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Factors influencing technology adoption among pig farmers in Ashanti region of Ghana

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The study examined the constraints to utilization of pig production technology in Ashanti Region of Ghana. Primary data were collected using a set of structured and validated interview schedule from 80 pig farmers who were selected using multistage sampling techniques from selected villages and towns scattered in the region. Data analysis was carried out using frequency counts, percentages and Pearson Product Moment Correlation (PPMC). The result of the analysis showed that the major source of information of pig farmers to utilization of pig production technology was mostly through veterinary officers. The adoptions of improved technologies were associated with age, education, operational land holding, farm size, income from piggery, social participation, extension contact, farming experience, farm education exposure, scientific orientation, knowledge level, training and financial help received. These variables contributed 35.00% variation in the adoption gain in improved technologies in pig farming. The major recommendation that emanated from the study was, that to increase the level of adoption of improved technologies in pig farming, farmers were required to be exposed to as many as cosmopolite sources of information as possible, to make them aware of these technologies.

Key words: Pig farming, improved piggery technology, Technology adoption, communication and socio-economic factors.

Introduction

Animal agriculture has a specialized significance as it can play an important role in improving the socio-economic status of a sizable section of the weaker population. In most cases livestock is the source of cash income for the subsistence farmers. If agricultural technologies developed for farmers in developing countries are not transferred in correct (appropriate) manner and adopted accordingly, all the efforts by the researchers who developed new technologies would have been in vain. A farmer is a rational decision maker

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who normally strives for a better standard of living and seeks ways of adopting new technologies to accomplish this goal (Nell *et al*., 1998).

There is a need to identify the factors that contribute positively to the adoption of new livestock technologies as well as those that represent main constraints for the diffusion /adoption process. (Nell *et al*., 1998). This type of research is essential for policy formulation to develop the livestock sector and alleviate poverty in rural areas of the state. For instance, extension and research are well-organized systems that design and disseminate technological innovations to farmers. Despite all the technological innovation transfer, there is a wide gap between levels of production which research contends is attainable and that which farmers achieves (Oladele, 2004). Much research has been conducted to find solution to improve productivity in agriculture including pig production, but in fact, those farmers who are expected to be the end users utilize very few of these research results.

The problem with modem agricultural science is that technologies are finalized before farmers get to see them. If new technologies are appropriate and fit a particular farmer's conditions or needs, then they stand a good chance of being adopted. But if they do not fit and if farmers are unable to make changes, then they have only the one choice. They have to adapt to the technology, or reject it entirely. The alternative is to seek and encourage the involvement of farmers in adapting technologies to their conditions. This constitutes a radical reversal of the normal modes of research and technology generation, because it requires interactive participation between professionals and farmers (Jiggins and De Zeeuw, 1992).

The important element of any innovation transfer is the appropriate adoption of such technology without any hitch.

The objective of the study was to assess the factors to the utilization of pig production technology in Ashanti region of Ghana.

Materials and methods

Study area

The study was carried out between August 2010 to January 2011 in the Ashanti Region of Ghana. Ashanti, with Kumasi as its capital, lies approximately at the centre of the country. It covers an area of 24,390 square kilometres representing 10.2% of the land area of Ghana. It is located within the semi-deciduous humid forest zone of Ghana. This zone is characterized by bimodal rainfall pattern with an annual rainfall of 1300mm. The major rainy season (62% of total precipitation) occurs from March to July and the minor season (21% of total precipitation) from November to February. Daily

temperatures range from 20^0C to 35^0C with a mean of 26^0C. The relative humidity varies from 97% during the early morning in the wet season to as low as 20% during the late afternoon in the dry season. The average photoperiod is 12h.

Ashanti is the most populous region in Ghana. According to the 2000 Population and Housing Census Report, the Region recorded a total of 3,612,950 representing 19.1% of national total of 18,912,079. The Region has abundant food supplies to feed its people and others. These include plantain, maize, cassava, cocoyam, yam, vegetables and other cereals and legumes. The industrial crops grown include cocoa, oil palm, tobacco, bast fibre, cotton, citrus and cashew. The Region has the largest number of Poultry Industries in the Country. It is also the home of large poultry feedmills.

Study population

Eighty (80) pig farmers were selected from 20 towns and villages in the Ashanti Region with the help of extension agents of Ministry of Food and Agriculture (MOFA) by using purposive sampling (Galloway, 1997). The farmers were visited at their farm sites to help get accurate information.

Information was gathered using structured questionnaires, field observations and interviews. Interviews were conducted on a one-no-one basis with farmers. The data was analyzed by using SPSS computer programme (SPSS, 2006). Pearson Product Moment Correlation coefficient was computed to know the relationship between selected Independent variables of pig farmers with dependent variable i.e. adoption of improved technology on piggery practices. Multiple Regression Analysis was employed to find out the effect and extent of influence of each Independent variable contributing significantly towards the dependent variable i.e. adoption of improved technologies on piggery practices.

The interview with farmers who were not fluent in English was done in Akan in order to preserve the accuracy of the information. In order to ascertain extent of adoption of improved technology, the responses of respondents were collected on seven selected practices, namely Housing, Improved breeds, Feeding, Health Care, and General Care and Management, Record keeping, and Identification.

The total score for a respondent was obtained by summing up the score obtained on each practices. The minimum score one could score was 0 and maximum score was 100.

The adoption level of the respondents was measured by making use of adoption index developed by Karthikeyan (1994).

$$Adoption\ index = \frac{\text{Re}\ spondents'\ total\ score}{Total\ possibles\ core} X\ 100$$

Depending upon the extent of adoption of improved technologies the respondents were categorized as follows:
1) Low adopters (up to 33%),
2) Partial adopters (34-66%) and
3) High adopters (67-100%).

The study was carried out with 16 independent characteristics (Socio-personal, economic and communication characteristics) and one dependent variable (Y=Adoption of improved technologies on piggery practices) of the pig farmers.

Results and discussions

Table 1. Frequency distribution of respondents according to personal characteristics (n= 80)

Variable	Frequency	Percentage
Age (years)		
Under 25	11	13.8
26-35	23	28.8
36-45	23	28.8
46-55	13	16.3
56 and above	10	12.5
	80	
Religion		
Christian	76	95.0
Muslim	1	1.2
Traditionalist	3	3.8
	80	
Gender		
Male	76	95.0
Female	4	5.0
	80	
Educational Status		
Basic	40	50.0
Secondary	26	32.5
College	7	8.8
University	3	3.8
None	4	5.0

Herd Size	46	57.5
Under 50 pigs	9	11.3
51 – 100 pigs	4	5
101- 150	5	6.3
151 – 200	16	20
200 and above		
Family Size		
1-3	37	46.2
4-6	22	27.5
7-9	18	22.5
10 and above	3	3.8
Occupation		
Full-time	62	77.5
Part-time	18	22.5

Personal Characteristics of Poultry

The result of the analysis shows that less than 30% (28.8%) of the respondents were between the ages of 26-35 years, 28.8% were between 36-45, 12.5% were 55 or older and 13.8% were under 25 years of age (Table 1). It could be inferred from this result that there is high percentage of youths (under 40 years) among the pig farmers. This age distribution among farmers suggests high level of vitality for agricultural activities and play central role in productive enterprises (Durston, 1996). Majority (95%) of the respondents were males while 5% were females (Table 1). The high percentage of men involved in pig production than women could be as a result of drudgery, physical and energy demand as well as capital-intensive nature of investment required by pig production, which discourages women. As regards education, there is high level of education among the respondents as majority had one form or the other formal education ranging from basic education to tertiary education (Table 1). This showed that majority of the respondents were literate. The relative high level of literacy is expected to enhance innovativeness of farmers. Over 55% of the respondents kept below 50 pigs, whiles 20% keep over 200 pigs (Table 1)

Table 2. Sources of information on pig production technology

Source of information	Major	Intermediate	Minor	Rank
Farmer contact	36 (45%)	21 (26.25%)	23 (28.75%)	3rd
Extension agents contact	33 (41.25%)	42 (52.50%)	5 (6.25%)	4th
Veterinary officers contact	43 (53.75%)	32 (40%)	5 (6.25%)	1st
Radio contact	40 (50%)	29 (36.25%)	11 (13.75%)	2nd
Television contact	11 (13.75%)	31 (38.75%)	28 (35%)	6th
Friends/ Neighbours contact	7 (8.75%)	16 (20%)	57 (71.25%)	8th
Newspapers contact	8 (10%)	10 (12.5%)	62 (77.5%)	7th
Workshops contact	14 (17.5%)	20 (25%)	46 (57.5%)	5th

Farmers Sources of Information

The findings of this study revealed that farmers obtained information on pig technology from various sources ranging from interpersonal to mass media. About half (53.75%) of the sampled farmers indicated Veterinary officers as their major source of information on pig technology. This is followed by Radio (50%), contact farmers (45%), extension agents (41.25%) in that order (Table 2). From this result it could be inferred that veterinary officers serve as the main source of information to the farmers on pig production technology. This finding is in contrast to the findings of Adekoya *et al*. (2000). The results also showed that social networking contributes significantly to technology dissemination (Table 2).

Table 3. Practice-wise distribution of respondents according to extent of adoption

Sl.No.	Level of adoption	Score index	Frequency and percentage (N=100)	Mean
A	*Housing*			
1	Low adopter	Up to 33%	47	
2	Partial adopter	34-66%	18	41.51
3	High adopter	67-100%	14	
B	*Record Keeping*			
1	Low adopter	Up to 33%	42	
2	Partial adopter	34-66%	0	48.68
3	High adopter	67-100%	38	
C	*Feeding*			
1	Low adopter	Up to 33%	63	
2	Partial adopter	34-66%	22	82.98
3	High adopter	67-100%	15	
D	*Health care*			
1	Low adopter	Up to 33%	5	81.99

	2	Partial adopter	34-66%	6	
	3	High adopter	67-100%	69	
E		*General care and Management*			
	1	Low adopter	Up to 33%	3	
	2	Partial adopter	34-66%	24	75.56
	3	High adopter	67-100%	53	
F		*Identification*			
	1	Low adopter	Up to 33%	44	
	2	Partial adopter	34-66%	5	27.03
	3	High adopter	67-100%	11	
G		*Improve Breeds*			
	1	Low adopter	Up to 33%	9	
	2	Partial adopter	34-66%	4	82.35
	3	High adopter	67-100%	67	

Extent of adoption of improved technology

The majority of the farmers i.e. 69% and 67% adopted improved technology on health care and improve breeds at higher level in their farms and the average adoption score was found to be 81.99 and 82.35, respectively as shown in Table 3. A perusal of the data in Table 2 reveals that the overall adoption was partial (Average score was 62.87). Majority of the respondents (58.2%) adopted the improved technology on pig rearing partially, whereas 30% and 11.29% adopted improved technology on pig rearing at lower and partial level, respectively.

Table 4. Overall adoption level of pig farmers

Sl.No.	Level of adoption	Score index	Frequency and percentage (N=100)	Mean
1	Low adopter	Up to 33%	30.42	
2	Partial adopter	34-66%	11.29	62.87
3	High adopter	67-100%	38.29	

Table 5. Correlations of adoption of improved pig rearing practices with fifteen selected independent variables

Independent variables	Coefficient of correlation (r)	Sig
Age (X_1)	-0.256*	0.022
Sex (X_2)	-0.145	0.198
Education status (X_3)	-0.092	0.418
Family size (X_4)	-0.214	0.065
Religion (X_5)	-0.128	0.259
Occupation (X_6)	0.314**	0.005
Herd Size (X_7)	0.252*	0.024
Farming experience (X_8)	0.067	0.557
Extension contact (X_9)	-0.134	0.237
Vet officers (X_{10})	-0.183	0.104
Radio (X_{11})	0.184	0.103
Television (X_{12})	-0.002	0.987
Newspapers (X_{13})	0.193	0.087
Friend (X_{14})	0.124	0.274
Farmers (X_{15})	-0.228**	0.01
Workshop (X_{16})	-0.033	0.771

** Correlation is significant at the 0.01 level

* Correlation is significant at the 0.05 level

There was a significant negative correlation (-0.26) between age and adoption ($P<0.05$). The results of this study is at variance with the study of Teklewold *et al.* (2006), which showed that farmers' decision on the extent of adoption of exotic poultry breed was positively influenced by age of household head. They observed that farmers who were above 39 years were most likely to have lower adoption rates, because older people fear the risk of poultry diseases and other unexpected events in exotic breed of poultry whilst young farmers tend to be more flexible in their decisions to adopt new ideas and technologies more rapidly.The correlation between sex and adoption was +0.26 ($P<0.05$). This indicates that farmers' decision on adoption of pig technology was positively influenced by sex of respondent. Recently, Teklewold *et al.* (2006) made the same observation in poultry. The result of their work indicated that male household heads were potential adopters of exotic poultry breed than female farmers. Full-time and part-time farmers, constituted the occupational status of respondents (Table 1). Full-time farmers dominated both the high adopter categories with respect to occupation. The correlation between occupation and adoption (0.31) was not significant ($P>0.01$). This indicates that occupation had influence on adoption of pig farming. The respondents were grouped into four; basic, secondary, college and university and 'None' leavers (Table 1). None included school drop outs below basic school level. Most of the

respondents were basic school leavers, followed by secondary, tertiary and illiterate in that order. The coefficient of educational status in the adoption of pig farming was negative (-0.09) and statistically significant (P<0.05). Education level influences farmers' access to information as well as their ability to understand technical aspects of innovations which largely affects production decisions (Rahman, 2003). The results show that adoption was negatively influenced by level of education.

Pressure from family, measured by family size, ranges from 1-16 with the average being 7. According to Rahman (2003) the Chayanovian theory of the peasant economy contends that higher subsistence pressure increases the tendency to adopt new technology. This was contradictory to the result of this study. The correlation between family size and adoption was -0.214 (P>0.05). It exhibited a positive and significant relationship with adoption level. It indicates that farmers having large number of pigs in their farms adopted improved technologies in their farms.

Farming experience showed a positive and significant relationship with the adoption of improved technologies by the farmers. Experience helps an individual to think in a better way and makes a person more mature to take right decision. It was found to be positively and significantly associated with the adoption level of farmers. Contact with extension personnel influenced the farmers to adopt improved pig production practices in their farms. There was a non-significant negative correlation (-0.183) between veterinary officers contact and adoption (P<0.05). The correlation between Radio contact and adoption was 0.184 (P>0.05). Radio had positive effect on enhancing adoption of technologies by the respondents. There was a non-significant negative correlation (-0.002) between Television and adoption (P<0.05). This means that there was no effect of television in the adoption of pig farming technologies. The correlation between newspaper and adoption was 0.193 (P>0.05). The relationship is surprising since Ghanaian Newspapers rarely educate farmer on technologies developed by researchers.

There was a non-significant positive correlation (0.124) between friend contact and adoption (P<0.05). Farmer contact was found to be negatively (-0.228) and significantly (P<0.05) associated with the adoption level of farmers. A survey conducted by Besley and Case (1994) of approximately 450 individuals in four clusters of villages in Ghana's Eastern Region over a period of 21 months in 1996-98 indicated that, it does not appear to be the case that farmers learn from all other farmers in their village. In their survey each respondent was matched randomly with 10 other farmers in his/her village. In only 11% of these matches had one of the two individuals ever received advice about farming from the other. In 30% of the matches, the respondent indicates

that he could approach the other farmer for advice about fertilizer. Social networks have been shown in several studies to influence both the adoption and management of new technologies (Bandiera and Rasul, 2006). There was negative correlation (-0.033) between workshop and adoption (P>0.05). This is mainly due to the non-existence of workshops for pig farmers by researchers. The multiple regression analysis was performed to find out the effect and extent of influence of 16 independent variables to levels of adoption of improved technologies in pig farming. The results of analysis involving 16 variables are presented in Table 4.

Table 6. Multiple regression analysis of adoption of improved technologies with sixteen selected independent variables

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	Std. Error	Beta		
a	(Constant)	143.768	84.798		1.695	.095
	Age	-.216	.166	-.213	-1.297	.199
	Religion	-3.676	4.454	-.106	-.826	.412
	Educational status	-.333	1.538	-.026	-.217	.829
	Sex	-9.479	7.645	-.152	-1.240	.220
	Marital status	-.394	4.028	-.014	-.098	.922
	Occupation	6.958	3.851	.213	1.807	.076
	Farming experience	.356	.313	.150	1.138	.259
	Herd size	.019	.020	.127	.967	.337
	Veterinary officers contact	-2.459	3.359	-.244	-.732	.467
	Radio	-.711	3.154	-.086	-.225	.822
	Television	-2.732	2.973	-.296	-.919	.362
	Newspapers	-1.174	3.174	-.131	-.370	.713
	Friend	-2.412	3.201	-.294	-.754	.454
	Farmers	-3.330	3.056	-.473	-1.090	.280
	Workshop	-2.077	3.033	-.312	-.685	.496
	Extension contact	-2.601	1.761	-.218	-1.478	.145

a. Dependent Variable: ADOPTIONINDEX

** Significant at the 0.01 level * Significant at the 0.05 level $R^2 = 0.35$

None of the 16 variables taken for analysis of regression was found to have significant contribution at either five or one percent level to adoption of technology (Table 4). The coefficient of determination (R^2 value) was 0.35, which indicates that 35.00% variation in the adoption of improved technologies

in pig farming was accounted for by these 16 independent variables selected for the study.

Conclusion

The findings of this study have shown that pig farmers were able bodied, young with modal class ages of 26-35 and 36-45 years who are married and mostly males with moderate level of education. The farmers are mainly small-scale producers with majority with herd size less than 50 pigs. Overall adoption level of pig farmers was partial. Farmers' sources of information were mostly veterinary officers. Veterinary officer's contact has positive effect on adoption level. Therefore efforts should be made to increase these contacts of the farmers with veterinarians to increase their level of adoption. To increase the level of adoption of improved technologies in pig farming, farmers are required to be exposed to as many as cosmopolite sources of information as possible, to make them aware of these technologies.

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