Investment incentives and knowledge sharing key for agrivoltaics in Africa

Agrivoltaics | With appropriate policy support and investment incentives, agrivoltaics could play a crucial role in Africa's green energy transition, writes Dr Richard Randle-Boggis of the University of Sheffield.

Agrivoltaics have generated promising results for energy security and food production in Europe, the US and Asia. Yet, the greatest benefits are likely to be found in locations with abundant solar radiation, an urgent need for decentralised energy systems and where water scarcity threatens food systems. Agrivoltaics could therefore play a crucial role in green energy transitions across much of Africa. These conditions here present an unparalleled opportunity for agrivoltaics to deliver sustainable economic benefits.

Electricity demand across Africa is predicted to triple between 2015-2030, yet more than half of the population of Africa still do not have access to electricity. Addressing electrification needs poses several challenges, including a lack of coordinated regulation and financial investment from governments. Given the expansive grid-connection challenges, decentralised solutions are the only option to bring power to unconnected communities in the short term. Previously, PV prices were prohibitively expensive for most people and businesses across Africa, leaving much of the rural population in the dark, but rapidly decreasing costs have resulted in substantial growth in solar developments. The International Energy Agency reports that 71% of investment to achieve universal electricity access around the world by 2030 needs to be spent on off-grid and mini-grid infrastructure, and 95% of that directed at sub-Saharan Africa.

The solar energy sector already employs over 100,000 people in sub-Saharan Africa, and emerging markets require innovative business strategies. There are three broad business models currently used to operate mini-grids: utility owned, community owned, and privately owned, each with various advantages and disadvantages. The model that has achieved the greatest success has been the anchor-business-customer (ABC) model, which supplies power to three different groups of targeted customers: 1) an anchor client, who is ensuring a steady revenue for the developer; 2) small village businesses or institutions with a greater load demand than regular households; and 3) rural household customers. Both the community model and the ABC model could be applied to agrivoltaics, as such systems offer several improvements in community livelihoods.

Mini-grid systems that offer financial benefits beyond those associated solely with electricity access will increase economic benefits and the likelihood of securing finance to cover initial costs. Agrivoltaics do just this, adding an income source via the sale of crops. The sale of higher-value crops in marginalised zones further improves livelihood gains, while the mitigation of environmental challenges reduces risks to farmers' incomes. Agrivoltaics will also generate new, skilled employment opportunities for agrivoltaic construction, operation and maintenance, especially in rural locations currently lacking modern infrastructure.

Various financial instruments have been used to promote investment in the energy sector. Government bodies have the mandate to pool resources from various sources, such as government funds, investors and development partners, towards renewable energy projects. These government bodies also offer tools to attract investments from the private sector, including partial risk guarantees during the early phase of projects and credit enhancement instruments directed at reducing the risks faced by commercial lenders and other financial institutions. This financial mobilisation for renewable energy initiatives could be used to support agrivoltaic development. However, there are currently no mandates spanning co-use of land for energy and agriculture, so new supporting policy briefs need to be produced.

Knowledge exchange and co-design are essential to appropriately designing and implementing agrivoltaics in Africa. The first key driver in implementing agrivoltaics successfully is capacity building. It is important that the end-users, ranging from multinational agribusinesses to smallholder farmers, have access to information on how agrivoltaic systems work, how they are competitive with alternative solutions and what benefits they can bring. Cross-sectoral dissemination and engagement strategies are also key to realising the benefits of agrivoltaics, which span both the energy and agricultural sectors.

The private sector plays a key role in sustainability innovation, and policymakers should explore ways to improve interactions between the private sector and governments' climate-smart agriculture programmes. To support investment, it will be necessary to demonstrate the economic competitiveness of agrivoltaic systems compared to conventional ground-mounted PV systems, which are slightly cheaper due to the smaller mounting structures. Metrics such as land equivalent ratio and levelised cost of energy can be used to compare the values of agrivoltaics with alternatives, informing policy reform to support dual use of land for energy and agriculture. To overcome initial implementation barriers, governments could provide incentives to farmers that co-use their land for food and energy production, such as by subsidising development costs. Government- and NGO- backed training and knowledge exchange programmes will also support the expansion of agrivoltaics effectively. With appropriate policy support, investment incentives and knowledge sharing, agrivoltaics could play a vital role in the rapidly growing PV sector and the green energy transition across Africa. ■

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Dr Richard Randle-Boggis is a research associate at the University of Sheffield. His research bridges different sectors and disciplines to tackle complex global challenges such as energy and food insecurity. The overarching question guiding much of his research is: how can we achieve even greater socio-economic and environmental benefits from solar energy initiatives, in addition to low-carbon electricity? His current research focus is on agrivoltaics in East Africa.