American Open Journal of Agricultural Research
Vol. 1, No. 8, December 2013, PP: 1 - 11, ISSN: 2333 - 2131 (ONLINE)
Available online at http://acascipub.com/Journals.php

Research article

Constraints Facing Cocoa-Based Agricultural Knowledge and Information System in Ghana: Perception of Cocoa Farmers in the Eastern Region of Ghana

Francis Nana Yaw Codjoe[1*], Samuel Asuming Brempong[2] and Dennis Owusu Boateng[3]

[1]Technical Department, Bunso Cocoa College, P.O. Box 2, Bunso Eastern Region, Ghana
[2]Department of Agricultural Economics and Agribusiness, University of Ghana, Legon
[3]Technical Department, Bunso Cocoa College, P.O. Box 2, Bunso Eastern Region, Ghana
*For correspondence: f_codjoesa@yahoo.com OR myxylo4on@yahoo.com/ +233 262771294

Abstract

The study ranked and analysed the constraints facing the Cocoa-based Agricultural Knowledge and Information System (AKIS) in Ghana from the perspectives of cocoa farmers in the Eastern Region. Kendall's Coefficient of Concordance (W) was used to test the rank of factors that influence the efficient functioning of the cocoa-based AKIS. The study revealed that there was a 100% agreement among the various rankings that 22.7% of the coefficient of concordance is correct. Implying that, there is agreement among cocoa farmers concerning the factors/constraints that limit the efficient functioning of the cocoa-based AKIS. Inadequate interaction with researchers and extension agents had a mean rank of 4.57, representing the highest ranking order with a few cocoa licensed buying companies (LBC's) providing cocoa-based information ranking the least among the fifteen constraints. It indicates that, it does not seem to be generally true that the existing AKIS institutions or stakeholders have reneged on their duties but that they have not reached their full potential in their quest of information dissemination to farmers. The study therefore advocates an effective and participatory synergy among all the stakeholders in the cocoa AKIS chain to ensure that all the bottlenecks that exist in the information, knowledge and technology dissemination are reduce to the barest minimum for higher productivity and overall efficiency of the system.

Keywords: Constraints; AKIS; Kendall Co-efficient; Cocoa Farmers; Ghana

---

Introduction

Ghana as a country is almost synonymous with the cocoa (*Theobroma cacao* L) crop. Since its introduction from Fernando Po in 1879, cocoa has transformed the nature of agricultural activities and has occupied centre stage in the country's socio-economic development. The introduction of cocoa into Ghana's agricultural system over a century ago changed the agricultural landscape. The potential of earning more income from an economic crop brought out the entrepreneurial acumen in thousands of farmers who began an economic migration from the point of introduction in the eastern region) into the hinterland, buying forest land to plant cocoa (Hill, 1963). The total export earnings from cocoa have been increasing since the mid 2000s. Apart from a dip between 2006 and 2007, there has been steady increase from 2007 consistently up to 2010 when the country earned approximately $2.285 billion from total cocoa exports, which contributed 28.9% of the total foreign exchange earnings. It has been the stated policy goal of achieving total cocoa production of one million tons by 2011. It is argued that, for this goal to be achieved despite government and Ghana Cocoa Board efforts in rolling out intervention and programmes, there still remain informational bottlenecks that inhibit this goal and its subsequent sustainability.

The concept of AKIS was coined by Röling (1986). According to FAO and the World Bank (2000), "cocoa-based AKIS is a system that links cocoa farmers (rural people) and institutions to promote mutual learning and generate, share and utilize agriculture-related technology, knowledge and information in cocoa production. The system integrates cocoa farmers, agricultural educators, researchers and extension workers to harness knowledge and information from various sources for better cocoa farming and improved livelihoods. This re-echoes the crucial role of these actors in the AKIS chain in ensuring that whatever new technology, information or knowledge gets to the farmer who is the ultimate user in the system. The shortfall of these however breaks the channel of information dissemination hence low productivity as knowledge or new technologies developed do not get to the ultimate user (farmer). Any study which therefore seeks to highlight the understanding of the constraints of cocoa farmers in accessing AKIS and suggest ways to meeting the informational needs of both old and new cocoa farmers would be fuelling increase productivity. This is because information and knowledge are regarded as essential for farmers to respond successfully to the opportunities and challenges of the physical, social and policy environments in which they operate (McQuail, 1983). It has also been said that empowering the poor is about providing them with information (World Bank, 2004), and the demand for agricultural information is stronger than ever (LEISA, 2002).

Many cocoa farmers fail to benefit from technological and other advances. In many cocoa growing countries like Ghana, the productivity and incomes of the poorer cocoa farmers have stagnated or even decreased. This is solely due to a lack of investment in education, research, extension and key constraints such as knowledge gaps and information problems which are crucial to equitable growth and development as stated by Garforth et al., 2003. It can also be traced to a number of other causes, such as poorly functioning markets for inputs, products, or credit. The challenge, as argued, is to increase farm-level output to the level obtainable on Ghana's own research farms (over 1000kg/ha). Information provision to farmers is however central to this challenge. There is also a problem of not addressing most pressing information requirements on technical grounds for most cocoa farmers. This is because technological change has been slow due to some bottlenecks that inhibit its adoption. From the foregoing the study seeks to find answers to the following questions. What are the socio economic characteristics of the respondents? What are the constraints in the efficient functioning of the cocoa-based AKIS? provision of answers to the above questions would contribute to overcoming the constraints that inhibit the efficient functioning of the Cocoa-Based AKIS, ensuring the successful dissemination of agricultural technologies to a majority of cocoa farmers, thereby increasing productivity and helping COCOBOD attain its policy target within the stipulated year and its subsequent sustainability.

Materials and Methods

The study was undertaken on community level. It consists of desk study and primary data collection. The desk study consists of a literature review of existing reports and works -- i.e. previous studies relating to the subject matter whiles primary data collection involved visits to selected cocoa growing communities. It employed survey methods using questionnaires. Data collection using trained and experienced enumerators were deployed to interview the farmers. Prior to actual data collection, the instrument were pretested to determine its validity and reliability. A total of 300 respondents were randomly selected across ten (10) cocoa growing communities in the Atiwa and East Akim districts in the Eastern Region. 150 respondents were selected from each district. The selected communities in

Atiwa district include Anyinam, Abakoase, Kwabeng, Adasawase, and Subrisu. In the East Akim districts, communities selected were Old Tafo, Osiem, Bunso, Apedwa and Ettokrom. Eastern region was purposively selected since it forms one of the most important cocoa regions in the country aside it being the first point of introduction of the crop. The districts were selected because they are closer to the Cocoa Research Institute of Ghana (CRIG) and it is believed that farmers would be more accessible to research and other technologies that have been developed by the research Institute.

Socio Economic Characteristics of the Respondents

The various socio economic activities of the respondents were explored using structured questionnaires. Descriptive Analysis using SPSS was used to analyze the responses which were tallied and frequencies of the various variables computed into percentage (%) and presented in tables.

Identification and Ranking of Constraints in the Efficient Functioning of the Cocoa-Based AKIS

Literature was reviewed to identify some of the factors that inhibit the efficient function of the cocoa-based AKIS. Farmers were made to rank those constraints according to the order of severity. Here the Kendall coefficient of concordance was used to test the agreement of the constraints.

The Kendall's Coefficient of Concordance

To test the agreement among the ranking of the identified constraints that influence the efficient functioning of the cocoa-based AKIS, Kendall's coefficient of concordance was used. It establishes the extent of disagreements and agreements among responses.

The Kendall's Coefficient of Concordance (W) is the measure of the degree of agreement among m sets of n ranks. W is an index that measures the ratio of the observed variance of sum of ranks to the maximum possible variance of sum of ranks. The idea behind this index is to find the sum of the ranks for each thing being ranked and then examine the variability of this sum. If the rankings are in perfect agreement, the variability among these sums will be a maximum (Legendre, 2005).

The analysis is a statistical procedure that is used to identify and rank a given set of constraints/problems into the most pressing one up to the least pressing one, and then measures the degree of agreement/concordance among these constraints/problems. The identified constraints/problems are ranked according to the most pressing to the least pressing using numerals: 1, 2,3,4……, n, in that order. Computing the total rank score for each problem, the problem with the least score is ranked as the most pressing whilst the one with the highest score is ranked as the least pressing problem. The total rank score computed is then used to calculate for the Coefficient of Concordance (W), to measure the degree of agreement in the rankings.

The limits for W cannot exceed 1.00 and cannot be negative. That is, it can only be positive in sign and ranges from 0 to 1. It will be 1 when the ranks assigned by each judge (cocoa farmer) are exactly the same as those assigned by other judges (cocoa farmers), and it will be 0 when there is a maximum disagreement among the judges (cocoa farmers). If we let T represent the sum of ranks for each thing being ranked, the variance of the sum of ranks is found by the formula:

$$\mathrm{Var_T} = \frac{\sum \mathrm{T}^2 - (\sum \mathrm{T})^2 / \mathrm{n}}{n} \qquad (3.2)$$

The maximum variance of T is then given by:

$$m^2(n^2 - 1)/12$$

The formula for the Coefficient of Concordance (W) is then given by:

$$W = \frac{(\sum T^2 - (\sum T)^2/n)/n}{m^2(n^2-1)/12} \quad (3.3)$$

W is simplified as:

$$W = \frac{12[\sum T^2 - (\sum T)^2/n}{nm^2(n^2-1)} \quad (3.4)$$

Hypothesis and Significance Test for W

The null and alternate hypotheses were stated as follows:

Ho: there is no agreement among cocoa farmers concerning the ranking of the constraints in the order of increasing severity factors that limit the efficient functioning of the cocoa-based AKIS.

H_1: there is agreement among cocoa farmers concerning the ranking of the constraints in the order of increasing severity factors that limit the efficient functioning of the cocoa-based AKIS.

Results

Personal and Socio-Economic Characteristics:

The data in table 1 and 2 show the distribution of the cocoa farmers by their socio-economic characteristics. Cocoa farming in the study area appears to have more men than women with 80.0% of the respondents being men. This may be attributed to the laborious nature of cocoa establishment and maintenance. At the community level, about 8.0% of the farmers are in the age range of 25-35years, 26.0% falling within age range of 36-46years, while 66.0% of the farmers are in the age range of 56years and above. This means that there are older people generally staying in the villages whiles relatively younger people either leave for the cities to find other jobs apart from farming or are in the village but not involve in farming activity. It is reported that 19 % of the farmers had no formal education, 41% of the farmers had education up to the middle/Junior school level with 35.67% attaining senior high school education followed by only 4.33% who have had either college or one form of tertiary education. This educational stratification in the community could somewhat affect farmers' knowledge and the way they look at new technologies. This could be link to the research finding by Saha et al., (1994) which found out that larger and more educated operator (farmers) are likely to adopt new technologies more intensively.

The 32.0% of 1-10 year farming experience record dominance of farmers from those with 28.7% (11-20 years of farming experience), 29% (21-40 years of farming experience) and 10.3% (41-60 years of farming experience) reflects that, there are new entrant farmers to cocoa cultivation in the study area. This would require that such categories of farmers are empowered with the needed knowledge, information and technology to be able to thrive in the cocoa sector. This will also enable them to overcome the key constraints such as knowledge gap to be able to take advantage of market and other opportunities to increase their productivity. Additionally, it is observed from the study that 42.67% of farming activities are organized on a farm size of about 0-10 acres followed by 20% on 11-30 acre with 12.33% who are farming on > 30 acre. However 25% of the respondents do not have knowledge on the total acreage they are cultivating on. With 25% farmers in this category, it calls for more education and knowledge on simple tools of measurement by the relevant actors in the AKIS chain to enable farmer's measure their farm size accurately. This is because with the current situation there is the likelihood of farmers underestimating or overestimating the quantity of inputs that they would require in their farming activities. This could affect production.

About 10.67% of the respondents are migrant farmers while 89.33% are native farmers with about 28.33% having family land ownership. Furthermore 45% of the farmers had one form of land ownership (bought, gifted or rented), followed by 14.67% having a lease form of land ownership with 12% accounting for other forms of land ownership for their cocoa production.

Planting mixed cocoa variety is dominant among respondents representing 35%, followed by *Amazonia* (31.67%) while 21.33 plant hybrid cocoa with 12% having *Amelonado i*n their farms as a main variety that they cultivate. By implication, the old variety which is the *Amelonado* is fading out of the system as a result of the increase awareness about the other varieties most especially the hybrid which is known to be early bearing, disease resistant and early maturing. This means that farmers would be increasing their productivity with the hybrid *ceteris paribus*. Additionally, 73.0% of the respondents farms are in the farm age range of 0-20 years indicating the presence and dominance of young cocoa (A and B class) farms in the study area. 18.3% of the respondents' farms fell within the farm age range of 21-30 years also indicating the presence of the C class of cocoa while 8.6% are in the farm age range of 31 and above representing D and E classes of cocoa. The latter classes however represent old and dying cocoa farms which are no longer yielding as required hence need information, knowledge and techniques in good rehabilitation practices to improve upon their performance.

Constraints that influence the efficient functioning of the Cocoa-Based Agricultural Knowledge and Information Systems (AKIS)

Table 3 presents the rankings of the constraints that influence the efficient functioning of the cocoa-based AKIS. Kendall's test of Concordance was used to test agreement among rankings of the constraints by respondents. Respondents ranked fifteen (15) constraints in a descending order, which is from the most pressing constraint to the least pressing constraint. The mean rank of each constraint is then used to determine the relative position in the list (table 3).
The coefficient of concordance is 0.227 with 14 degrees of freedom. This coefficient is significant at 1 percent. This implies that there is 22.7 percent agreement among rankings of the respondents concerning the constraints that influence the efficient functioning of the cocoa-based AKIS. The Asymptotic Significance was 100%, which represents the fact that, there was a 100% agreement among the various rankings that 22.7% of the coefficient of concordance is correct. Hence, the null hypothesis which states that there is no agreement among cocoa farmers concerning the factors that limit the efficient functioning of the cocoa-based AKIS is rejected in favour of the alternative thus; there is agreement among cocoa farmers concerning the factors that limit the efficient functioning of the cocoa-based AKIS.

Discussion

Results from this study indicate that, inadequate interaction with researchers and extension agents had a mean rank of 4.57, representing the highest ranking order. This corroborates one of the empirical findings of this research where majority of farmers in their opinion are calling for regular and timely interactive sessions with researchers and extension agents as a way of updating their knowledge and sharing ideas and information. With the study area closer to the Cocoa Research Institute of Ghana (CRIG) it is expected that farmers would have more educative interactive sessions with researchers who develop new technologies as well as extension agents who transmit them. As recounted by Tiwari et al. (2004), this demands new thinking and skills amongst researchers and extension staff, and new institutional mechanisms and tools to facilitate their interaction with farmers. Since knowledge generation is a continuous process; researchers and extension staffs need to continuously keep in touch with farmers so that they can capture new knowledge that is generated. This new knowledge can then be fed back into the research and development (R&D) system for further research to address issues that need answers.

Insufficient training programs for farmers, low general educational level of farmers and the delays in information delivery were amongst some of the pressing constraints ranking 2nd, 3rd and 4th with the mean rank of 4.88, 5.66 and 5.88 respectively. Farmers find insufficient training avenues where they come together and share ideas with researchers as a problem to their knowledge advancement about the crop. Delay in information delivery to farmers as one of the pressing constraints brings to mind the situation and condition of the current cocoa extension service as

farmers cannot readily access information on time. This calls for the strengthening of the existing lean extension system and the need for its privatization or, more private-public partnership in the sector.
Furthermore, political interference in input distribution to farmers, high cost of adoption of recommended technology and research information by CRIG and poor farmer and extension agent's knowledge in ICT systems (mobile telephony, internet etc) were 8th, 9th and 10th most pressing constraints with a mean rank of 8.53, 9.1 and 9.64 respectively. The constraint here is that, the distribution of farm inputs and government programs such as the cocoa mass spraying exercise which is aimed at assisting farmers to increase their cocoa production is given a political colour. Farmers express discontent of political interference when it comes to the distribution of these incentives by government thereby enriching some farmers and impoverishing others. The removal of these barriers as a way of allowing the relevant AKIS actors to deal with this situation will ensure the even distribution of this national cake for the benefit of the farmers. Expatiating on high cost adoption of recommended technology and research information by CRIG personnel, farmers are of the view that, it is very difficult to come by and even if they have access, affordability of such recommended techniques becomes a problem. Research information on new techniques and methods are also difficult to get due to the lack of the frequent interactive session they have with the researchers.

Additionally, the use or knowledge about the use of ICT in information search, finding market opportunities in this modern age cannot be glossed over. Its ranking as a constraint and not among the top five most pressing constraints could be attributed to the poor knowledge of farmers and their extension agents in its usage. The importance of ICT is supported by works of the following authors. According to Obiechina (2004), agricultural farmers have the opportunity to access information through ICT and have the opportunity to create networks with development agencies and other farmers, thus increase their chances to strengthen their agriculture productivity.

ICT without doubt has big impact on agriculture. ICT also gives opportunity for farmers to widen their market and gain new customers through internet (Pickerrnell, et al 2004). An example of successful use of ICT in agriculture development is "mobile telephony". It has been used as a means of accessing market prices, weather and other advice. It is currently the most accessible ICT available, allowing access to a broad spectrum of people including marginalized people in remote rural areas (Mangstl, 2008). All of these changes give advantage to farmer in creating cost effective project and provide the opportunities to improve their quality of life. The role of ICT in improving rural livelihood was officially recognized and endorsed at the World Summit on the Information Society (WSIS), 2003-2005. This includes the use of computers, internet, geographical information systems, mobile phone as well as traditional media such as radio and TV (Stienen *et al.*, 2007). According to a research done by Batchelor *et al.* (2005), ICT is one of the tools to overcome poverty. This is also strengthened by a study done by Dixon *et al.* (2007), which found that ICT can reduce poverty especially on the rural area. From the foregoing adequate training on ICT for the various actors in the AKIS chain would go a long way to help in the knowledge and information dissemination process.

A few cocoa licensed buying companies (LBC's) providing cocoa-based information ranked the least among the fifteen (15) constraints. It confirms the assertion by Baah (2002) that potential service providers abound in the cocoa communities including licensed buying companies (LBCs) adding that many are already providing information, inputs and advice to its clients (farmers). Efforts must therefore be intensified to get all the LBCs in the communities involved in this crucial task by way of equipping them with the needed logistics and update on cocoa agronomic practices. In conclusion, it appears not to be enough synergy between these actors leading to these countless shortfalls in cocoa-based information dissemination hence weak performance of the system. Efforts involving actors in their frequent interaction, organization of relevant training programs for farmers will help bring cocoa-based AKIS to an enviable level. This would also help farmers to readily translate and practicalize the information- heard, knowledge-learnt and technology-taught issues by their respective actors overcoming informational constraints and eventually increasing living standards of rural farmers.

Conclusion

From the discussions, it is concluded that, agricultural knowledge and information is shared among cocoa farmers, agricultural educators, researchers and extensionists through a variety of channels. Shortfalls in the functions of the various actors have led to the knowledge and information constraints of cocoa farmers both old and new. The

collective effort by all the actors is important in ensuring that the discussed constraints are removed for free flow of information, knowledge and new technologies to enhance productivity to better the lot of farmers since they form the ultimate end-users of any developed technology.

Acknowledgement

We would like to put on record the immense support received from Mabe F. Nantui, Ms Erica Tegah and Obed Boanya in bringing this piece to fruition.

References

[1] Batchelor, M.S., N. Scott, D. Woolnough and I. Tambo, 2005. Good Practice Paper on ICT for Economic Growth and Poverty Reduction. Paper Presented at World Summit on the Information Society Geneva, Switzerland, 13 July, 2005

[2] Dixon, N.A., L. Sallstrom, A.L. Wasmer and R.J. Damuth, 2007. The Economic and Societal Benefits of ICT Use: An Assessment and Policy Road Map for Latin America and the Caribbean, pp: 61-64. Comptia Publisher, Arlington, United States of America

[3] FAO and World Bank, 2000. Agricultural Knowledge and Information Systems for Rural Development (AKIS/RD). Strategic Vision and Guiding Principles. Food and Agriculture Organization of the United Nations, and World Bank: Rome.

[4] Hill, P., 1963.The Migrant Cocoa Farmers of Southern Ghana: A Study in Rural Capitalism. Cambridge: Cambridge University Press

[5] LEISA 2002. Changing information flows: Editorial introduction. Leisa 18 (2) 4-5.

[6] Mangtsl, A., 2008. Emerging issue, priorities and commitments in agriculture. J. Agric. Inform. Worldwide, 1: 5–6

[7] McQuail, D., 1983. Mass communication theory. London: Sage publications.

[8] Obiechina, J., 2004. ICT and Agriculture: A contest Project on ICT and Agriculture. Paper presented at AYF's seminar on ICT and Agriculture, Accra, Ghana, 21-23 April, 2004

[9] Pickernell, D.G., M.J. Christie, P.A. Rowe, B.C. Thomas, L.G. Putterill and J.L. Griffith, 2004. Farmers market in Wales: Making the network? J. British Food, 106: 194–210

[10] Röling, N., 1986. Extension science: increasingly preoccupied with knowledge systems. Sociologia Ruralis, 25: 269-290.

[11] Saha, A., H. A. Love, and R. Schwart, 1994. Adoption of emerging technologies under output uncertainty. American Journal of Agricultural Economics 76, 836-846.

[12] Stienen, J., W. Bruinsma and F. Nueman, 2007. How ICT can Make Difference in Agricultural Livelihoods, pp: 2–4. The Commonwealth Minister Reference Book, Henley Media Group Publisher, Hague, Netherland

[13] Thysen, I., 2000. Agriculture in the information society. J. Agric. Engin. Res., 10: 297–303

[14] Tiwari, T. P., R. M. Brook, and F. L. Sinclair, 2004. Implications of hill farmers' agronomic practices in Nepal for crop improvement in maize. Exp Agric 40:397–417

[15] World Bank 2004. Democratizing HIV Communication: Development Outreach. World Bank. Washington, DC.

Tables:

Table 1: Distribution of farmers by their Socio economic characteristics

Characteristics	Frequency	Percentage
Age	24	8
25-35 years	78	26
36-46 years	114	38
47-57 years	84	28
ABOVE 57 years	57	
Education		
No Formal Education	57	19
Primary	87	29
Middle/Junior High	36	12
Senior High	107	35.67
College/University	13	4.33
Marital status		
Single	12	4
Married	253	84.33
Widowed	28	9.33
Divorced	7	2.33
Gender		
Male	240	80
Female	60	20
Family size		
1-5	115	2.3
6-10	132	16.3
11-15	26	40.3
>15	27	24

Table 2: Distribution of farmers by their Socio economic characteristics

Characteristics	Frequency	Percentage
Farming Experience		
1-10 years	96	32
11-20 years	86	28.7
21-30 years	64	21.3
31-40 year	23	7.7
41-50 years	18	6
51-60 years	13	4.3
Migration Status		
Native	268	89.33
Migrant Farmer	32	10.67
Nature of farm Ownership		
Family Land	85	28.33
Own Land	135	45
Lease	44	14.67
Others	36	12
Total Farm Size		
0-10	128	42.67
11-20	39	13
21-30	21	7
>30	37	12.33
Don't Know	75	25
Cocoa variety		
Amazonia	95	31.67
Amelonado	36	12
Hybrid	64	21.33
Mixed	105	35
Total	300	100

Source: Compiled from survey data 2010-2011

Table 3: Rank of Constraints by Cocoa Farmers

Constraint	Mean rank	Rank
Inadequate interaction with research and extension agents	4.57	1
Insufficient training programs for farmers	4.88	2
Low general educational level of farmers	5.66	3
Delay in information and knowledge delivery	5.88	4
Poor access to recommended inputs	6.39	5
Ineffective extension support system	6.59	6
Poor support system	7.67	7
Political interference in input distribution to farmers	8.53	8
High cost of adoption of recommended technology and research information by CRIG personnel	9.1	9
Poor farmer and extension agent's knowledge	9.64	10
Inadequate information on cocoa prices	9.73	11
Unfavorable government policies concerning cocoa	9.87	12
Bad attributes of extension agents towards information dissemination	9.94	13
Low general capacity of extension agents to information dissemination	10.25	14
Few cocoa buying companies (LBC's) providing cocoa-based information to farmers	11.29	15
Test Statistics		
(N) Sample size	300	
Kendall's W	0.27	
Chi-Square	1.162	
Degrees of freedom	14	
Asymptotic Significance	0.000	

Source: Computed from survey data 2010-2011