Md Hamidul Haque

Department of Agricultural and Biological

Engineering, The Pennsylvania State University

State College, Pennsylvania

Towards Ethical Transformation of Food and Agriculture Systems into Circular Systems

The undesirable output of the agricultural and food industry has long been regarded as simply 'waste' and dumped into landfills. For example, 30% to 50% of unused produced food in the US is landfilled even though it contains a high concentration of nutrients like nitrogen, phosphorus, carbon, etc. that can be reused as fertilizer (Jones et al. 2021). The main reason behind this wastage is the lack of infrastructure and industrial culture to recover the undesirable output to process and transport it back to Food and Agriculture Systems (FAS). Therefore, the current FAS is termed a 'Linear System' because it follows a one-way path of take-make-use-dispose (Jones et al. 2021). In recent years, the 'Circular System' has received attention because it calls for reusing waste or disposal in the production of goods again. Circular system also supports innovations that reduce and optimize resource usage. Even though the circular business model application in agriculture is new, the circular business model or circular system or circular economy itself is not a new idea.

However, critiques of the circular economy have criticized the idea as a corporate-led model that is too theoretical, neglects established knowledge, is unclear on how to implement it, and is unclear how it contributes to the environment and social sustainability (Corvellec et al. 2021). Since the term circular economy does not have an exact definition, different businesses adopt different definitions. Therefore, Lazarevic and Valve (2017) criticized the circular economy as being intentionally vague but principally uncontroversial. Greer et al. (2021) mentioned the waste paradox where demand for waste in a circular economy will increase waste generation rather than reduce the volume of waste. The circular economy will therefore risk endorsing more waste generation.

Moreover, one of the significant features of a circular economy is that it relies heavily on technological innovation to solve the problem of sustainability (Dagevos and de Lauwere 2021), but the timescale of those innovations is uncertain. This criticism of circular economies also applies to circular agriculture and is further amplified because of the socio-environmental complexity of the agricultural and food industry. However, very few articles discuss the ethical concerns of this transformation. In order to ensure equity and

fairness during the transformation toward circular agricultural systems, ethical and epistemic values must be incorporated into the discussion. In this essay, I have used a coupled epistemic-ethical framework to analyze and discuss the transformation of food and agriculture systems (FAS) into circular systems.

The definition of ethical and epistemic values in this essay has been adopted from Deitrick et al. (2021). In summary, ethical values ensure justice and fairness through someone's moral compass. For example- credibility, equity, reliability, responsibility, sustainability, etc., are ethical values. Epistemic values endorse exploring the truth of science to support the pursuit of knowledge. For example- consistency, methodological accuracy/soundness, scope, simplicity, testability, and fruitfulness are some of the epistemic values that we can apply in our case. Coupled ethical-epistemic analysis has been used over the years to minimize gaps between scientists and practitioners without compromising the integrity of science (Tuana 2017; Valles et al. 2019; Grady et al. 2021). In complex problems, where stakeholders from different epistemic backgrounds interact to find ethical solutions, ethical-epistemic analysis can provide a unique platform for discussion.

Firstly, I reframed and applied the ethical problems associated with the transformation of food and agriculture systems (FAS) into circular systems. Four (4) main components of this transformation have been identified -

1. New technological innovations for circularity in agriculture,
2. Change in consumer, supplier, and producer behavior (i.e., change of diet, farming practice, dynamic marketing),
3. A new chain for waste management considering waste as a resource in circular agriculture,
4. New policies and investments for transforming current food and agriculture into a circular system.

Then, these components of circular transformation were analyzed based on the following six ethical questions or themes- a) How will the transformation to circularity create equal opportunities for small farmers and big corporations? b) Who will benefit and who will not? How can we compensate the people

who are affected by the transformation? c) Who will share or sponsor the cost of innovation required for circularity? Who will own those innovations? d) Can food security be ensured while the current linear system is changing? e) Are consumers and producers ready to accept the changes proposed? f) Will demand for waste encourage the generation of more waste?

Based on the coupled ethical-epistemic analysis, innovations need to be consistent and methodologically accurate or sound to ensure reliability, responsibility, and sustainability in transforming current FAS into a circular system. These innovations should be practical, simple, and testable to ensure economic viability, efficiency, and credibility. Also, the scope of the new innovations should be such that they provides environmental justice. The primary ethical question for this componenttra is who will sponsor or share the cost of innovation and who will own it? Owners of the new innovations must ensure the availability of innovations to all classes of farmers even if the share for innovation is not equal. Otherwise, the transformation of circularity may fail to ensure equity. Thus, a secondary set of ethical questions about new techological innovation arise – Who will benefit from it? How to compensate for people who will be affected, and will innovation ensure food security? Since short, medium, and long time scales have been envisioned for circular transformation, in every step of innovation and every time step, we must address these ethical questions so that it can bridge among scientists, practitioners, and farmers without confusion and mistrust.

Change in consumer, supplier, and producer behavior requires discussion of three central epistemic values – fruitfulness, scope, and simplicity. Simplicity in change is essential for the participation of people from all sectors of agriculture- producer to consumer. However, fruitfulness should not be compromised for simplicity. Otherwise, achieving circularity can be a difficult task. Incorporation of ethical values related to this discussion- economic viability, efficiency, equity, fairness, food security, engagement, and sustainability can aid in deciding compromise between fruitfulness and simplicity. These values will also address another primary ethical question: Are the consumers and producers ready to accept the changes proposed? This moral question also warrants two secondary questions discussed before – creating equal

opportunities for all classes of farmers and identifying and compensating people affected by the transformation. Intergenerational justice is one of the prime ethical values that should be addressed in this case. Changes will affect different age groups of present generation and different generations over a long time scale. Therefore, intergenerational justice should be ensured by designing equitable and fair transformation to circularity.

Re-usage of waste for product generation is one of the main component of circularity that works to ensure ethical values of environmental aesthetics, environmental justice, environmental protection, and sustainability. However, that also draws attention to different epistemic values in this discussion- predictability of waste supply, traceability, soundness of methods for waste transformation, testability of ideas from small to large scale, and consistency in waste handling. Without discussing or thinking about these epistemic values, we cannot ensure two main ethical values related to transformation to circularity – economic viability and reliability. One of the main ethically paradoxical questions in circularity is– Will the demand for waste encourage the generation of more waste? It should be addressed through engagement among consumers, producers, and waste managers to ensure that a circular system can inspire less waste generation. At the same time, it promotes bringing back waste in production generation. Two secondary ethical questions are warranted in this discussion: are we (consumers and producers) ready to accept the proposed changes, and who benefits and does not?

Lastly, the transition to circularity will require new policies and investments. With those policies, we have to ensure equity and fairness for different classes and types of farmers, advocate for human and non-human welfare, and ensure integrity, intergenerational justice, and food security. These ethical values need to be supported by different epistemic values- reliability and consistency of investments and policy applications, appropriate explanations of the scope of policies, and fruitfulness of investments. The primary ethical question requires discussion here is – who will benefit and how will affected people be compensated? Policies and investments should be formulated and applied to ensure everyone is being incorporated in the transformation equitably. That will also address the second ethical concern of new policies development

and investment - How does the transformation to circularity create equal opportunities for small farmers and big corporations? This is also our prime ethical question in this analysis.

Circularity in agriculture can ensure food security for our future while ensuring environmental sustainability. Since it is still in the inception stages for most cases, we have the opportunity to improve the transformation to ensure equity and fairness. Thus, coupled ethical-epistemic analysis in this essay lays the ground for discussing the ethical transformation of current Food and Agriculture Systems into Circular Systems.

References:

Corvellec H, Stowell AF, Johansson N. 2021. Critiques of the circular economy. J Ind Ecol.:1–12. doi:10.1111/jiec.13187.

Dagevos H, de Lauwere C. 2021. Circular business models and circular agriculture: Perceptions and practices of dutch farmers. Sustain. 13(3):1–15. doi:10.3390/su13031282.

Deitrick AR, Torhan SA, Grady CA. 2021. Investigating the Influence of Ethical and Epistemic Values on Decisions in the Watershed Modeling Process. Water Resour Res. 57(12). doi:10.1029/2021WR030481.

Grady C, Rajtmajer S, Dennis L. 2021. When Smart Systems Fail: The Ethics of Cyber–Physical Critical Infrastructure Risk. IEEE Trans Technol Soc. 2(1):6–14. doi:10.1109/tts.2021.3058605.

Greer R, von Wirth T, Loorbach D. 2021. The Waste-Resource Paradox: Practical dilemmas and societal implications in the transition to a circular economy. J Clean Prod. 303:126831. doi:10.1016/j.jclepro.2021.126831. https://doi.org/10.1016/j.jclepro.2021.126831.

Jones J, Verma B, Basso B, Mohtar R, Matlock M. 2021. Transforming food and agriculture to circular systems: A perspective for 2050. Resour Eng Technol Sustain World. 28(2):7–9.

Lazarevic D, Valve H. 2017. Narrating expectations for the circular economy: Towards a common and contested European transition. Energy Res Soc Sci. 31(May):60–69. doi:10.1016/j.erss.2017.05.006. http://dx.doi.org/10.1016/j.erss.2017.05.006.

Tuana N. 2017. Understanding Coupled Ethical-Epistemic Issues Relevant to Climate Modeling And Decision Support Science. In: Scientific Integrity and Ethics in the Geosciences. American Geophysical Union (AGU). p. 155–173. https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1002/9781119067825.ch10.

Valles SA, Piso Z, O'Rourke M. 2019. Coupled Ethical-Epistemic Analysis as a Tool for Environmental

Science. Ethics, Policy Environ. 22(3):267–286. doi:10.1080/21550085.2019.1652288.

https://doi.org/10.1080/21550085.2019.1652288.