Potential Benefits of the EAPI Agro-processing Skills Training Course on Micro, Small, and Medium Scale (MSMEs) Agro-processors in Uganda

Julia Kigozi (Corresponding author)

Department of Agricultural & Bio-systems Engineering, Makerere University, P. O. Box 7062, Kampala, Uganda

E-mail: jbulyakigozi@yahoo.com

Emmanuel Baidhe

Department of Agricultural & Bio-systems Engineering, Makerere University, P. O. Box 7062, Kampala, Uganda

ORCID iD: https://orcid.org/0000-0002-0045-5633

Isaac Oluk

Department of Agricultural & Bio-systems Engineering, Makerere University, P. O. Box 7062, Kampala, Uganda

Ivan Muzira Mukisa

Department of Food Technology and Nutrition, Makerere University, P. O. Box 7062, Kampala, Uganda

Charles Muyanja

Department of Food Technology and Nutrition, Makerere University, P. O. Box 7062, Kampala, Uganda

Leatitiah Namubiru

Uganda National Bureau of Standards (UNBS) P. O. Box 6329 Kampala, Uganda

Brenda Katarikawe

Uganda Export Promotion Board (UEPB) P. O. Box 5045 Kampala, Uganda

Abstract

Micro, Small, and Medium Scale Enterprises (MSMEs) in Uganda contribute significantly to socio-economic growth and development. Several training programs have been organized to upgrade the skills and competencies of personnel in these agro-processing enterprises but these often lack a wholistic approach. An Empowerment of the Agro-Processing Industry (EAPI) training was organised to include eight modules covering the key concepts necessary for an agro-processor. These included; food process and value-chain management, product optimization, national and international food standards, Good Management Practices (GMP) and hygienic food processing, quality control, waste management, infrastructure development for food production and food product marketing. This study assessed the potential benefits of the EAPI training on 40 agro-processors from 40 selected agro-processing facilities. Upon completion of a three-day skills development training, MSME practitioners were interviewed using a semi-structured questionnaire. Descriptive, scale, and thematic analysis were used in the study. The questionnaire used was reliable (Cronbach's coefficient alpha for relevancy = 0.873). Agro-processors found all modules relevant with an average score ranging between 8.7 and 9.5 on a scale of 10. Increase in knowledge, and interaction between stakeholders were the most outstanding potential benefits of the training. Respondents anticipated improving their operations after the training. Provision of handouts, increasing the number of days for the training, and simplifying the language of delivery were some of the suggested improvements. The study suggests that trainings of this nature could improve operations at different agro-processing facilities.

Keywords: Agro-processing, Micro, Small and Medium-scale Enterprises, Training, Skills Development

1. Introduction

In Uganda, agriculture plays a central role in economic growth generating close to 24% of the Gross Domestic Product (GDP) and more than half of the country's export earnings. Food processing alone accounts for 40% and dominates the manufacturing output in Uganda (Fowler & Rauschendorfer, 2019). Additionally, agro-processing which mainly comprises, mushrooming Micro, Small and Medium Enterprises (MSMEs) (Mutambi, 2013) is the backbone of the manufacturing sector accounting for approximately 60% of its total output (Fowler & Rauschendorfer, 2019). Therefore, harnessing the potential and efficiency of agro-processing MSMEs is key to increasing household production, employment, incomes, and national economic growth. According to MTIC (2014), MSMEs are a channel through which the rural poor and the jobless population can transit into the middle and industrial class. Agro-processing MSME's stimulate growth in the agricultural sector by providing backward linkages in terms of demand for agricultural produce such as fruits (mangoes, pineapple, jackfruit, etc), vegetables and flour (cassava, maize, etc) among others.

Many agro-processed products in Uganda have untapped potential and forecasts for aggregating their market stakes both locally and beyond international borders. Also, primary agricultural produce rather than agro-processed products dominate Uganda's exports hence fetching low returns. According to the World Bank (2012), most agro-processing enterprises operate at less than 50% capacity. However, the current low quality and quantity of the processed products hamper their penetration into the local and international markets. Most of the locally produced products in Uganda do not meet the required standards. Most of the MSMEs are managed by personnel with limited training in food product development aspects such as product optimization, standards, GMPs, Quality assurance and Quality control (Turyahikayo, 2015). This partially explains the low quality and quantity issues surrounding the products produced by MSMEs.

Although several training programs have been organized to upgrade the skills and competencies of agro-processors they are often focused on a particular concept and there is no follow-up as regards further training in other important concepts. The Empowerment of the Agro-processing Industry (EAPI) course was developed with the objective of combining all the basic key aspects necessary for producing products of acceptable quality. The agro-processors therefore, received a more holistic training that would enable them improve their facility/processing protocols more effectively. The training took on a participatory approach so as to first understand the knowledge gaps to enable effective training in new concepts. Evaluation of the training was done to assess its achievements, improve upon its effectiveness and to provide valuable feedback on the design and implementation. This study evaluated the potential of the EAPI agro-processors training course in enabling trained agro-processors to transform the operations of their MSMEs to meet the desired quality of products and increased market share. The study findings have important implications on the development and implementation of the EAPI programme. The findings can also be used to advise agro-processors and policymakers on how best to invest and improve the agro-processing MSMEs to propel national economic growth and development.

2. Methodology

2.1 Structure of the Training

This study was undertaken to assess the potential benefits of a three-day training conducted by the Empowerment of the Agro-Processing Industry (EAPI) to meet the Quantity and Quality Standards for the Local and Export Market; a Programme Enhancing the Practical Skills of Students in Makerere University dubbed EAPI Project. The training was conducted from the 6th to 8th of February 2020 at the School of Food Technology, Nutrition and Bio-engineering Conference Hall, Makerere University.

The training was delivered in a modular manner. A total of eight scientific modules were developed and delivered to the participants. The scientific modules included; (i) Process and value chain management, (ii) Product optimization, (iii) General Manufacturing Practices (GMPs), (iv) Quality control and quality assurance, (v) Waste management, (vi) Standards, (vii) Marketing, and (viii) Infrastructural development. On average, each module took about 1.5 to 2 h. The modules were co-developed and initially reviewed by experts in the respective

fields working within the university, Uganda National Bureau of Standards (UNBS), and Uganda Export Promotions Board (UEPB). The training also involved 40 students from the School of Food Technology, Nutrition and Bioengineering, Makerere University. Each student was attached to a processor majorly to support the processor during simple assignments as well as translating for those that were not very familiar with English.

The modules were developed on purpose as they relate to the core aspects and areas of interest for a company to acquire a Quality Mark (Q - mark). The Q-mark is a standardized mark that symbolizes that a given product is certified for use by the UNBS (UNBS, 2018). Marketing was included since it is one of the major challenges hampering penetration of different products into the local and export markets. Experienced persons in the areas of food safety and quality control, waste management, food-processing infrastructural development, product development, standards, marketing, and export trade thoroughly assessed content in the modules to ensure that they meet the needs of the MSMEs.

2.2 Data Collection and Analysis

The data was collected from 40 respondents (Agro-processors) with the help of semi-structured questionnaires (Appendix). The processors were mainly based in districts of central Uganda (Kampala, Wakiso, Mpigi, Luwero, Kasanda, Mityana, Kayunga, and Mukono). The processors dealt with processing of agricultural produce into juices, dried fruits, wines, flour, yoghurt, grains such as chia seeds, spices, crisps, jam, and peanut butter. The potential effect was determined in terms of the extent to which the training modules were relevant and what processors anticipated to change as a result of the training. The processors were also requested to give suggestions that could improve the delivery of the training. Data analysis was carried out using MS Excel 2016. Descriptive, scale and thematic analysis were used to evaluate the effect of the training on the competences of the agro-processors. Descriptive analysis such as frequencies, percent, means, and standard deviations were used to elaborate the findings for the relevancy of the module, effect of the training, as well as the anticipated change at the facility resulting from the training. Scale analysis employed reliability tests. The reliability of the questionnaire was tested based on the Cronbach's alpha measure of scale reliability as given in equation 1 (Arifin, 2018).

$$\alpha = \frac{K}{K-1}\left(1 - \frac{\sum_{i=1}^{K}\sigma_{Y_i}^{\;2}}{\sigma_x^{\;2}}\right) \#1$$

Where K is the number of items in the scale, $\sigma_{Y_i}^{\;2}$ is the variance of the ith item and $\sigma_x^{\;2}$ is the variance of the scale (total) scores.

The relevancy of the modules delivered during the training were assessed using a 10-point Likert scale, where 1 is Irrelevant and 10 is Very relevant. A thematic coding system was used in analyzing the responses for open-ended questions. Thematic analysis was based on the principles of analysis set out by Braun & Clarke (2006).

3. Results and Discussion

The results of the study are presented in four sections, i.e., Reliability tests, Relevancy of modules, what the participants expected to change after the training and what suggestion for improving the training.

3.1 Reliability Tests

The reliability of the questionnaire was checked using Cronbach's alpha coefficient. The results indicate that Cronbach's coefficient alpha for Relevancy of the modules to the processor (RM) is 0.873 with eight items (modules). The value of Cronbach's alpha ranges from zero to one with the higher values implying the items are measuring the same dimension (Bujang et al., 2018). According to Nunnally & Bernstein (1994), the questionnaire becomes reliable when Cronbach's coefficient alpha is above 0.7. Since the Cronbach's coefficient values fall in the acceptable range, the questionnaire of the study is reliable.

3.2 Relevancy of modules

The results for central tendencies of the relevancy of the training to the processors are presented in

Table 1. The mean score for relevancy of each of the eight modules to the processor (RM) ranged from 8.7 – 9.5, therefore indicating that the processors found all the modules very relevant.

Table 1. Mean scores for relevancy of modules to the processor

Variables	Items	Mean	SD
Relevancy of the module to the processor (RM)	RM1	8.9487	1.2184
	RM2	9.1282	1.1363
	RM3	8.8462	1.3875
	RM4	9.5128	0.9573
	RM5	9.3590	1.0497
	RM6	8.6842	1.8368
	RM7	9.0263	0.9594
	RM8	8.9231	1.4030

RM1 - Process chain management; RM2 - Standards and certification; RM3 - Product optimization; RM4 - GMPs and Hygiene; RM5 - Quality control; RM6 - Infrastructure development; RM7 - Waste management; RM8 - Product marketing and preparation for the export market, SD = Standard Deviation

3.3 Potential impact of training

Often, the training means different things to the participants. The participants were therefore asked to identify key aspects that they liked about the training. The responses were categorized into four major groups as shown in Figure 1. Survey results indicate that 62% and 22% of the respondents noted increase in their knowledge and the interaction between stakeholders, respectively, as the most outstanding aspects of the training. It is not surprising that the majority (62%) acknowledge the knowledge gathered during the training. The information delivered during the training was robust to cover all aspects of the food processing industry. Some respondents particularly appreciated the way information regarding the certification process was presented. The information shared also enabled processors to appreciate the role of Uganda National Bureau of Standards (UNBS) in food processing as opposed to the public misconception that UNBS only impounds uncertified products and shuts down premises in the guise of enforcing standards. Respondent 9 acknowledged learning about the certification process and UNBS requirements. Respondents also mentioned that '*the training gave their company courage and took away the fears of the UNBS*'.
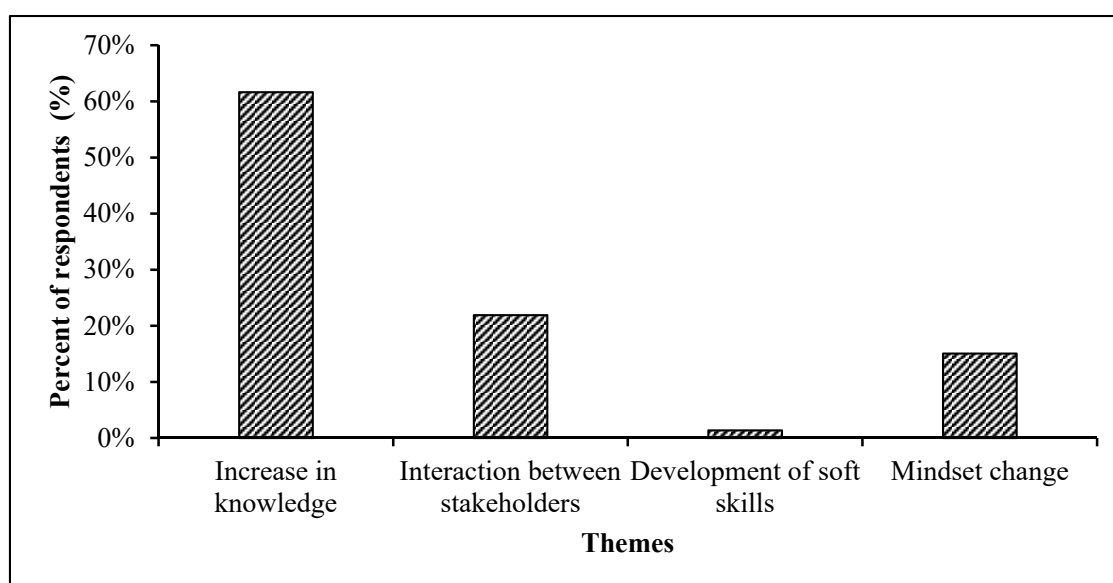

Figure 1. Perceived changes due to the EAPI training of agro-processors (n = 40)

The interaction amongst stakeholders (22%) was the second most important aspect to the knowledge acquisition. The training brought academia (Professors and students), the business community (agro-processors), and regulators (UNBS), and export promoters (UEPB) in one place. It is rare to have all the three arms of food product development interacting at ago. Under normal circumstances, each of the three operates in isolation. The triple helix model enables the generation of robust solutions that are tailored to the same problem. According to Razak & White (2015), the triple helix model allows stakeholders to perform the roles of

others alongside their primary functions, therefore, improving access to services. Also, students' support to the processors during the training could have contributed to the proportion of the interaction among stakeholders. Many respondents acknowledged the immense support provided by the students during the training. Respondent 17 mentioned that '*the engaging and interactive discussion with student consultants who demonstrated excellent technical and interpersonal skills was a plus for the training.*'

Mindset change (15%) that stood in the third position could be attributed to the information shared during the training. Most of the literature on food processing focuses on robust and well-developed industries. The modules were highly simplified to relate complex processes and terminologies to the MSMEs. Some respondents attested to the proficiency of the facilitators in the delivery of information during the training, a critical factor for effective training. Though very weak, the development of soft skills can be linked to the induction session that was conducted before the delivery of the training modules. Induction focused on strengthening character as a means of improving the efficiency and effectiveness of their enterprises.

3.4 Anticipated changes in practice as a result of the training

Upon successful training, it was of great interest to ascertain what changes different agro-processors planned to have at their respective facilities. The survey indicated that of the 40 participants, the majority (86%) of the agro-processors planned to improve the operations. Others planned to apply for certification (11%) and consult with the technical people in the area of food and product development (4%) as shown in Figure 2. For those that planned to improve their operations, most planned to improve GMPs and hygiene, waste management, quality control, documentation as well as acquire appropriate equipment and develop infrastructure for their companies. This affirms that many processors had started thinking of certification since all the aspects they planned to improve are major landmarks for product certification in Uganda. Currently, the law requires that all products in the Ugandan market must be certified by UNBS (The Uganda National Bureau of Standards (Use of Distinctive Mark) Regulations 2018, 2018). The fact that most of the training was anchored on good practice leading to certification, many agro-processors could have scored less for certification upon self-evaluation. This could be responsible for the small numbers of those planning to do the certification. The power of technical consultancy cannot be under-estimated during food production. A study by Dora et al. (2020) in Belgium revealed that human errors due to lack of knowledge and low level of training futured as the most frequent cause of food processing losses for about 75% of the food companies that participated in the study. Technical consultancy reduces the losses that would otherwise be incurred in trial and error. Besides, technical consultancy keeps the processor upfront with the current food regulations. However, the low interest in consultancies could be attributed to the high costs associated with technical consultancy services in Uganda.
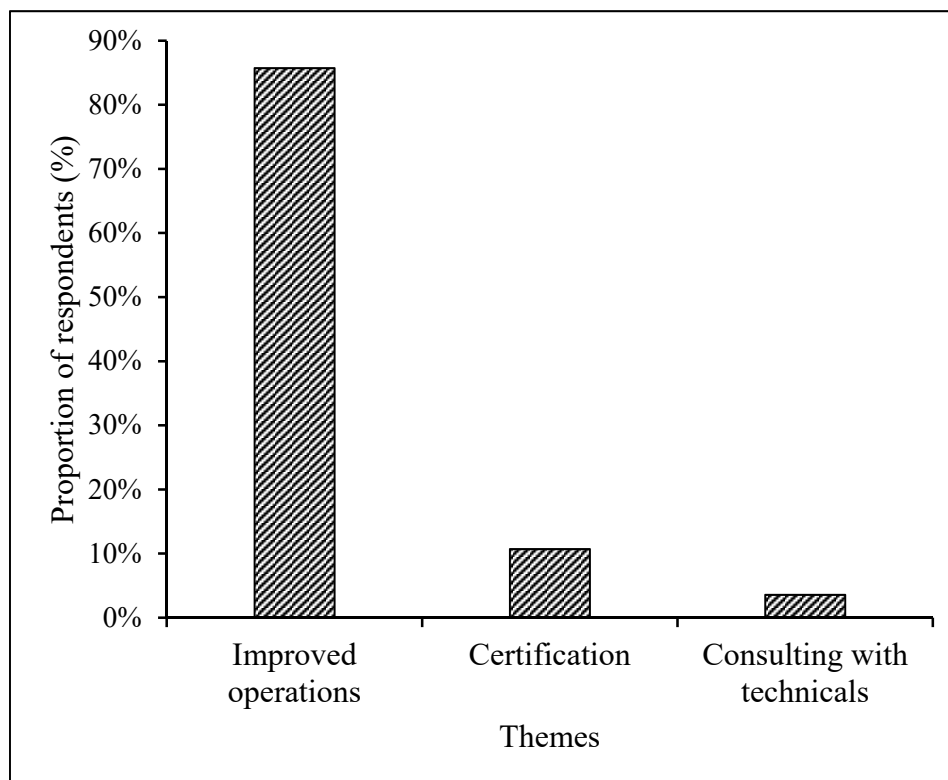
Figure 2. Anticipated changes due to the EAPI training of agro-processors (n = 40)

3.5 Aspects of the training that could be improved

Whereas the training was successful, many things if improved could have made it more resourceful and interesting for all participants. Participants were asked to suggest improvements that needed to be effected to better the training. Comments of the respondents suggest the following improvements: (i) Provision of handouts for modules; (ii) Increasing the number of days for the training; (iii) Simplifying the language (probably use local language) to have all participants on-board during the training; (iv) Making the training sessions more practical such as in the development of Hazard Analysis and Critical Control Points (HACCP) plans for the processing facilities; (v) Improving time management during the training; and (vi) Increasing on the frequency of the training. The suggested improvements agree with the skills necessary for an effective training reported by World Health Organization (2012). According to World Health Organization (2012), a trainer must consider communicating at level and in a language well understood by the participants, as well as understand the target audience level of knowledge.

3.6 Limitations of the study

One of the limitations of this study is the number of respondents. Although the size of our sample (40 respondents) was equivalent to the population size (participants in the training), the size was rather too low limiting the use of statistical methods to make proper inferences. Further studies should consider more participants for proper evaluation and generalization of the findings.

4. Conclusions

This study aimed at evaluating the effectiveness of the EAPI agro-processors training course in enabling trained agro-processors to transform the operations of their MSME's to meet the desired quality of products and increased market share. The results for relevancy of the training modules indicated that on a scale of 10, all modules scored between 8.7 and 9.5, therefore indicating that the processors found all the modules very relevant. Increase in knowledge, and interaction between stakeholders featured as the most outstanding highlights about the training. The majority (86%) of the agro-processors anticipated improving their operations. Others planned to apply for certification and consult with the technical people in the area of food and product development. The provision of handouts, increasing the number of days for the training, and simplifying the language of transmission were some of the suggested improvements. Overall, results depicted that agro-processor training has great influence on the nature of operations at different agro-processing facilities. The Government of Uganda and its partners should focus more on capacity development through training as well as support the processors financially to develop their infrastructure and procure appropriate equipment.

Conflict of interest statement

The authors declare that they have no conflict of interest.

Acknowledgments

References

Arifin, W. N. (2018). Calculating the Cronbach's alpha coefficients for measurement scales with "not applicable" option. https://doi.org/10.13140/RG.2.2.16955.87843

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Bujang, M. A., Omar, E. D., & Baharum, N. A. (2018). A Review on Sample Size Determination for Cronbach ' s Alpha Test: A Simple Guide for Researchers. *Malays J Med Sci*, *25*(6), 85–99.

Dora, M., Wesana, J., Gellynck, X., Seth, N., Dey, B., & De Steur, H. (2020). Importance of sustainable operations in food loss: evidence from the Belgian food processing industry. *Annals of Operations Research*, *290*(1–2), 47–72. https://doi.org/10.1007/s10479-019-03134-0

Fowler, M., & Rauschendorfer, J. (2019). *Agro- industrialisation in Uganda. Current status,*

future prospects and possible soultions to pressing challenges. Retrieved from https://www.theigc.org/wp-content/uploads/2019/11/Fowler-and-Rauschendorfer-2019-Working-paper-v2.pdf

MTIC. (2014). Buy Uganda Build Uganda Policy. Kampala, Uganda: Ministry of Trade, Industry and Cooperatives. The Republic of Uganda. Retrieved from https://www.bubuexpo.com/wp-content/uploads/2019/BUBU Policy.pdf

Mutambi, J. (2013). *Stimulating Industrial Development in Uganda through Open Innovation Incubators*. Blekinge Institute of Technology. Retrieved from https://www.diva-portal.org/smash/get/diva2:834399/FULLTEXT01.pdf

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGrawHill.

Razak, A. A., & White, G. R. T. (2015). The Triple Helix model for innovation: A holistic exploration of barriers and enablers. *International Journal of Business Performance and Supply Chain Modelling*, *7*(3), 278–291. https://doi.org/10.1504/IJBPSCM.2015.071600

The Uganda National Bureau of Standards (Use of Distinctive Mark) Regulations 2018 (2018). Uganda. Retrieved from https://www.unbs.go.ug/attachments/menus/47/UNBS-Use-of-Distinctive-Mark-Regulations-2018.pdf

Turyahikayo, E. (2015). Challenges faced by Small and Medium Enterprises in Raising Finance in Uganda. *International Journal of Public Administration and Management Research*, *3*(2), 21–33.

UNBS. (2018, May). The "Q" Mark is the only Distinctive Mark given by UNBS. *Quality Chronicles*, 46. Retrieved from https://www.unbs.go.ug/attachments/menus/36/QC_OCTOBER_2018.pdf

World Bank. (2012). *Uganda - Promoting inclusive growth : transforming farms, human capital, and economic geography - synthesis report*. Washington, DC: The World Bank Group. Retrieved from http://documents.worldbank.org/curated/en/802021468110672147/Uganda-Promoting-inclusive-growth-transforming-farms-human-capital-and-economic-geography-synthesis-report

World Health Organization. (2012). Designing and implementing training programs. In *Human resources Management* (pp. 52.1-52.20). Retrieved from https://www.msh.org/sites/msh.org/files/mds3-ch52-training-mar2012.pdf

Appendix

SKILLS TRAINING EVALUATION FORM

FOR PARTICIPANTS IN MAKERERE UNIVERSITY (MAK-RIF PROJECT)

Name of Participant and Company: _____

Name of the product: _____

Title and location of training: _____

Date: _____

1. How relevant have the following modules been to you as a processor? (Score from 1 – 10 where 1 is Irrelevant, 10 – Very relevant)

Module	1	2	3	4	5	6	7	8	9	10
Process chain management										
Standards and certification										
Product optimization										
GMPs and hygiene										
Quality control										
Infrastructure development										
Waste management										
Product marketing and preparation for the export market										

2. What did you like most about this training? What was your most outstanding aspect of the training?

3. What changes in practice do you anticipate to make as a result of this training?

```



```

4. What aspects of the training do you think can be improved to make it more resourceful?

```



```

Thank you

World Health Organization. (2012). Designing and implementing training programs. Hum Resour Manag, 52-0.

Copyright Disclaimer

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).