experiential learning to address a problem (Durand, 1988). It may be characterized as either intellectual or manipulative. The third dimension is derived from factors including social companionship, self-identity, and collaborative learning (Suvedi and Ghimire, 2015). Attitude is linked to social and emotional dimensions that pertain to an individual's responsibilities. Durand defines attitude as the extent to which an individual accepts or rejects a person, object, event, or concept. The competency theory posits that the three dimensions are interconnected, indicating that the absence of knowledge precludes substantiality. The research employed Durand (1988) competency theory as a framework to evaluate and record the skills and abilities of agricultural extension agents in commercial pineapple production. Consequently, the theory was deemed appropriate for the study, as it allows the researcher to collect data from the three dimensions outlined by the theory.

Numerous studies in developing countries have applied competency theory to evaluate the competencies of agricultural extension agents (Wasihun et al., 2013; Issahaku, 2014; Bahua, 2018; Suvedi and Ghimire, 2015). Despite the significance of smallholder farmers in Ghana's pineapple sector, there is limited understanding of the competencies that agricultural extension agents possess to facilitate the adoption of commercialized production practices. Understanding the competencies of extension agents is essential for assessing the strengths and weaknesses of the department. Suvedi and Ghimire (2015) highlighted that the expertise of agricultural extension agents represents a significant benefit for agricultural extension organizations. Agricultural extension professionals must have a thorough understanding of the technical aspects of their specialized fields, as well as the procedures and methods necessary for effective service delivery. Factors influencing the necessity for

commercialization in agriculture encompass rising demand, the requirement for diverse and adaptable agricultural systems, advancements in science and technology, globalization trends, and heightened competition for resources.

This study analysed the competencies of agricultural extension professionals in commercialising pineapple production in Ghana's Central Region. The capability and competencies of agricultural extension professionals in Ghana's Central region in disseminating necessary improved technology and information for commercializing pineapple production are not well documented in this specific field. Considering the increasing significance of pineapple in the region and the possible socio-monetary benefits pineapple offers, it is essential to evaluate the capabilities of extension agents. The results will establish a scientific foundation for creating specialized in-service training programs aimed at improving their proficiency in pineapple cultivation.

Objectives

To achieve this goal of the study, these specific objectives were addressed:

1. To assess the personal characteristics of agricultural extension professionals involved in pineapple information dissemination; and
2. To determine the competencies of agricultural extension professionals involved in disseminating commercial pineapple production information.

Hypothesis of the study

The hypothesis determined whether there is a significant relationship between selected personal characteristics (age and sex) and agricultural extension experts' competence measured based on knowledge, attitude, and skills in pineapple production.

MATERIALS AND METHODS

Study area

The research was carried out in the Central Region of Ghana, encompassing 21 administrative districts. The region is located in the southwestern part of the country, bordered by the Ashanti Region to the north, the Eastern Region to the northeast, the Greater Accra Region to the southeast, the Western Region to the west, and the Gulf of Guinea to the south, featuring a coastline of approximately 150 km. The region exhibits a bi-modal rainfall pattern, characterized by primary agricultural seasons in May-June and secondary seasons in September-October. Annual rainfall varies from 750 to 1,000 mm along the coast and from 1,200 to 1,500 mm in the hinterlands, while relative humidity fluctuates between 50% and 85%. The climatic conditions favor pineapple cultivation. The 2010 Population and Housing Census indicate that the Central Region has a population of 2,201,863, accounting for 8.9% of Ghana's total population (GSS, 2012). Agriculture engages

more than 50% of the working-age population. In the region's total land area of 9,830 km², 7,864 km² is deemed suitable for agriculture; however, only 50% of this area is currently cultivated. Most farmers are smallholders, cultivating an average of 0.5 ha, while some larger farms function under out-grower schemes. Land ownership is predominantly indigenous, with inheritance and familial distribution serving as the principal methods of transfer. Agricultural input supplies are available, and pineapple farmers typically possess adequate market and road access (Badu-Gyan, 2015).

The primary districts for pineapple cultivation in the region are Awutu Senya East, Gomoa East, Gomoa West, Ajumako Enyan Essiam, Ekumfi, Nfantsiman Municipality, Komenda Edina Eguafu Abrem, and Abura Asebu Kwamankese. Thus, these districts were selected for this study. These districts were selected because they were mainly dominated by smallholder pineapple farmers in the region (Badu-Gyan et al., 2019) (Figure 1).

Design, population, and sampling technique

The study employed a cross-sectional survey to examine the competence of extension professionals in facilitating the commercialization of pineapple production for smallholder farmers. The study targeted extension experts who are employed by the Department of Agriculture in eight selected districts within the Central Region of Ghana (Badu-Gyan, et al., 2019). A census technique was used to survey all 97 extension professionals in eight selected districts in the study area using a questionnaire.

Instruments, pre-testing, and data collection

This quantitative survey utilized a questionnaire as the instrument for data collection. The questionnaire was divided into two parts. The first part obtained data on personal characteristics while the second part covered areas of competencies in pineapple production consisting of 18 items on knowledge, attitude, and skill adapted and modified from Akpotosu (2015). Extension experts' level of knowledge measured based on having information about the existence of commercial pineapple production items was scaled on a five-point Likert-type scale of very high (5 points), high (4 points), moderate (3 points), low (2 points) and very low (1 point). Attitude was assessed based on how extension experts perceived the commercial pineapple activities being measured to be important on a five-point scale ranging from very highly important (5 points), highly important (4 points), moderately important (points 3), not important (points 2), and not very important (1 point). Skills refer to the ability to which extension professionals can express the identified pineapple production activities related to pineapple production with very high (5), high skill (4), moderate skill (3), low skill (2), and very low skill (1). Reliability of the instrument was conducted using Cronbach's alpha coefficients. The Cronbach's alpha coefficients of 0.70 to 0.98 were recorded for the three competency subscales on the instrument after the instrument was pre-tested on ten agricultural extension professionals in the Western Region of Ghana. An alpha coefficient of 0.70 is deemed reliable for social research. The instrument was considered reliable and hence used for the main study. The scale for measuring competency was adapted from Akpotosu (2015) and modified. The instruments were then administered to all extension agents. To increase the overall response rate of the study, some extension agents who were not present in person were contacted through mobile phone and the instrument was delivered to them. These efforts have increased the total number of participants involved in the study. At the end of the one-month data collection period, a total of 86 extension agents responded to the instrument representing an 89% response rate.

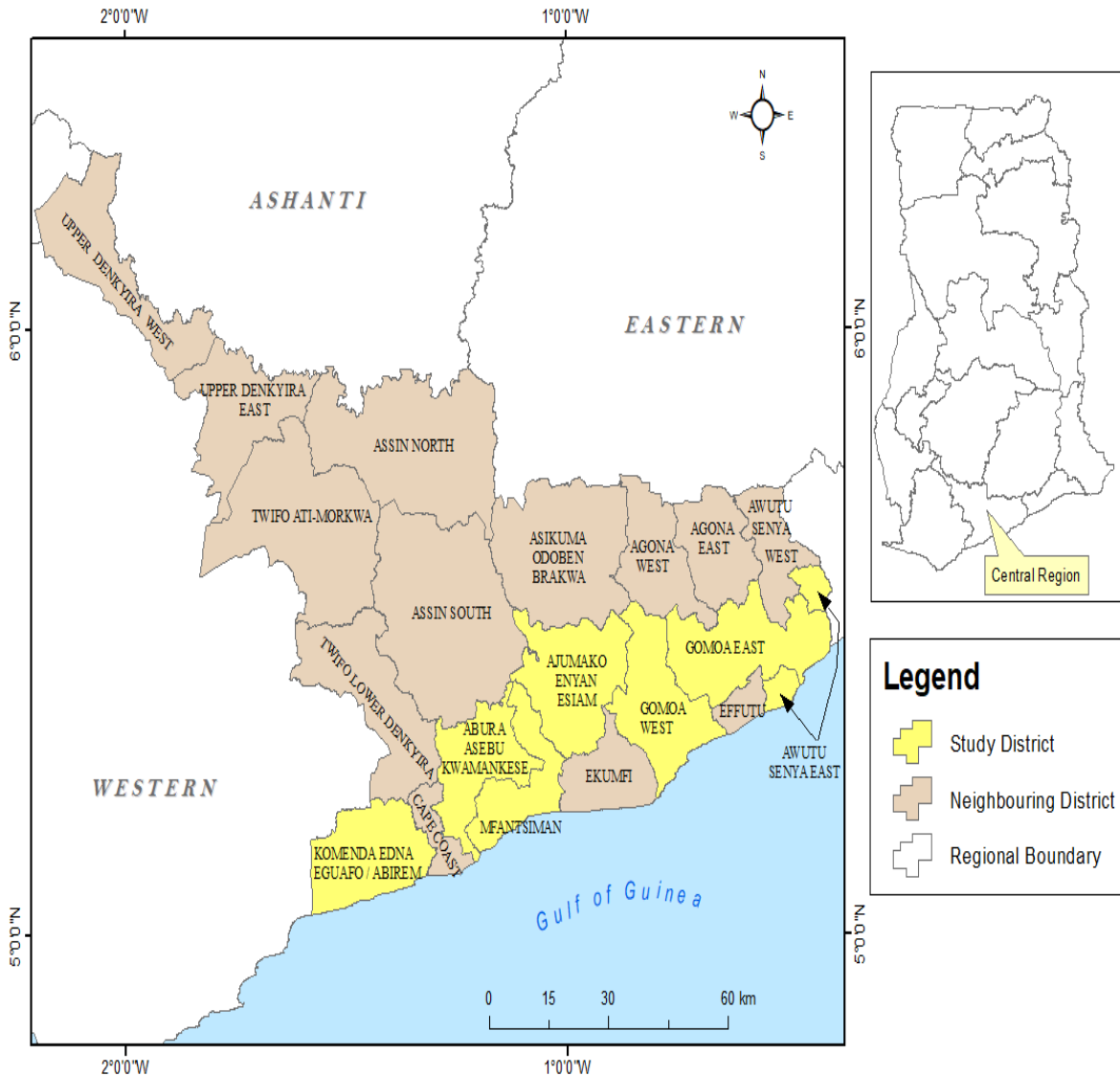


Figure 1. Map of the study area.
Source: Geography Department, UCC.

Data analysis

Descriptive and inferential statistics were used to analyze the data. Specifically, frequency, percentage, mean, and standard deviation were used to analyse the data. Using the Durand competency theory, the competency of extension experts was computed using their knowledge, attitude, and skills. The research hypothesis was analysed using a Two-way multivariate analysis of variance (MANOVA).

RESULTS AND DISCUSSION

Personal characteristics of extension agents for commercial production of pineapple

Out of the 86 extension professionals who participated in

the survey, 79% were male, while 21% were female as shown in Table 1. This implies that the extension profession is dominated by the male gender in the study areas and this suggests a gender gap that needs to be addressed. The result conforms with the findings of Nyarko and Kozari (2021) who concluded that more male than female extension agents work with the Departments of Agriculture under the Ministry of Food and Agriculture in Ghana. The finding is also similar to that of Ocran et al. (2024) who found more males than their female counterparts in a study examining benefits, barriers, challenges, and requirements for applying digital technologies in agricultural extension in selected regions of Ghana.

The result on age indicates that 20.9% of the

Table 1. Personal characteristics of extension professionals.

Variable	<i>f</i>	%
Sex		
Female	18	20.9
Male	68	79.1
Age (M = 39, SD ± 10)		
20-30	22	25.6
31-40	33	38.4
41-50	15	17.4
51-60	16	18.6
Educational qualification		
Certificate	29	33.7
Diploma	21	24.4
Bachelor's degree	32	37.2
Postgraduate/Masters	4	4.7
Experience of extension agents in years (M = 9.5, SD ±10)		
1-10	57	66.3
11-20	18	20.9
21-30	6	7
31-40	4	4.7
41-50	1	1.2
Trainings attended (number of times)		
No training	51	59.3
1-2	26	30.2
3-4	7	8.5
5-6	2	1.4

Source: Field Survey (2020).

respondents were within the ages of 20-30 years, 38.4% were within 31-40 years, 17.4% were within 41-50 years and 18.6% were within 51-60 years. The mean age was 39±10 years. This indicates that most of the extension agents were middle-aged and were old enough to make decisions that would enable smallholder farmers to scale up pineapple production when given the training needed. The result mirrors that of Nyarko and Kozari (2021) who found that 38.6% of extension staff were between the ages of 31-40 years and were active in the service. More than two-thirds of the extension agents (66.3%) had some form of formal education and have obtained certificates ranging from diploma to postgraduate/master's degree education. The results revealed that extension agents have appreciable educational credentials and as such have the fundamentals to further enhance their competencies and acumen in pineapple production. In addition, the extension agents have an average of 9.5 to 10 years of working experience with the Departments of Agriculture. This means they have

substantial exposure to the nature of their work and experience in the services they provide. Experience is a crucial determinant of an individual's existing competencies, skills, and expertise. The rate at which technology, talent, or knowledge gets adopted or diffused is directly determined by an individual's experience (Ashraf et al., 2020).

It is, however, unfortunate that more than half (59.3%) of the extension professionals did not attend any training on pineapple production, while 30.2% attended at most two trainings on pineapple production. This implies that there is a need for robust tailored training required to enable extension professionals to enhance their acumen in pineapple production competencies.

Table 2 presents the outcome of the sub-scales of knowledge, attitude, and skills as derived from the study. The findings indicate that extension agents possess moderate knowledge of 14 items related to commercial pineapple production. Specifically, the knowledge sub-scale revealed an average mean score of $M = 3.0$, and a

Table 2. Knowledge, attitude, and skills sub-scale related to pineapple production.

Competency areas in pineapple production	Knowledge		Attitude		Skills	
	M	SD	M	SD	M	SD
Land preparation for pineapple production	3.6	0.8	3.7	0.9	3.2	1.0
Use of appropriate planting space for planting, 3 to 5 feet apart	3.5	1.1	3.7	1.0	3.2	1.1
Selection of disease-free planting material	3.4	0.9	3.8	1.0	3.1	1.0
Selection of suitable land to grow pineapple	3.5	0.8	3.5	1.1	3.1	1.0
How to prepare ridges for planting	3.3	0.9	3.7	0.9	3.0	1.0
Managing soil erosion on the farm	3.4	0.9	3.5	1.1	3.1	1.1
Use of plastic mulch and its benefits	3.4	1.2	3.5	1.1	3.0	1.0
Periods of fertilizer application	3.3	1.0	3.5	1.0	3.0	1.1
Proper weed control measures	3.2	1.2	3.5	1.3	3.1	1.1
Integrated pest management in the pineapple farm.	3.2	1.1	3.4	1.1	3.1	1.0
Postharvest handling practices	3.1	1.1	3.5	1.2	3.1	1.1
Conventional pineapple system	3.0	1.1	3.5	1.0	3.1	.9
Methods of flower induction	3.2	1.1	3.4	1.1	2.8	1.2
Production of Sugarloaf variety	3.0	1.1	3.4	1.0	2.9	1.1
Organic pineapple farming system	2.9	1.3	3.5	1.2	2.8	1.1
Production of smooth cayenne variety	2.8	1.2	3.1	1.3	2.8	1.0
Harvesting for the export market	2.6	1.2	3.3	1.3	2.7	1.0
Production of MD2 variety	2.9	1.1	3.0	1.1	2.5	.09
Overall/Average	3.0	0.8	4.1	0.7	3.0	0.6

Source: Field Survey (2020).

standard deviation of $SD = 0.1$, signifying a moderate level of knowledge. Four items scored below a mean of 3, suggesting low knowledge in those areas conceptualized relating to commercial pineapple production. In terms of attitude, the results indicated a mean score above 3 for all 18 items, with an average mean score of 4.1 and a standard deviation of 0.7, indicating that extension agents perceive these items as highly important. Regarding skills, the results showed a mean score above 3 for 12 items and below 3 for 6 items, with an average mean score of 3.0, and a standard deviation of 0.6. This indicates that extension agents possess moderate skills in commercial pineapple production. The result on knowledge deviates from the findings of Ifeanyi and Corbon (2023) who observed a high level of knowledge in digital tools used in extension delivery among extension agents in Akwa Ibom State, Nigeria.

Competencies possessed by extension professionals for commercial pineapple production

In Table 3, the competencies of agricultural extension agents were evaluated. This evaluation was based on the three dimensions of competency as outlined by Durand (1988). The overall competency, derived from the sub-scales, indicated a moderate level of competency with a mean score of 3.2 ± 0.8 . These findings highlight the need

for substantial improvement in the competencies of agricultural extension agents to scale up commercial pineapple production. It is imperative that the Ministry of Food and Agriculture, along with other stakeholders, prioritize the provision of tailor-made training programs (Ocran et al., 2024) to significantly enhance the competencies of extension professionals through targeted training in pineapple production. This approach is essential to enhance the commercialization of pineapple in the central region.

The training programs provided must be customized to address fundamental areas of expertise in pineapple production. Therefore, a focused and comprehensive training strategy is necessary to elevate the proficiency of extension agents and support the growth of commercial pineapple production. The success of an extension organization is heavily reliant on its proficiency in the specified domains and its capacity to exhibit and communicate these proficiencies to its clientele (Aregaw et al., 2023). Furthermore, the effectiveness of extension/change agents depends on their capacity to acquire and effectively utilize existing knowledge and skills to accomplish a specific objective within the intended audience (Amanah et al., 2023). Therefore, the competencies of extension agents in pineapple production in the central region need upgrading to meet the commercialization goals of smallholder pineapple farmers in the region.

Table 3. Pineapple production competency areas.

Competency areas in pineapple production	Competency	
	M	SD
Land preparation for pineapple production	3.5	0.9
Use of appropriate planting space for planting 3 to 5 feet apart	3.5	1.1
Selection of disease-free planting material	3.4	1.0
Selection of suitable land to grow pineapple	3.4	1.0
How to prepare ridges for planting	3.3	0.9
Managing soil erosion on the farm	3.3	1.0
Use of plastic mulch and its benefits	3.3	1.0
Periods of fertilizer application	3.3	1.0
Proper weed control measures	3.3	1.2
Integrated pest management in the pineapple farm.	3.2	1.0
Postharvest handling practices	3.2	1.1
Conventional pineapple system	3.2	1.0
Methods of flower induction	3.1	1.1
Production of Sugarloaf variety	3.1	1.0
Organic pineapple farming system	3.1	1.2
Production of smooth cayenne variety	2.9	1.1
Harvesting for the export market	2.9	1.2
Production of MD2 variety	2.8	1.0
Composite	3.2	0.8

Table 4. Inter-correlation matrix for competency dimensions.

Competency dimension	Knowledge	Attitude	Skill
Knowledge	1	0.436**	0.727**
Attitude		1	0.444**
Skills			1

**Correlation is significant at $p < 0.01$ (2-tailed).
Source: Field Survey (2020).

Inter-correlation matrix for competency dimensions

Pearson's Moment correlation analysis was carried out to explore the relationship and the magnitude of the correlation between the competency dimensions of knowledge, attitude and skills, to satisfy the demands before proceeding to carry out the MANOVA (Scheiner, 2020). The results of the inter-correlation matrix indicate a significant positive correlation between the competency dimensions ranging from 0.436 to 0.72 at $p < 0.01$ as presented in Table 4. Scheiner (2020) noted that when the dependent variables are uncorrelated, running a MANOVA is in vain.

A two-way Multivariate Analysis of Variance (two-way MANOVA) test was computed to establish the linear combination of the difference in the three dimensions of competency (knowledge, attitude, and skills) for agricultural extension agents surveyed in pineapple production based on their ages and sex as presented in

Table 5. Age and sex were selected to ascertain if older extension agents were more competent than younger ones and whether males differ in terms of their competencies from the female gender.

MANOVA was used to determine the differences that existed between agricultural extension agent's knowledge, attitude, and skills based on their age and sex. The MANOVA results are presented in Table 5. The test of homogeneity of variance-covariance matrices based on Box's M test was conducted, $M = 37.167$, $F(24, 7668.907) = [1.389]$, $p = 0.098$ hence the assumption of equality of homogeneity of variance-covariance matrices was satisfied. Wilks' Lambda Λ_w was reported in testing for statistical significance. It was obvious from the study that, there exists no statistically significant difference in the linear combination of knowledge, attitude, and skills based on Sex, $[F(3, 76.00) = 1.723, p = 0.169, \Lambda_w = 0.064]$ and age $[F(9, 185.115) = 0.728, p = 0.676, \Lambda_w = 0.028]$. Again, no significant difference was observed

Table 5. Differences in the three competency dimensions based on the age and sex of extension agents.

Effect		Value	F	df	Error df	Sig	Partial Eta square
Sex	Pillai's Trace	0.064	1.72	3.00	76.0	0.169	0.064
	Wilks' Lambda	0.936	1.72	3.00	76.0	0.169	0.064
Age	Pillai's Trace	0.083	0.74	9.00	234.0	0.670	0.028
	Wilks' Lambda	0.918	0.74	9.00	185.1	0.676	0.028
SexxAge	Pillai's Trace	0.084	0.75	9.00	234.0	0.660	0.028
	Wilks' Lambda	0.917	0.74	9.00	185.1	0.669	0.028

Source: Field Survey (2020).

between the interaction of sex and age of agricultural extension agents. The findings from this analysis indicate that the knowledge, attitude and skill of agricultural extension agents involved in the study are not significantly dependent on their age or sex. This implies that male and female extension agents across various age groups do not differ significantly in their competencies related to commercial pineapple production.

The results indicate that training programs and professional development activities need not be customized according to the gender or age of extension agents. Instead, a more generalized approach to training can be effectively implemented across the entire workforce. This approach ensures that all extension agents receive the same level of training, leading to a more consistent and efficient extension service delivery within the study area.

The three competency domains in pineapple production among agricultural extension professionals are unaffected by age and sex. Thus, demographic characteristics like age and sex should not dominate interventions to enhance competency. Extension agents' knowledge, attitude, and skills may be influenced by other factors in other situations.

CONCLUSION AND RECOMMENDATIONS

This research delved into the competency of agricultural extension agents in facilitating the commercialization of pineapple production among smallholder farmers in the Central region of Ghana. The study focused on pineapple production districts located along the coastal areas of the region and drew its theoretical foundation from the Durand competency theory, which was formulated in 1988. This theory served as a robust framework, encompassing three essential dimensions: knowledge, attitude, and skills. The findings of this study unveiled a notable gender and age disparity among extension agents. Again, extension agents in the study area were predominantly youthful. The overall assessment of competency levels revealed that agricultural extension

agents in the central region of Ghana possess a moderate degree of competency in the context of commercial pineapple production. Consequently, the study points out the need for a tailored training program aimed at augmenting their competencies in this vital sector. Moreover, it is noteworthy that age and gender were found to exert no significant influence on the three fundamental dimensions of competency, namely knowledge, attitude, and skills based on the MANOVA estimated. As such, in the pursuit of rectifying competency disparities, our research posits that undue emphasis should not be placed on these demographic characteristics. The study is limited to the central region of Ghana and focuses on smallholder farmers.

This study suggests a set of recommendations, topmost among them being the imperative for the Ministry of Food and Agriculture and other key stakeholders within the horticultural sub-sector to institute comprehensive in-service training initiatives for extension agents. Such programs are envisioned to fortify the competencies of extension professionals in pineapple production, thereby enabling them to assist farmers in the region better in realizing their commercialization aspirations and meeting the increasing demand for fresh pineapple. Furthermore, the research suggests that future research should extend its purview to encompass all pineapple-growing districts across the nation. Such an expanded scope will be more comprehensive in understanding the competencies of extension agents in Ghana. Further studies could assess the competencies of agriculture extension agents on a national level to inform holistic policy formulation at the national level.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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