

Agrivoltaics for Food and Energy Justice: Securing Livelihoods and Strengthening Resilience in Africa

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Agrivoltaics for Food and Energy Justice: Securing Livelihoods and Strengthening Resilience in Africa

Kariuki Muigua*

Abstract

This paper critically examines how agrivoltaics can be utilised to achieve food and energy justice. The paper defines agrivoltaics. It observes that this approach provides innovative, effective and sustainable solutions towards tackling global and regional challenges affecting food and energy justice. Despite its role in driving food and energy justice, the paper observes that agrivoltaics is yet to be fully harnessed. In particular, the paper discusses some of the key challenges undermining the use of agrivoltaics in Africa. In light of underlying challenges, the paper proposes how agrivoltaics can be fully harnessed and utilised towards securing livelihoods and strengthening resilience in Africa for food and energy justice.

1.0 Introduction

Food and energy are essential resources for human health, well-being and development. According to the World Health Organization (WHO), food is a critical part of health, development and the well-being of all individuals¹. In particular, it has been observed that the food we take provides nutrients that are essential for the growth, development and maintenance of body functions². Permanent and unrestricted access to adequate, safe and nutritious food upholds the dignity of every person and ensures that they can live a healthy, productive and prosperous life³. Food is therefore necessary for human health, well-being and development since healthy and well-balanced diets provide energy needed to perform day-to-day tasks while also providing nutrients that prevent illnesses and foster good health and well-being⁴.

Energy is also a crucial resources for human progress and development. It has been correctly observed that energy is a vital resource for human progress and development since energy systems drive economies and sustain societies⁵. For example, energy services directly impact health, food security, education, water security and communication services⁶. As a result, the availability, accessibility, affordability, reliability and sustainability of energy has been identified as a pre-condition for socio-economic development due to its

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¹ World Health Organization., 'Nutrition' Available at https://www.who.int/health-topics/nutrition#tab=tab_1 (Accessed on 13/07/2026)

² How Does Food Impact Health?, Available at <https://www.takingcharge.csh.umn.edu/how-does-food-impact-health> (Accessed on 13/07/2026)

³ Food and Agriculture Organization of the United Nations., 'Right to Food' Available at <https://www.fao.org/right-to-food/en> (Accessed on 13/07/2026)

⁴ Health benefits of eating well., Available at <https://www.nhsinform.scot/healthy-living/food-and-nutrition/eating-well/health-benefits-of-eating-well/> (Accessed on 13/07/2026)

⁵ United Nations Environment Programme., 'Energy' Available at <https://www.unep.org/topics/energy> (Accessed on 13/07/2026)

⁶ Gaye. A., 'Access to Energy and Human Development' Available at <https://hdr.undp.org/system/files/documents/gayeamie.pdf> (Accessed on 13/07/2026)

potential to spur economic development and poverty eradication⁷. On the other hand, it has been observed that lack of access to clean, reliable and sustainable energy contributes to poverty, deprivation and underdevelopment⁸.

Despite their role in ensuring human progress, well-being and development, ensuring that every person has access to sufficient, healthy and quality food, and clean, affordable, reliable and modern energy services remains a challenge all over the world. For example, it has been observed that millions of people globally are experiencing acute levels of food insecurity⁹. The Food and Agriculture Organization of the United Nations (FAO) points out that achieving food security remains a challenge globally with millions of people facing food insecurity, hunger and malnutrition especially in developing countries¹⁰. In particular, Africa has been classified as the most food insecure continent in world with 1 in 5 people in Africa facing the risk of hunger¹¹. Further, it has been observed that millions of people all over the world lack access to electricity with many more others relying on biomass fuels such as charcoal, coal and animal waste for cooking¹². This situation is more severe in Africa where it is estimated that over 600 million Africans still lack reliable access to electricity, which is nearly half the continent's population and more than 80 per cent of the global electricity access gap¹³. In light of the foregoing challenges, it is imperative to utilise novel and sustainable approaches towards achieving food and energy justice for development.

This paper critically examines how agrivoltaics can be utilised to achieve food and energy justice. The paper defines agrivoltaics. It observes that this approach provides innovative, effective and sustainable solutions towards tackling global and regional challenges affecting food and energy justice. Despite its role in driving food and energy justice, the paper observes that agrivoltaics is yet to be fully harnessed. In particular, the paper discusses some of the key challenges undermining the use of agrivoltaics in Africa. In light of underlying challenges, the paper proposes how agrivoltaics can be fully harnessed and utilised towards securing livelihoods and strengthening resilience in Africa for food and energy justice.

⁷ United Nations Development Programme., 'Energy Access.' Available at <https://www.undp.org/energy/our-work-areas/energy-access> (Accessed on 13/07/2026)

⁸ Bradbrook. A., 'Access to Energy Services in a Human Rights Framework.' Available at https://www.un.org/esa/sustdev/sdissues/energy/op/parliamentarian_forum/bradbrook_hr.pdf (Accessed on 13/07/2026)

⁹ World Food Programme., 'Food security – what it means and why it matters' Available at <https://www.wfp.org/stories/food-security-what-it-means-and-why-it-matters#:~:text=Jean%2DBaptiste%20Joire-.What%20is%20food%20security?,threatens%20people's%20lives%20or%20livelihoods> (Accessed on 13/07/2026)

¹⁰ Food and Agriculture Organization of the United Nations., 'The State of Food Security and Nutrition in the World 2024- 2024 – Financing to end hunger, food insecurity and malnutrition in all its forms' Available at <https://openknowledge.fao.org/server/api/core/bitstreams/d5be2ffc-f191-411c-9fee-bb737411576d/content> (Accessed on 13/07/2026)

¹¹ World Vision., 'Africa hunger crisis: Facts, FAQs, and how to help' Available at <https://www.worldvision.org/hunger-news-stories/africa-hunger-famine-facts> (Accessed on 13/07/2026)

¹² Sustainable Energy for All., 'SDG 7.1 - Access to energy' Available at <https://www.seforall.org/goal-7-targets/access> (Accessed on 13/07/2026)

¹³ United Nations Sustainable Development Group., 'Decoding Africa's Energy Journey: Three Key Numbers' Available at <https://unsdg.un.org/latest/stories/decoding-africa%E2%80%99s-energy-journey-three-key-numbers> (Accessed on 13/07/2026)

2.0 The Role of Agrivoltaics in Promoting Food and Energy Justice

Food and energy justice play a key role in unlocking Sustainable Development. Food justice focuses on ensuring that every person has equal and equitable access to adequate, nutritious, affordable and culturally-appropriate food for their health, well-being, progress and development¹⁴. It has been observed that food justice covers *food security*, which is a state where every person has access to enough, safe, affordable and nutritious food for normal growth and development, and an active and healthy life¹⁵; *food systems transformation* which covers fair, just and inclusive methods for producing and distributing food¹⁶; *community participation* in food production and decision-making processes¹⁷; and *environmental sustainability* which seeks to ensure that food production does not harm local ecosystems¹⁸. On the other hand, energy justice is premised on the understanding that access to clean, safe, reliable, modern, sustainable and affordable energy is a fundamental human right¹⁹. The goal of energy justice seeks to ensure that every person is involved in decision-making processes towards securing the right to clean, affordable, reliable and sustainable energy²⁰.

Achieving food justice ensures that every person has access to adequate, safe, healthy and affordable food towards spurring human progress and development²¹. In addition, achieving energy justice ensures universal access to safe, affordable and sustainable energy for every person while sharing the benefits and burdens of energy fairly and equitably towards Sustainable Development²². In light of global, regional and national challenges such as food insecurity, hunger and malnutrition, achieving food justice is necessary towards Sustainable Development²³. Further, due to challenges such as energy poverty and unsustainable energy systems which are heavily reliant on fossil fuels such as coal, natural gas and oil, achieving energy justice is key for both people and planet towards Sustainable Development²⁴.

Agrivoltaics provides a suitable approach towards tackling global, regional and national food and energy justice challenges for Sustainable Development. Agrivoltaics has been described as a new frontier that uses land both to produce photovoltaic energy through the installation of solar panels while also supporting agricultural activities including crop farming and pastoralism²⁵. Agrivoltaics has also been defined as the

¹⁴ What is Food Justice? Principles and Benefits., Available at <https://www.medicalnewstoday.com/articles/what-is-food-justice> (Accessed on 13/07/2026)

¹⁵ World Food Programme., 'Food security – what it means and why it matters' Op Cit

¹⁶ What is Food Justice? Principles and Benefits., Op Cit

¹⁷ Ibid

¹⁸ Ibid

¹⁹ Union of Concerned Scientists., 'Environmental Justice, Climate Justice, and Energy Justice—What Do They Mean?' Available at https://www.google.com/search?q=energy+justice&oq=energy+justi&gs_lcrp=EgZjaHJybWUqBwgAEAAyGAQyBwgAEAAyGAQyBggBEEUYOTIHCAIQABiABDIHCAMQABiABDIHCAQQABiABDIHCAUQABiABDIHCAYQABiABDIGCAcORRg90gEIMzAyOGowajeoAgCwAgA&sourceid=chrome&ie=UTF-8 (Accessed on 13/07/2026)

²⁰ Ibid

²¹ What is Food Justice? Principles and Benefits., Op Cit

²² United Nations., 'In Quest of an Energy Justice Framework for Bangladesh' Available at <https://www.un.org/en/chronicle/article/quest-energy-justice-framework-bangladesh> (Accessed on 13/07/2026)

²³ What is Food Justice? Principles and Benefits., Op Cit

²⁴ Solomon. B., & Krishna. K., 'The Coming Sustainable Energy Transition: History, Strategies, and Outlook.' *Energy Policy* 39 (2011) 7422-7431

²⁵ All the Benefits of Agrivoltaics., Available at <https://www.enel.com/learning-hub/renewables/agrivoltaics> (Accessed on 13/07/2026)

practice of locating agricultural production, including crops, livestock, or pollinator habitats, underneath solar panels or between rows of solar panels²⁶.

Agrivoltaics provides a new and innovative approach that provides simultaneous benefits for both food and energy justice. For instance this technique supports renewable energy production towards achieving energy transition while also bolstering agricultural productivity towards food security²⁷. In particular, it has been observed that in resource-scarce regions and nations where competition for land is fierce, agrivoltaics provides a solution to double up on land use towards ensuring availability of food for the world's growing population while also providing sustainable energy²⁸. Agrivoltaics is therefore an innovative approach that enables renewable energy production, with emphasis on solar energy, and agricultural practices to coexist and interact in a mutually beneficial manner²⁹.

The practice of agrivoltaics therefore plays an important role in unlocking food and energy justice by optimizing agriculture and energy production. In particular, it has been observed that locating solar panels alongside agricultural activities can provide farmers and businesses with benefits such as diversified revenue sources and environmental protection while reducing land use competition³⁰. Further, it has been observed that agrivoltaics can boost crop production since in areas where sunshine is more intense, solar panels can reduce evaporation and lay the basis for higher production³¹. In particular, it has been pointed out that crops such as broccoli, potatoes, onions and certain grains thrive when grown under agrivoltaic systems³².

Despite its appropriateness, implementing agrivoltaics presents several challenges. For instance, it has been observed that implementing agrivoltaics requires technical expertise in order to achieve the delicate balance required between the design of solar plants, microclimatic conditions and the type of crops to be grown³³. Agrivoltaics can also pose a challenge for the use of agricultural machinery which are heavily used in modern agriculture since the presence of solar panels can prevent the free movement of such equipment³⁴. It is imperative to tackle these among other challenges towards effectively utilising agrivoltaics for food and energy justice.

3.0 Adopting Agrivoltaics towards Food and Energy Justice in Africa

With Africa facing challenges in achieving food and energy justice, agrivoltaics provides a novel and innovative approach towards securing livelihoods and strengthening resilience. This approach provides benefits for both people and planet including through promoting food and energy justice while tackling

²⁶ What is Agrivoltaics., Available at <https://www.energy.gov/cmei/systems/agrivoltaics-solar-and-agriculture-co-location> (Accessed on 13/07/2026)

²⁷ World Economic Forum., 'Can crops grow better under solar panels? Here's all you need to know about 'agrivoltaic farming' Available at <https://www.weforum.org/stories/2022/07/agrivoltaic-farming-solar-energy/> (Accessed on 13/07/2026)

²⁸ Ibid

²⁹ All the Benefits of Agrivoltaics., Op Cit

³⁰ What is Agrivoltaics., Op Cit

³¹ Agrivoltaics: Combining solar panels and agriculture into a win-win result., Available at <https://www.statkraft.com/energy-insights/articles/agrivoltaics-combining-solar-panels-and-agriculture-into-a-win-win-result/> (Accessed on 13/07/2026)

³² Ibid

³³ Ibid

³⁴ Ibid

global environmental challenges including climate change and biodiversity loss³⁵. Agrivoltaics supports livelihoods including through greater agricultural production, less consumption of water for irrigation due to the shade provided by solar panels and ensuring a source of additional income for farmers³⁶. In addition, by supporting renewable energy generation towards confronting climate change, sustainable land use and biodiversity conservation, agrivoltaics enhances the resilience of both people and planet in the wake of mounting global environmental threats³⁷.

It is therefore imperative to adopt agrivoltaics towards bolstering food and energy justice in Africa. It has been observed that for Africa, agrivoltaics provides opportunities to increase crop yields for sustainable livelihoods, support clean energy production towards energy justice, and save on electricity and irrigation costs³⁸. Access to energy is a major development challenge in Africa where millions lack affordable, clean, modern and sustainable sources of energy³⁹. However, the continent has high potential for renewable sources of energy including solar due to several favourable factors such as high solar irradiation levels due to proximity to the equator especially in the Sub-Saharan region⁴⁰. As a result, solar energy has been identified as a key solution towards tackling Africa's energy challenges but traditional ground-mounted arrays of solar panels reduce the amount of land needed for other economic activities including agriculture⁴¹. Agrivoltaics is therefore an effective approach that can support both clean energy production and agriculture in Africa towards food and energy justice.

Due to its advantages, it is imperative for African countries to invest in agrivoltaics. Through this approach, countries can maximise on land-use through simultaneous use of land for both agriculture and solar photovoltaic power generation, and the possibility of incorporating water management solutions into this infrastructure⁴². In particular, African countries have been urged to utilise public-private partnerships in order to unlock funding towards investments in agrivoltaics⁴³. It is also necessary to design policies and regulatory frameworks can support agrivoltaics including through provisions that govern conversion of farmland for agrivoltaics use, and providing subsidies on farmlands where agrivoltaics are installed⁴⁴. Community engagement is also key towards successful implementation of agrivoltaics in Africa. For instance, by collaborating with farmers, it is possible to build their capacity on this technology, enhance support for the implementation of agrivoltaics, and identify the most suitable locations for the development of agrivoltaics⁴⁵. Cross-sectoral collaboration involving agricultural and energy experts is also

³⁵ World Economic Forum., 'Can crops grow better under solar panels? Here's all you need to know about 'agrivoltaic farming' Op Cit

³⁶ All the Benefits of Agrivoltaics., Op Cit

³⁷ Ibid

³⁸ Launching East Africa's first combined solar energy and agriculture system., Available at <https://sheffield.ac.uk/sustainable-food/news/launching-east-africas-first-combined-solar-energy-and-agriculture-system> (Accessed on 14/07/2026)

³⁹ Ibid

⁴⁰ Gordon. E., 'The Politics of Renewable Energy in East Africa' Available at <https://www.oxfordenergy.org/publications/politics-renewable-energy-east-africa/> (Accessed on 14/07/2026)

⁴¹ Ibid

⁴² Decentralized and with triple benefit – the potential of agrivoltaics in sub-Saharan Africa., Available at <https://www.welthungerhilfe.org/global-food-journal/rubrics/agricultural-food-policy/agrivoltaics-in-sub-saharan-africa> (Accessed on 14/07/2026)

⁴³ Ibid

⁴⁴ Ibid

⁴⁵ Launching East Africa's first combined solar energy and agriculture system., Op Cit

key towards tackling the technical challenges involved in implementing agrivoltaics in order to ensure successful adoption of this technology in Africa for food and energy justice⁴⁶.

4.0 Conclusion

Achieving food and energy justice is vital for human health, well-being, development and progress. However, realising food and energy justice remains a challenge especially in Africa where millions face food insecurity and hunger and lack access to clean, affordable, reliable and sustainable sources of energy. Consequently, there is need to adopt agrivoltaics in order to deliver simultaneous benefits of clean energy production and high agricultural productivity towards fostering food and energy justice in Africa.

⁴⁶ Ibid

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