Pelita Perkebunan 35 (3) 2019, 230–240 ISSN: 0215-0212 / e-ISSN: 2406-9574

Empirical Analysis of the Best Warehousing Practices and Its Impact on Cocoa Beans Quality: The Perspective of Cocoa Producers

Ishmael Prah[1*)] and Peter Dzakah Fanam[2)]

[1)]Kwame Nkrumah University of Science and Technology – Department of Supply Chain and Information Technology, KNUST School of Business PMB Knust, Kumasi - Ghana
[2)]University of Tasmania – The Australian Maritime College Maritime Drive, Launceston – Tasmania, Australia
[*)]Corresponding author: ish.prah2018@gmail.com
Received: 14 June 2019 / Accepted: 3 September 2019

Abstract

The importance of cocoa to the economy of Ghana cannot be overemphasized. For several decades, cocoa has been the backbone of the country's economy and plays a major role in employment, foreign exchange earnings, government revenue, education, and infrastructural development of Ghana. Ghana is the world premier supplier of high quality cocoa and second largest exporter of the commodity. Maintaining this high quality of cocoa beans is important in maintaining this status, and in doing so, continue in charging a cocoa premium price. In this study, four best practices of cocoa warehousing were identified from literature and the impact they have on the quality of cocoa beans was explored to much detail using data collected from sixty-six district managers and depot keepers of cocoa warehouses in the Agona East and Agona West districts of the Central region of Ghana. A structural equation model was developed and tested to explore this phenomenon. The findings revealed that the four cocoa warehousing best practices – inventory control, warehouse maintenance, warehouse inspection, and records keeping – were significantly positively associated with quality of cocoa beans. This suggests that all efforts aimed at improving these aspects of cocoa warehousing would reflect positively on the quality of cocoa beans. The study also revealed important challenges to cocoa warehousing in the sampled cocoa warehouses and depots including low capacity of warehouses, poor lighting, poor ventilation, attack by pests and diseases, mishandling, insufficient equipment and facilities, pilferage and damage of cocoa beans, and lack of training for staffs and other workers of cocoa warehousing and storage institutions. These challenges threaten to lower the quality of Ghana's cocoa beans. The study recommends that greater investment should be channelled into cocoa warehousing as doing so would address most of the challenges identified. The study also calls for further research into other cocoa warehousing practices not tackled in this study to determine how they impact on the quality of cocoa beans.

Keywords: Warehouse, cocoa beans, beans quality, handling, Ghana

INTRODUCTION

Cocoa harvesting span several time periods and the peak harvest in Ghana is between October to December (Vos *et al.*, 2003; Mikkelsen, 2010). Alternatively cocoa is also harvested at all times of the year provided the tree is in its production stage (Wood & Lass, 1985) Harvesting is usually done using particular tools and techniques. Sharp cocoa hook on a stick are used for pods higher up the trees. Secateurs are used to harvest pods within easy reach. These tools are required to be maintained and kept clean (ICCO, 2008). Harvesting of cocoa pods is required to be done on regular time periods (Mossu, 1992). A delay in harvesting ripe cocoa result in germination of the beans inside the pods and harvested unripe pods have smaller beans which when fermented produce poor quality of beans with possible lower fat content which are low in aromatic compounds (Wood & Lass, 1985). Hence, pods should be collected rapidly and efficiently to avoid damage by rodents and other predators. Pods sorted out into healthy, diseased, damaged and mature classes. The time between pod harvesting and breaking of the pods influences bean quality.

Warehousing management is a very important process in the cocoa value chain. There are several propositions of what encompasses a good warehouse management system. Rushton *et al.* (2000) contend that in warehouse management, it is importance for individuals and organizations to pay particular attention to warehouse design structure to ensure that the products stored are maintained in good storage condition in the value chain for the market or customer. Rushton *et al*, (2000) further explain that warehouse management includes maintenance the product quality and integrity and at the same type reducing drastically products quality decline due to depreciation, obsolescence, spoilage, breakage and pilfering, and complying with food and drugs regulations.

Bidgoli (2010) also explains that a warehouse management system (WMS) computerizes all warehousing operations including handling, storage and information transfer logistic activities. This he noted will ensure efficiency in warehousing operations and information system.

Cocoa beans warehousing and storage follows immediately after drying of the cocoa beans and it is one of the most important stages in the cocoa value chain. The importance of cocoa warehousing and storage in the cocoa value chain cannot be overstated as it also precedes cocoa beans export and sale. In Ghana, warehouse for storing cocoa beans are popularly called depots.

Cocoa beans storage starts at the farmer's level right from drying before it is delivered to the purchasing clerks (PCs) at the various communities. The PCs upon obtaining the stocks from the farmers also store the produce for a relatively short period of time and then deliver the stock to their various LBCs (Olam, 2005). The LBCs also store the cocoa beans at their depots until they are graded and sealed by QCCL before they subsequently delivers the stock to the COCOBOD at COCOBOD determined Take-over-point (TOP) in Tarkoradi, Tema or Kaase (Olam, 2005).

COCOBOD warehouses at the various TOP managed by CMC serve as the last storage point before the produce is sold on the world market by CMC, the COCOBOD subsidiary which is mandated to sell Ghana's cocoa internationally (Olam, 2005). It is important to note that cocoa warehouse is done at two major levels, that is, at the LBCs depots and at the Cocoa Marketing Company TOP. Throughout these levels of cocoa beans storage, it is important to ensure that there is effectiveness and efficiency at the warehouses in order to ensure that the high premium quality of Ghana's cocoa beans is maintained.

According to Olam (2005), careful steps and processes must be followed to create the enabling environment for proper storage of the cocoa beans. Unless cocoa is properly stored, Olam (2005) argues that there is high risk of the cocoa beans becoming damaged from moisture, pest infestation and diseases infection, contamination by mould and foreign odours, or even stolen by thieves. Olam (2005) and CMAA (2010) recommended five stage warehousing storage process to control the risk of mould of the cocoa beans. However, Dand (1999) noted that cocoa beans should be stored in a chemical and metals free warehouses in other to maintain the quality and the chocolate aroma of the cocoa beans because materials like chemicals and certain metals are offensive to the cocoa and cocoa tend to pick up the odour of such materials thereby affecting the quality of the cocoa beans.

In cocoa farm management, regular weeding, spraying of cocoa trees against pests and diseases, removal of epiphytes and climbers, harvesting at the suitable time period when the pods are fully ripped and proper fermentation and drying advance the quality of the cocoa beans (Magan *et al*., 2003). Exposure of cocoa beans to high clamminess is likely to take place at stages between harvest and final consumption. Poor post-harvest management can result in quick decline in the quality of cocoa, hence reducing the commercial and nutritional values (Magan *et al*., 2003). The effectiveness of the drying process predicts the quality and the life of the product to be stored (Thompson *et al*., 2001). Usually dried cocoa beans with good humidity content normally resist mould growth and insect infestation (Thompson *et al*., 2001). Nevertheless, given that cocoa beans tend to absorb moisture from the air, moving them from cool to warm areas without adequate temperature could cause moisture migration (Jonfia-Essien & Navarro, 2010). Ironically some farmers in Ghana and particularly Nigeria and other neighboring countries still practice the system of storing dried cocoa beans on the floor. This practice expose the beans to rodent and insect pest attack (Dongo *et al.,* 2009).

Whilst some companies in most West Africa countries are practicing bulk handling in containers, others are still bagging cocoa beans in jute bags for trading (Navarro *et al*., 2007). This practice subjects the cocoa beans to problems such as insect infestation, mould contamination hence reducing the quality of the cocoa product (Villers *et al.*, 2007). Warehouses are convenient and suitable means for storing and protecting cocoa beans (Plate 2.8). A well planned warehouse structure ought to be free from insect infestations which affect the quality of the beans (Jonfia-Essien & Navarro, 2010). An alternative method of storage that guards the cocoa beans from insects and moulds is the hermetic storage (HS) technology. This technology, also known as sealed storage, airtight storage, or assisted hermetic storage, is a form of bio-generated modified atmosphere (MA) (Plate 2.9). According to Jonfia-Essien *et al.* (2008) cocoa beans that are stored through Hermetic storage technology maintain their quality.

MATERIALS AND METHODS

The paper is an empirical exploratory study which estimates the impact of identified cocoa best warehousing practices on quality of cocoa beans using data collected from warehouse operators and managers of selected warehouses in the Agona East and West districts of the Central Region of Ghana. The study is mainly a quantitative one, and hypothesizes that sound warehousing practices have a positive impact on the quality of cocoa beans. Quantitative research allows an objective and formal process in which numerical data are used to measure phenomena and produce findings (Leach, 1990).

The survey instrument was designed to collect the needed data from the cocoa producers in Ghana to enable the authors to analyze the cocoa best warehousing practices. The survey instrument was designed based on the intensive literature review on best warehousing practices. Thus, the survey questionnaire for the present study was designed based on the contemporary literature review which resulted in the formulation of the 20 warehousing practices statements.

The data was collected using questionnaire; the hypotheses of the study were tested by analyzing data from survey of 66 respondents from the study area. Structured questionnaires are used in data collection and responses received are analyzed using Structural Equation Modeling (SEM) procedures that estimate the strength and significance of the hypothesized relationships. Findings, conclusions, and recommendations are then provided.

The research model developed for this study involved four identified constructs which explore identified best cocoa warehousing practices. These constructs are inventory control, warehouse maintenance, warehouse inspection, and records keeping. These four constructs were identified in the work of Danso-Abbeam *et al.* (2012) when he studied the warehouse practices of COCOBOD. In this research, these four practices are developed into constructs and are conceptualized together to define the manifest construct named best cocoa warehousing practices.

Best cocoa warehousing practices is then conceptualized to impact positively on quality of cocoa beans, which was conceptualized from CMAA (2010) specifications. This construct measures the state of the cocoa beans kept in the warehouse. The research model is presented in Figure 1.

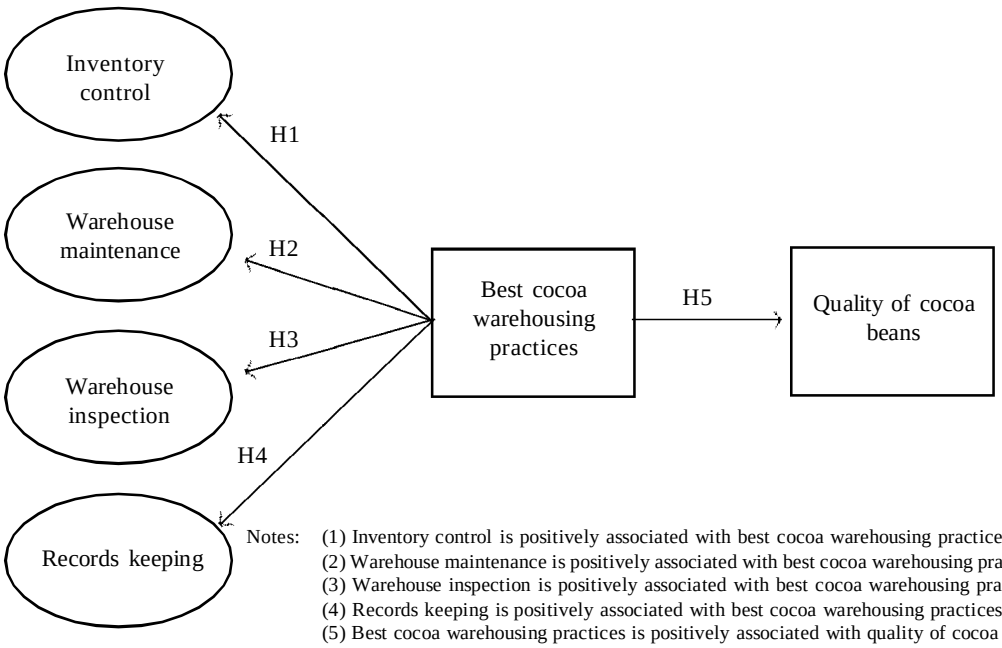

Figure 1. Research model for the study

It will be crucial in driving the study and help the researchers to confirm whether the identified best practices are supported empirically and estimate the impact of cocoa warehousing best practices on quality of cocoa beans. Each hypothesis is a structural path in the research model and the test of the measure of the strength of each structural path will indicate whether a hypothesis is supported or not. The researchers propose that each identified category of warehousing practices were positively associated with best cocoa warehousing practices.

RESULTS AND DISCUSSION

In terms of the frequency distribution, about 58% of the respondents were district managers, whilst sampled depot keepers consisted of about 42% of the sample size as shown in Table 1.

Table 1. Positions of respondents

Current position	Frequency	Percent	Valid percent
District manager	38	57.6	57.6
Depot keeper	28	42.4	42.4
Total	66	100.0	100.0

Interestingly, of the sixty-six respondents surveyed, all were males. This leads the researchers to believe that cocoa warehousing and storage is a predominantly male dominated activity. The age of the respondents revealed that a majority of the respondents were within the age range of 31-40 years (almost 60%), followed by respondents 41-50 years old (about 23% of respondents). The least represented age group was 51-60 years, which represented only 9.1% of total respondents.

When quizzed on how long respondents had been working with their firms, 45.5% of them revealed they had been employed there for five years or less. Another 31.8% of respondents had been at post for 6 to 10 years. Only six respondents had been at post for twenty-one years or more (Table 2).

Table 2. Length of working with firm

	Frequency	Percent	Cumulative percent
1-5 years	30	45.5	45.5
6-10 years	21	31.8	77.3
11-20 years	9	13.6	90.9
21-30 years	3	4.5	95.5
Over 30 years	3	4.5	100.0
Total	66	100.0	—

Major Cocoa Warehousing Practices

As part of the study's objectives, the major cocoa warehousing practices that occur in the warehouses are presented in this section. Respondents were asked to list the major activities that are involved in warehousing and storing cocoa. The results obtained were summarized, grouped under thematic areas, and presented with their frequencies in Table 3.

Table 3. Warehouse activities

Warehouse activity	Frequency	Respondents (%)	Cases (%)
Ensure stored bags of cocoa are kept free of dirt, dead insects, cobwebs, cocoons, etc.	34	51.52	12.78
Maintain torn cocoa bags	32	48.48	12.03
Ensure adequate spacing between stacks of cocoa	32	48.48	12.03
Ensure proper stacking to allow free flow of air	31	46.97	11.65
Use warehouse to store cocoa only	31	46.97	11.65
Store bagged cocoa beans on pallets/gratings	30	45.45	11.28
Ensure that floor is always kept free of spilled beans	26	39.39	9.77
Ensure adequate ventilation	21	31.82	7.89
Ensure sufficient lighting	19	28.79	7.14
Ensure that the standard warehousing practices areadhered to	10	15.15	3.76
Total	266	—	100

A total of 266 different responses were obtained on the warehouse processes from respondents. These responses were summarized into ten thematic areas by the researchers. The most cited activity was ensuring that the stored bags of cocoa were free from dirt, insects, cobwebs, etc. This activity was indicated by 34 respondents (which is 51.52% of the respondents), and forms 12.78% of all cases of warehousing activities identified. Interestingly, the least mentioned warehousing activity carried out was ensuring the meeting standards of cocoa warehousing and storage, with just 10 respondents indicating this as an important warehouse process. The full range of identified warehousing processes has been presented in Table 3.

Challenges Facing Cocoa Warehousing

The study also sought to identify the peculiar challenges that confronted cocoa warehousing firms. To achieve this, the researchers directly asked the respondents to list the major problems that they faced in warehousing and storing of cocoa. The identified challenges with their frequencies of occurrence are also presented in thematic areas in Table 4.

From Table 4 above, it is evident that the challenge most cited by respondents was inadequate capacity of warehouses, with almost 33% of respondents complaining about little capacity of warehouses. Closely related to the challenge of small warehouses is challenge of limited actual cocoa storage space within the warehouses, which was noted by 18.51% of total respondents. Nine point twenty five percent (9.25%) of respondents also report that the cocoa was sometimes stored on the bare floor. Other major challenges that werecited by the respondents include poor lighting (27.18%) and poor ventilation (9.83%), lack of periodic staff training (18.51%), mishandling, pilferage and damage of cocoa beans (13.88%), and attack by pests and diseases (9.83%).

The research also sought to explore the relationship between warehousing best practices and the quality of cocoa beans in the warehouses. This was achieved using the research model of the study which hypothesizes that a positive relationship existed between the warehouse best practices of inventory control, warehouse maintenance, warehouse inspection, and records keeping, and quality of cocoa beans. The results of the SmartPLS analysis is presented and discussed in this section.

Validity and Reliability Model

Before presenting the results of the SEM analysis, it is necessary to discuss the validity and reliability of the research model, the research constructs, and the research instruments. The validity and reliability of the research model and constructs was measured by testing for composite reliability, Average variance extracted, and factor loadings and cross loadings. Composite reliability measures the

Table 4. Challenges of cocoa warehousing and storage

Identified challenges	Frequency	Respondents %	Cases %
Low capacity of warehouses	57	32.96	21.76
Poor lighting	47	27.18	17.94
Lack of periodic training for staff and workers	32	18.51	12.21
Inadequate storage space in the warehouse	32	18.51	12.21
Mishandling, pilferage and damage of cocoa beans	24	13.88	9.16
Holes and cracks in walls and floors	20	11.57	7.63
Poor warehouse ventilation	17	9.83	6.49
Attack by pests and diseases	17	9.83	6.49
Storage of cocoa on bare floor	16	9.25	6.11
Total	262	—	100

ability of the indicators to explain the variance of their latent variable (Chin, 1998). A rule of thumb benchmark of values of minimum 0.7 is usually used, although 0.60 to 0.70 is considered acceptable for exploratory studies. The results presented in Table10 show that all latent constructs have composite reliability values greater than 0.7.

Average variance extracted (AVE) suggested by Fornell & Larker (1981) measures the amount that a latent variable component captures from its indicators as opposed to the amount due to measurement error. Typically, a value greater than 0.50 is recommended (Fornell & Larcker, 1981), and the AVEs for the all constructs in the research model meet this requirement except Inventory Control, which has an AVE of 0.488266. R Square (coefficient of determination) measures the extent to which a construct is explained by their predictor(s). From Table 5, all R square values of the constructs are strong and add to the strength of the research model.

Convergent validity is achieved when scores of items used to measure a construct correlate with or are related to scores of other items that are designed to measure the same construct (Campbell & Fiske, 1959). Convergent validity can be assessed by measuring the reliability of survey items - composite reliability of constructs, average variance extracted (AVE) and factor analysis (Komiak & Benbasat, 2006). Some of the reflective items had in adequate loadings or had significant loadings across constructs and these were removed from the analysis. Because of their reflective nature, items capturing a reflective construct can be removed from data analysis without changing the meaning of the construct (Bollen & Lennox, 1991). There was an issue of high cross-loadings for research items IC4, RI2, RI3 and WM1 (Table 6) and it was advisable to refine these items and recollect data on them. However, due to time and resource constraints, data analysis proceeded with this minor limitation. Future research will focus

Table 5. Summary of attributes of the constructs

	Composite reliability	AVE	R Square
Inventory control	0.737341	0.488266	0.716755
Quality of cocoa beans	0.954960	0.841434	0.522322
Records keeping	0.970683	0.892225	0.852741
Warehouse best practices	0.915940	0.501674	—
Warehouse inspection	0.806445	0.586468	0.890545
Warehouse maintenance	0.774455	0.535900	0.744490

Table 6. Item loadings and cross loadings

	Inventory control	Quality of cocoa beans	Warehouse inspection	Records keeping	Warehouse maintenance
IC2	**0.7189**	0.2439	0.5458	0.5428	0.5489
IC3	**0.7931**	0.8425	0.7377	0.5074	0.5795
IC4	**0.5631**	0.3575	0.2436	0.2406	0.3466
Q1	0.6577	**0.8872**	0.6599	0.4687	0.5580
Q2	0.6538	**0.8881**	0.6880	0.4946	0.5657
Q3	0.6648	**0.9566**	0.6757	0.4328	0.5423
Q4	0.6673	**0.9352**	0.6656	0.4008	0.5524
RI1	0.6452	0.5355	**0.8833**	0.8857	0.7727
RI2	0.4930	0.3741	**0.6292**	0.4194	0.5292
RI3	0.6628	0.7906	**0.7635**	0.4707	0.5248
RK1	0.5972	0.4891	0.7027	**0.9262**	0.7617
RK2	0.6404	0.4952	0.7942	**0.9502**	0.7401
RK3	0.5859	0.4648	0.8117	**0.9534**	0.7331
RK4	0.6221	0.4078	0.7683	**0.9483**	0.7354
WM1	0.6222	0.7488	0.5836	0.3204	**0.5902**
WM3	0.4335	0.3866	0.6028	0.6765	**0.8129**
WM5	0.5650	0.2752	0.6046	0.6825	**0.7762**

attention on refining these research items further

Research Hypotheses Test

Analysis and empirical validation of the hypothesized relationships was done using partial least square (PLS) analysis. SmartPLS (Ringle *et al.*, 2005) was used for the analysis as it is well suited for complex models involving latent variables and requires fewer data points to estimate loadings (Chin, 1998). The magnitude and significance of the hypothesized causal relationships are presented as standardized path coefficients. The parameter estimate of the hypothesized structural path should be statistically significant with the hypothesized direction of the effect. The SmartPLS output with the estimates of the path coefficients and the R square values for the research model is shown in Figure 2. Path coefficients are shown on the paths that join constructs together, and the R square values are shown inside the constructs.

The path coefficients depict the strength of the relationships between the constructs. The values range from 0 (no relationship between constructs) to 1 (very strong relationship between constructs). SmartPLS performs bootstrapping calculations to determine the critical ratio of relationships between constructs which tells whether relationships between constructs are significant or not. The bootstrapping results revealed that all the hypothesized relationships were significant at $p < 0.01$. Table 9 presents the results of the path coefficients between constructs (effect size), critical ratio (level of confidence), and indicates whether hypothesized relationships were supported or not.

As can be seen from Table 7, all the hypothesized relationships were supported at $p< 0.01$, which indicates very significant effects. Inventory control, warehouse maintenance, warehouse Inspection, and records keepings are confirmed empirically as being positively associated with cocoa warehousing best practices. Also, the total effect of these warehousing best practices was confirmed to have a significant positive impact on quality of coca beans.

There were a few limitations to the study. Firstly, there were four reported cases of high cross-loadings in the research items of the study. Also the AVE of the inventory control construct was 0.488266 which is slightly lower than the standard of 0.5 suggested by Fornell & Larker (1981). These have a negative implication on the validity of the study. Also, the sample size of sixty-six respondents, whilst sufficient for SmartPLS analysis, may be considered small for a quantitative study of this nature. Future research would be directed at perfecting the research measurement items and eliminating all reported cases of cross-loadings. Also, the researchers will seek to identify other warehousing best practices from literature and test in a similar manner to see how they will impact on the quality of cocoa beans.

Table 7. Research results from SmartPLS analysis

H	Hypotheses	Path coefficient (effect size)	Critical Ratio (level of confidence)	Hypotheses supported or not supported
H1	Warehousing best practices ⟶ Inventory Control	0.830	52.038 ***	Supported
H2	Warehousing Best Practices ⟶ Warehouse Maintenance	0.902	89.063 ***	Supported
H3	Warehousing Best Practices ⟶ Warehouse Inspection	0.936	140.844 ***	Supported
H4	Warehousing Best Practices ⟶ Records Keeping	0.936	207.762 ***	Supported
H5	Warehousing Best Practices ⟶ Quality of Cocoa Beans	0.679	23.624 ***	Supported

*** $p < 0.01$

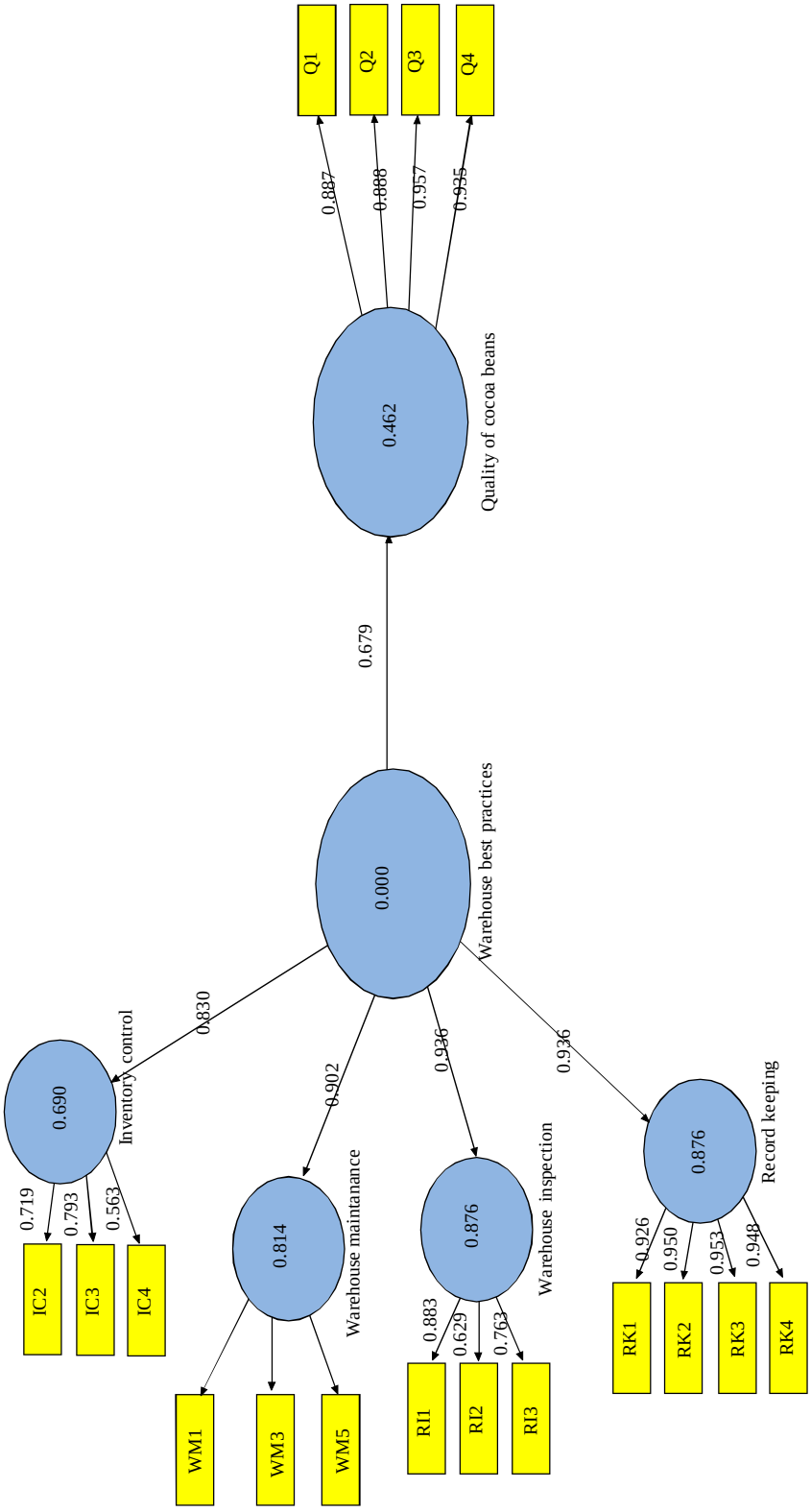

Figure 2. Research model indicating factor loadings

CONCLUSIONS

This paper empirically confirms inventory control, warehouse maintenance, regular warehouse inspection, and records keeping as important aspects of cocoa warehousing best practices to a high degree of confidence. These activities were positively associated with warehousing best practices. The study also empirically confirms that the joint effect of these warehousing best practices impact positively on the quality of cocoa beans based on the data collected. The findings have revealed that inventory control, warehouse maintenance, regular warehouse inspection, and records keeping should be established as important criteria and considerations in the operations of firms involved in the warehousing and storing of cocoa beans as these have been established as important cocoa warehousing best practices. Several of the challenges that were identified in cocoa warehousing and storage could be addressed by increasing investments in warehouse facilities and equipment. Warehouses and depots were hamstrung with low capacity issues, insufficient equipment, poor infrastructure, and insufficient training. Considering the amount of revenue cocoa export generates for the economy, it should not be too difficult to increasing investments in warehouses so as to tackle these challenges.

ACKNOWLEDGEMENTS

We wish to acknowledge the contribution of Mr.Benjamin Wilson, and Mr. Abass Afful District Directors of Agriculture for Agona East and West of the Central Region of Ghana respectfully for their assistance in selecting the research locations and for their advice and information about the district and its agricultural activities. Agricultural Extension Officers in both districts whose operational areas the research was carried out, we thank them for the role they played in this study and for the immense support in organizing depot keepers and district officers for numerous meetings that were held during the fieldwork. Finally, we wish to thank Mr Benjamin Agyei-Owusu, Dr. David Asamoah and Prof. Jonathan Annan of KNUST Business School in Ghana, for their hard work and contribution towards the study.

REFERENCES

Bidgoli, H. (2010). *The Handbook of Technology Management: Supply Chain Management, Marketing and advertising, and global management*. John Wiley and Sons, Inc. New Jersey, USA.

Bollen, K. & R. Lennox (1991), Conventional wisdom on measurement: A structural equation perspective. *Psychological Bulletin*, 110, 305–314.

Campbell, D.T. & D.W. Fiske (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychology Bulletin*, 56, 81–105.

Chin, W.W. (1998). Commentary: Issues and opinion on structural equation modeling *MIS Quarterly*, 22, vii–xvi.

CMAA (2010). *Warehouse Inspection Program. COCOBOD News* (September 2008), A Publication of Ghana Cocoa Board. Accra, Cocoa Merchants' Association of America, Inc. Ghana.

Dand, R. (1999). *The International Cocoa Trade*. (2nd Ed). Abington, Cambridge: Woodhead Publishing Limited. UK.

Danso-Abbeam, G.; R. Aidoo; K.O. Agyemang; K. Ohene-Yankyera (2012). Technical efficiency in Ghana's cocoa industry: Evidence from Bibiani-Anhwiaso-Bekwai District. *Journal of Development and Agricultural Economics*, 4, 287–294.

Dongo, L.N.; E.O. Aigbekaen; C.O. Jayeola; L.A. Emaku & S.B. Orisajo (2009). Influence of farmers practices on cocoa bean quality: Nigeria field experience. *African Crop Science Conference Proceedings*, 9, 299–302.

Fornell, C. & D.F. Larcker (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18, 39–50.

ICCO (2008) Consultative board on the world cocoa economy. *Manual of Best Known Practices in Cocoa Production*. International Cocoa Organization. London, UK.

Jonfia-Essien, W.A.; S. Navarro & J.V. Dator (2008). Effectiveness of hermetic storage in insect control and quality preservation of cocoa beans in Ghana. p. 305-310. ***In:*** *Proceedings of Eight International Conference on Controlled Atmosphere and Fumigation in Stored Products*. G. Daolin;S. Navarro; Y. Jian; T. Cheng; J. Zuxun; L. Yue & W. Haipeng (Eds). Chengdu, China. 21-26 September 2008, Sichuan Publishing Group, Sichuan, China.

Jonfia-Essien, W.A. & S. Navarro (2010) Effect of storage management on free fatty acid content in dry cocoa beans. *10th International Working Conference on Stored Product Protection. Julius-Kühn-Archives,* 425, 963–968.

Komiak, S.Y.X. & I. Benbasat (2006). The effects of personalization and familiarity on trust and adoption of recommendation agents. *MIS Quartely*, 30. 941–960.

Leach, M. (1990) Philosophical choice nursing. *The Journal of Clinical Practice, Education and Management*, 4, 16–18

Magan, N.; R. Hope; V. Cairns & D. Aldred (2003). Post-harvest fungal ecology: Impact of fungal growth and mycotoxin accumulation in stored grain. *European Journal of Plant Pathology*, 109, 723–730.

May, P.; R. Vegro & J.A. Menezes (1993). *Coffee and Cacao Production and Processing in Brazil*. United Nations Conference on Trade and Development. UNCTAD/ COM, Rome.

Mikkelsen, L. (2010). *Quality Assurance along the Primary Processing Chain of Cocoa Beans from Harvesting to Export in Ghana.* Research Paper Faculty of Life Science, University of Copenhagen, Denmark.

MMYE (2007). *Labour Practices in Cocoa.* Ministry of Manpower, Youth & Employment Accra, Ghana.

Mossu, G. (1992). *Cocoa. The Tropical Agriculturalist.* First edition. The Macmillian Press Ltd, London, UK.

Navarro, S.; T. De Bruin; A.R. Montemayer; S. Finkelman; M. Rindner & R. Dias (2007). Use of biogenerated atmospheres of stored commodities of quality preservation and insect control, with particular reference to cocoa beans. *Integrated Protection of Stored Products, IOBC Bulletin*, 30, 197–204.

Olam (2005). Ghana cocoa. *Paper presented at BAHCC Training Programme.* Kumasi, 20–21 Oct, 2005. Olam Ghana Limited. Operational Manual of COCOBOD, WPO Department. Kumasi, Ghana.

Ringle, C.; S. Wende & A. Will (2005). *SmartPLS 2.0* (*Beta*). Hamburg, Germany.

Rushton, A.; J. Oxley & P. Croucher (2000). *The Handbook of Logistics and Distribution Management*. Second edition. Kogan Page Publishers, London.

Thompson, S.S.; K.B. Miller & A.S. Lopez (2001) Cocoa and coffee. pp. 721–733. ***In:*** M.J. Doyle; LR. Beuchat & T.J. Montville (Eds.). *Food Microbiology: Fundamentals and Frontiers*, ASM Press, Washington D.C., USA.

Villers, P.; T. De Bruin & S. Navarro (2007). Development and applications of the hermetic storage technology. *Proceedings of the 9th International Working Conference on Stored Products Protections* (*IWCSPP*). Sao Paulo, Brazil.

Vos, J.G.M.; B.J. Ritchie & J. Flood, (2003). *Discovery Learning About Cocoa. An Inspirational Guide for Training Facilitators.* CABI Bioscience. London, UK.

Wood, G.A.R. & R.A. Lass (1985). *Cocoa.* 4th Edn, Longman Group Ltd., New York. USA.

0