EXECUTIVE SUMMARY

Increasing population growth

ACKNOWLEDGEMENT

Firstly, we are grateful to the Food Research Institute for the opportunity and Africa Challenges Research Fund (GCRF) and Innovate UK under the Knowledge Transfer Partnership Programme provided for this project as part of the Circular Economy in Agri-food Value Chains (CEAVC) project.

Secondly, we thank all participants of the stakeholder workshop that was held on 20th October, 2020 at the Food Research Institute under Ghana's Council for Scientific and Industrial research (CSIR-FRI). Special thanks to the organizing and support team namely Prof Mary Obodai, Dr Charlene Mateko Nyako and Dr Esther [illegible]

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RECOMMENDED CITATION

Eunice Oppon, Miriam Oppong, Emmanuel Frimpong-Boamah, Mary Obodai, Lenny Koh, 2021 "*Circular economy in Ghana's Agri-food value chain; A triple bottom line sustainability assessment"*

PROJECT FUNDING

Financial support for this project was provided by UK Research and Innovation, Global Challenges Research Fund (GCRF) and Innovate UK under the Knowledge Transfer Partnership Programme. The views expressed herein do not reflect the official opinion of the supporting agencies.

1.1 Background

The Food and Agriculture Organization (FAO) estimates that nearly

1.3 billion tonnes

The Food Research Institute and indeed the broader CSIR engages in a number of agri-food circular economy initiatives, a few of which is listed below:

- Extraction and reformulation of

1.4 Structure of the report

This introductory section of the report has provided a background of the project, highlighting the goals and objectives that the project sought to achieve. The remaining sessions of the report is structured into five sections. Section 2 presents discussions on circular economy in agri-foods in Africa and highlights the framework for analysis used in the project. The next three sections (section 3, 4 & 5) is focused on presenting some key findings and discussions on environmental , social and economic sustainability analysis. Finally, the report concludes with discussions and recommendations for achieving a triple bottom line agri-food circular economy in Ghana.

2. CIRCULAR ECONOMY OF AGRI-FOODS IN AFRICA: STATE-OF-THE-ART & FRAMEWORK FOR ANALYSIS

Sauvè et al. (2016), deġned circular economy as closing the loop between production and consumption. This is done with a conscious effort to incorporate social and environmental considerations. The authors view circular economy as reducing raw materials and waste along all the stages of the product life cycle. According to Preston (2012), ėcircular economy is an approach that would transform the function of resources in the economyĘ This means that waste from one factory will become raw materials for another process within the same factory or another. This deġnition of circular economy relates to conversion of

Principles of Circular Economy

Reduce: This principle represents the e á cient use of resources which is safe for the environment (Simone et al, 2000). The aim is to produce more but with less impact on the environment.

Reuse: Reuse is where the product itself is designed in such a way that it can easily be used again. It promotes a cyclical sequence of closing the loop of production (Ghisellini et al, 2016).

Refuse: This refers to the refusal of consumers to buy products that are not designed sustainably (Boon, E. K., & Anuga, S. W. 2020)

Rethink: Rethink refers to the reconsidering of current practices and lifestyle on how products are designed and manufactured (Boon, E. K., & Anuga, S. W., 2020)

Repair: This means ßxing or restoring a product and lengthening its lifespan instead of throwing away (Boon, E. K., & Anuga, S. W.,2020)

Recycle: This is where the product is reproduced into a material in the original supply chain or for a different purpose (Ghisellini et al. 2016)

2.2 Agri-food Circular Economy

Circular economy in the Agrifood chain looks at reducing the inputs of production in agriculture (input use such as water, fertiliser, etc.) and finding more efficient ways of producing with less. In addition, it also relates to the reuse of waste from farming processes such as post-harvest produce that go bad (Borghi et al, 2019). The aim is to create sustainable production and consumption patterns in the agrifood value chain in order to preserve the environment, increase market competitiveness and promote social wellbeing of people (Borghi et al., 2020; European commission, 2008). For example, a study of four UK manufacturing companies for their circularity showed that a citrus company could use the damaged oranges and lemons for cosmetics since the consumer market would not buy it (Garcia-Garcia et al, 2019). This damaged citrus would otherwise have ended up in a landfill. Other example include using of food waste for fertilizer, as biogas for producing electricity amongst others. Circular economy in the agrifood chain therefore looks at all the waste generated along the chain from raw material usage to processing to packaging to end of life to ascertain how the waste can either be reduced or reused into the same chain or into a different chain (Kibler et al., 2018).

A typical agri-food supply chain involves series of activities before the processed food product reaches end users or consumers. These activities include

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There are different approaches that has been used in analysis of circular economy in different regions or countries. However most ar ec


STEP 1-Food crops from farm

Embodied resources here is used to refer to the resources that goes into the production of agri-crop (maize, yam, plantain, etc) at the farm level. The relevance of this indicator is that it highlights the amount of lost resources if these crops were not purchased for food processing at CSIR-FRI. The implication here is that if agri-food processing facilities like that of CSIR-FRI were not absorbing the various crops produced and harvested and these were to go waste on the farm, then it means the embodied resources are wasted alongside with this. The embodied resources therefore signifies the environmental cost of food loss within the agri-food crop production in the absence of a circular economy

We conduc

Some participants at the Stakeholder workshop organised at CSIR-Food Research Institute,Accra

4.1 Introduction

We believe transition to an agri-food circular economy, could depend largely on the society's acceptance and role in adopting circular economy practices. Beyond the environmental and economic dimension of adopting an agri-food circular economy, it is important that the social sustainability angle is also considered. To achieve this, a stakeholders workshop and an online survey on consumer awareness and perception were used to gather relevant data that sought to capture the social sustainability of agri-food circular economy and inform policy decisions. We report on some of the key findings and discuss the implications for developing a agri-food circular economy in Ghana.

4.2 Stakeholders' Perceptions of Circularized Agri-Foods

A stakeholder's workshop was held in Accra at the CSIR-Food Research Institute on Tuesday, 20th October 2020. The objective of the workshop was to gather information from participants on their knowledge and awareness of circular economy and related core themes. In addition, we used focus group sessions to engage participants in discussions on the enablers and barriers of circular economy policy development in Ghana's Agri-Food sector.

Thirty-one (31) persons representing various Institutions/actors participated in the workshop. Twenty-One (21) of the participants were p

The Second part of the workshop was the, “Discussion Session” where participants were divided into groups to discuss the topic, “Identify the key constraints limiting the circular economy of Ghana’s agri-food value chain from the stakeholder’s perspective”.

According to the stakeholders, the following are some of the factors they believe are potential barriers to limiting circular economy initiatives:

1. Inadequate information sharing about ongoing ideas on circular economy
2. Absence of legislation and enforcement
3. Lack of funding for investments
4. Low marketability of products
5. Improper market research on new products
6. Low rate in adoption of innovative technologies

Stakeholders also identified believed the f

Stakeholders were also asked on their perceptions on risk associated with implementing an agri-food circular economy in Ghana. They were asked to indicate to what extent they agreed or disagreed with the following statements on risk associated with implementing circular economy in agri-food value chain.

Key Findings

i) Negative environmental impact:

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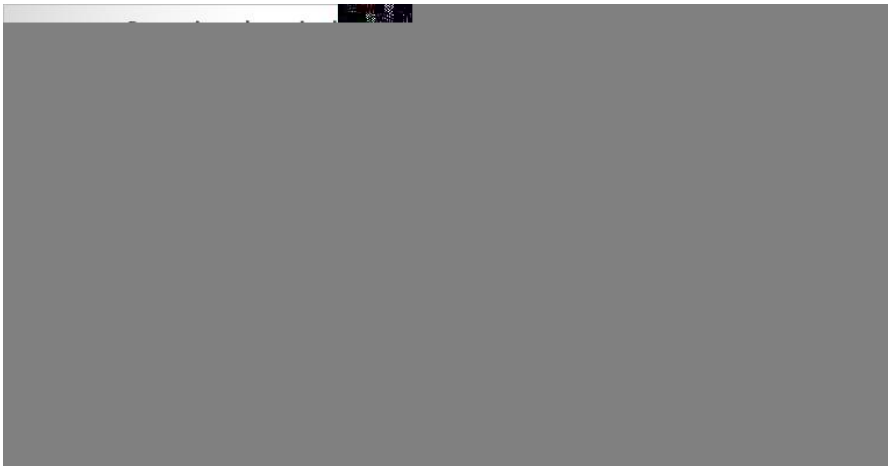
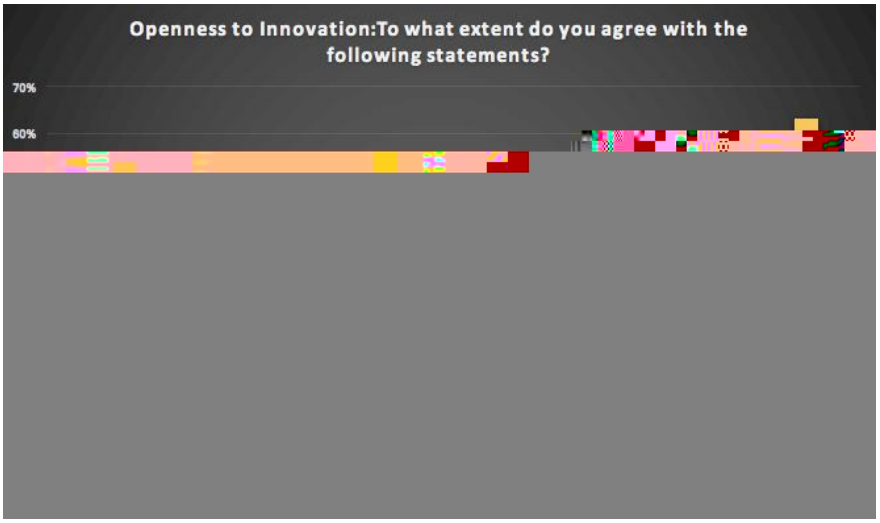
The level of awareness of circular economy among Ghanaian consumers was varied. We first asked whether they had heard of the term ‘circular economy’. We found that for 32% of respondents, this was their first time of hearing of the term, while 17% said they had heard of circular economy but did not fully understand what the term meant. However when asked about their awareness of the

Green Perceptions and Behaviors

Consumers perception about circularized agri-foods were collected by asking about their level of agreement. Thirty-one percent (31%) of Ghanaian consumers strongly agreed that circularized materials will reduce household waste sent to landfills with only 5% strongly disagreeing. When asked whether circularized materials used to produce agri-foods would reduce food waste, 49% strongly agreed, while 20% disagreed. 48% of the consumers also agreed that a circular agri-food economy would reduce greenhouse emissions.





In transitioning towards an agri-food circular, we believe that the Ghanaian consumers' openness to innovation would be a key factor. 60% of Ghanaian consumers agreed that agri-foods produced from recyclable or reusable are innovative. Overall we found that the Ghanaian consumer is opened to trying food that are new and different. The average Ghanaian consumer is mostly influenced by their Family and friends in their willingness to try new foods.

5.2 Embodied Economic Impacts of Circularized Agri-Foods

We accessed the CSIR-FRI products produced from two crop groups that is root and tubers and cereals and grains. These crops are regular staple foods in Ghana that contribute significantly towards food

5.3 Summary of Impacts and P

6.1 Summary of Main Findings

In this section, we present a brief summary of some key ġndings in relation to the triple bottom line analysis (economic, environment and social) of agri-food circular economy in Ghana.

Environment

Ě ***Reduction in food loss waste:*** The problem of food loss and waste in developing countries including Ghana is more prevalent at the production and post-harvest stage, compared to developed countries where food w

Social

- ***Stakeholder Awareness and perception:*** The findings showed that there is some appreciable level of awareness of circular economy among the stakeholders (farmers, agri-food processors, distributors, government, financial institutions) in Ghana's agri-food value chain. Stakeholders believed that lack of government legislation and enforcement, inadequate investment funds for innovative products and limited market r

The following recommendations are suggested as part of measures that can be taken to ensure a transition of Ghana's agri-food sector to a circular one.

Set up and expand food waste valorization plants

The next phase of Agri-Food CE research should be focused on expanding food waste valorisation opportunities identified. Waste valorisation is a process where waste is converted into useful resource. This represents real steps towards 'closing the loop' at the end of the value chain. Since CSIR-FRI has the technical resources and expertise, the Ghana government can support the institution in creating pilot case studies to demonstrate the technical feasibility of different rWaste

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