Food and Agriculture Organization of the United Nations

INVESTING IN SUSTAINABLE ENERGY TECHNOLOGIES IN THE AGRIFOOD SECTOR (INVESTA)

©KICKSTARTINDEVELOPMENT

The FAO *Investing in Sustainable Energy Technologies in the Agrifood* Sector (INVESTA) project supports innovative and sustainable approaches to accelerate the uptake of clean energy solutions in agri-business in developing countries and emerging regions. GIZ (*Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH*) funded the project as a contribution to the international initiative *Powering Agriculture – An Energy Grand Challenge for Development*.

POWERING AGRICULTURE: AN ENERGY GRAND CHALLENGE FOR DEVELOPMENT

USAID FROM THE AMERICAN PEOPLE

SWEDEN

german cooperation DEUTSCHE ZUSAMMENARBEIT

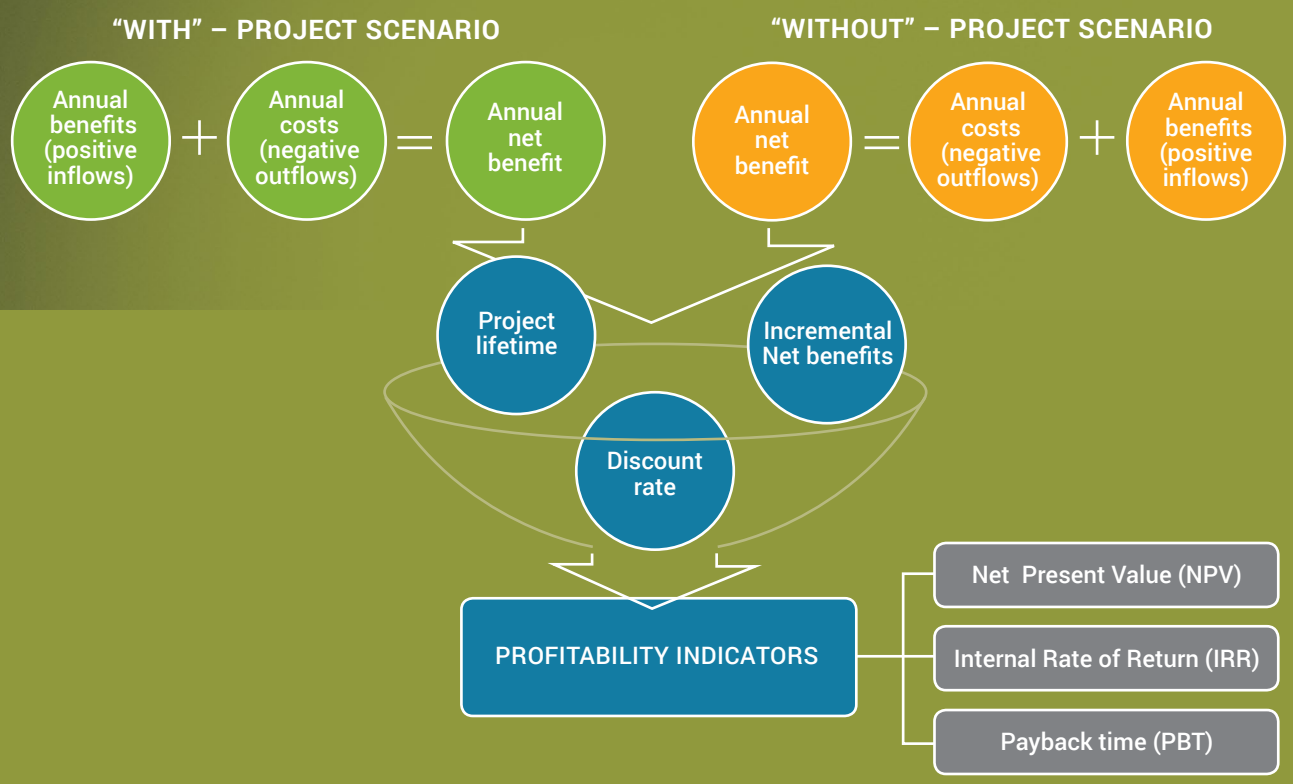
DUKE ENERGY

OPIC

The project has identified the main **barriers to the full deployment of clean energy technologies**, **possible ways to overcome them**, and the resulting **costs and benefits**. In addition, it considered the main **dimensions of women's economic empowerment** by means of sustainable energy technologies.

A methodological approach was developed for a sound and comprehensive **cost-benefit analysis (CBA)** of energy interventions in agrifood value chains. The approach highlights economic net benefits (including hidden costs and co-benefits) of investments, beyond simple financial benefits. This allows investors and policy-makers to take informed decisions.

FINANCIAL COST-BENEFIT ANALYSIS METHODOLOGY (CBA)



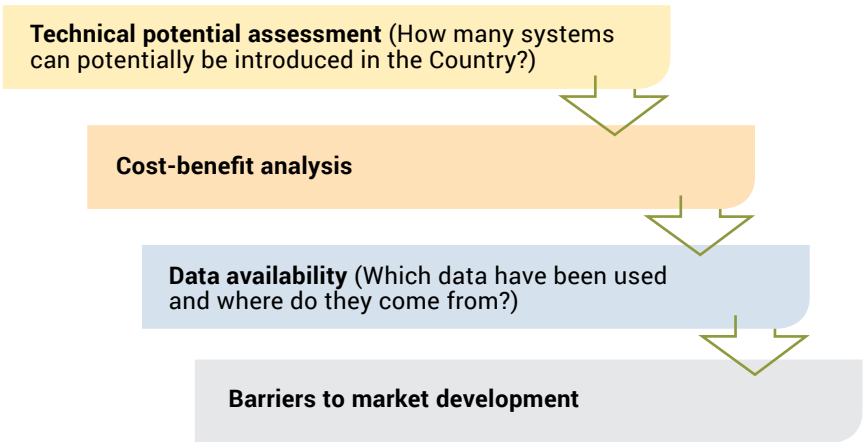
Non-monetized impacts were accounted for using a set of **environmental and socio-economic indicators**.

ENVIRONMENTAL AND SOCIO-ECONOMIC INDICATORS

INDICATOR	INTERVENTION LEVEL	NATIONAL LEVEL
Soil quality	●	
Fertilizer use and efficiency	●	●
Indoor air pollution	●	
Water use and efficiency	●	●
Water quality	●	
Food loss	●	●
Land requirement	●	●
GHG emissions	●	●
Health risk due to indoor air pollution		●
Fossil fuel consumption		●
Access to energy	●	●
Household income	●	●
Time saving	●	●
Employment	●	●

After having assessed the impacts at the single intervention level on environmental, social and economic aspects, the technical potential of a technology is estimated for a given country. Whenever possible, official national data on agricultural production and agrifood processing are used.

THE INVESTA CBA METHODOLOGY AT NATIONAL LEVEL

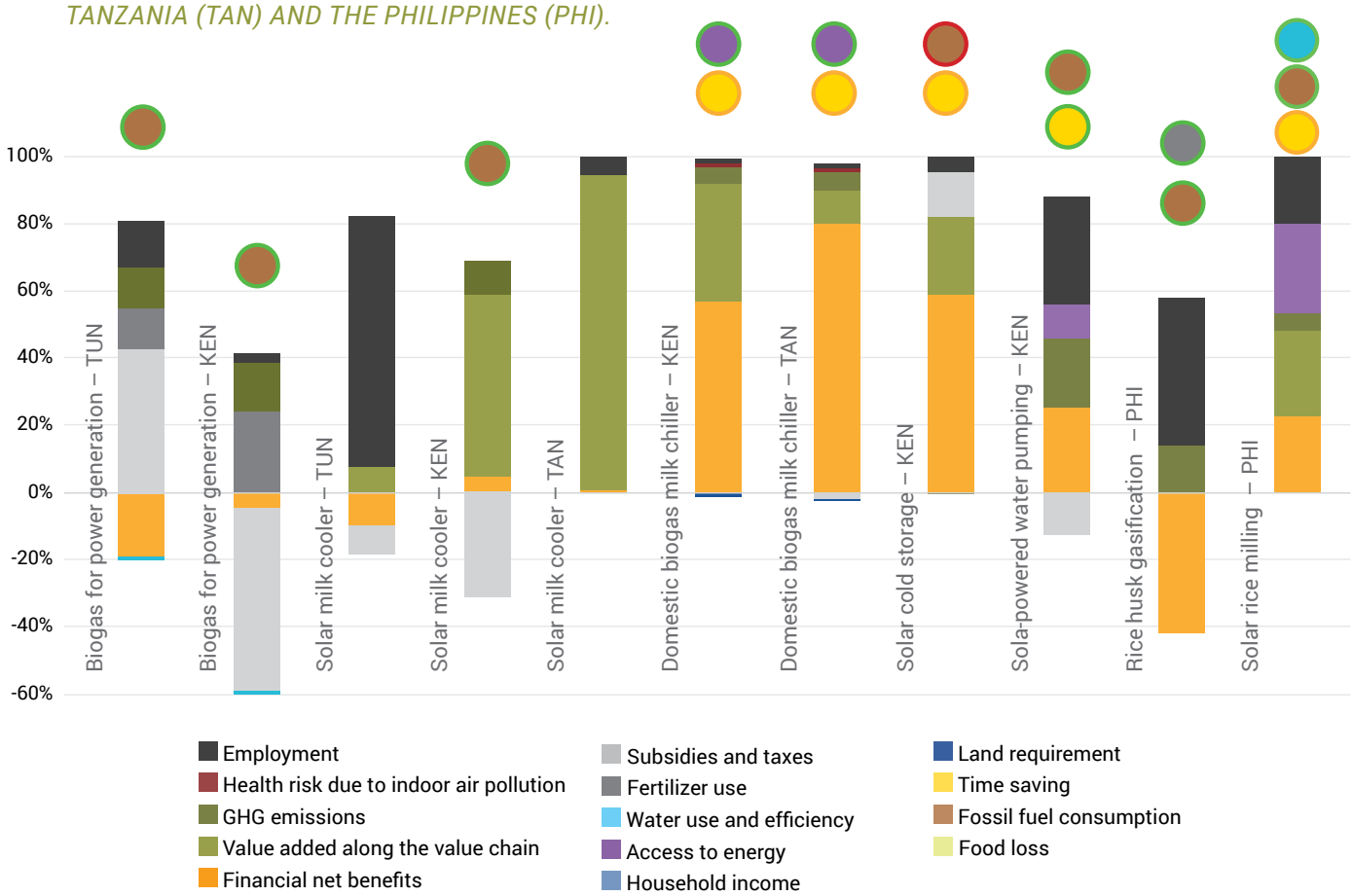


FINDINGS FROM 11 CASE STUDIES

The methodology helps identify priority technologies in order to maximize a certain impact, for example on employment creation or on value-added in the value chain.

The INVESTA CBA for the country case studies highlights the initial investment required (at country level), the investment horizon (over the expected lifetime of the technology), the financial attractiveness—in terms of internal rate of return (IRR) and net present value (NPV)—and the economic NPV, which includes hidden costs and co-benefits. Depending on the country conditions and on the benchmark choice, the impact of the same energy intervention can be significantly different.

DISTRIBUTION OF BENEFITS IN THE 11 CASE STUDIES ANALYSED IN KENYA (KEN), TUNISIA (TUN), TANZANIA (TAN) AND THE PHILIPPINES (PHI).



Note: the shares reported here take into account only the monetized impacts. Non-monetized impacts are reported above the bars and can be positive (green outline), have uncertain impact (orange outline), or negative (red outline).

©FAO/Alessandro Flammini

©FAO/Alessandro Flammini

POLICY RECOMMENDATIONS

FINANCIAL VERSUS ECONOMIC RETURNS

1. From the sustainable development perspective, it is important to **assess not only the financial attractiveness of an investment in energy technology in the agrifood chain, but also the co-benefits and hidden costs associated with it**. This includes impacts that can take place at different stages of the value chain.
2. **In national planning, establish proper baselines and well-defined and quantitative indicators, and effective results and impact monitoring**. Most countries lack reliable and up-to-date disaggregated data that allow baselines to be established and progress of energy interventions monitored. For measuring the performance of investments and technical assistance it is essential to improve the databases in all agrifood-related areas. Verifiable results and consistent impact indicators need to be defined, which would allow the degree of achievement to be determined and lessons learned for future interventions.
3. When developing energy interventions in the agrifood value chain (VC) or policies, keep in mind potential **food-energy-water nexus issues** and look for opportunities to de-couple them. Many interventions put additional pressure on already stressed resources. As a result, economic gains may be lost or existing water/food problems may worsen under pressure of climate change.
4. Prioritize interventions and policies that increase **resilience to natural disasters and social conflicts** due to poor natural resources management. Interventions that are vulnerable to such events should be discouraged.

REGULATORY FRAMEWORK

5. **Reform electricity tariffs so that they cover the real electricity production cost** (including generation, distribution, operation and maintenance and externalities). Also recent trends in terms of **falling prices of renewable energy** should be considered in national planning.
6. When planning decentralized technology options, make sure to foster local ownership, maintenance, **local repair and availability of spare parts**. In addition, a **saving scheme for maintenance** is recommended to assure long-term maintenance.
7. Create a **conducive framework for energy interventions in the agrifood chain that attracts local entrepreneurs and private investments**. This can be done by reducing the regulatory and tax burden (waive import duties, sales tax, corporate tax, license obligations, etc.) for companies that clearly have a social impact (net positive co-benefits) which the government can only achieve itself at a cost. It is likewise important for donors not to distort the market with subsidies to large agribusiness or to 'pick winners' through support programs.
8. Establishment of **codes and standards for equipment and by-products** to foster the development of a new market for these products which in turn can improve the financial viability of the investment in energy technology. For example, quality standards for anaerobic digestate or rice husks can help the development of a local markets for these products thus adding value to them. Codes and standard for equipment contribute to eradicate the commercialization of low-efficiency or counterfeit equipment (e.g. batteries, solar panels).
9. **Introduce environmental standards** including on waste disposal and favour the use of waste for bioenergy. Such a regulation would have multiple benefits: it would safeguard the environment by limiting pollution, would add value to a product that was considered a waste, and would develop a new market and its supporting industry.
10. **Set minimum food quality standards and enforce quality checks at an early stage of the food value chain**. Although the link with clean energy interventions is not straightforward, food quality standards often require VC actors to adopt modern energy technologies (thus moving away from manual or traditional fossil fuel-based work).
11. **Facilitate the administration process to obtain permits for commercial RE producing systems and grid connection**. This process can be a major burden, both in terms of cost and time, especially for developers of small energy interventions.
12. Set and properly communicate **national renewable energy and food quality targets** specific to the agriculture or food industry sectors.

©FAO/Alessandro Flammini

©CAMCO/VIP

MECHANISMS TO FOSTER INVESTMENTS

13. **Mainstream insurance and financing products tailored to agrifood energy interventions**.
    Insurance products should:
    a. hedge against market price spikes of biomass feedstock (if a market exists). This is applicable for example to bioenergy technologies which make use of agri-residues or food wastage; and
    b. protect early adoption of a technology against low yields. Bad experiences of early adoption can discourage new adopters. In agriculture, support guarantee schemes for producers should be tailored to farmers and farmer groups/cooperatives.

    Financing products include concessional loans which match the specific businesses. For example, in agriculture, the loan should be spread over a sufficient number of harvests/cropping cycles to allow flexibility in case of bad seasons. Financing products should be tailored to VC actors and take into account that smallholder farmers and processors often do not have a credit track record and collateral. New technologies such as smart meters and the wide spread use of mobile phones and mobile payment schemes can be used to provide alternative financing products. Gender-responsive financial products should be developed and facilitated.

    For highly indebted countries, concessional debt may be a more cost-effective way than subsidies to make RE interventions attractive to developers since it may reduce the total project support required to make the intervention viable, and governments have advantages that may enable them to provide dollar-equivalent debt subsidies more cheaply than price supports.
14. **Reduce or (whenever possible) remove any direct or indirect subsidy for fossil fuels and develop government-backed financial mechanisms or preferential loans** for early adopters. In the milk VC, a price premium for quality cooled milk is an effective measure to convince early technology adopters. The support should be guaranteed for a period sufficient to recover the difference between conventional and off-grid equipment. Subsidies should be used only for specific finite interventions to generate the products or when expansion can occur with a fixed public commitment in order to minimize market distortion.
15. Experiences of for-profit financial institutions confirm that a profitable investment in an energy technology can be developed to serve a poor rural clientele when there is knowledge of client needs, market and value chain dynamics; appropriate risk management technologies; and cost-effective delivery strategies. In this context, **win-win public-private partnerships should be prioritized** as they are critical to the sustainable provision of non-financial services which complement and support agricultural finance product delivery.
16. **Provide technical and financial assistance, possibly backed by international support, for micro-finance and local savings organizations**, such as service and credit associations, to help them develop and market savings products for farmers and processors. This includes assistance on the most appropriate business models.
17. **Foster knowledge and education schemes**, especially in rural areas. These can be summarized as follows:
    - Develop capacity to give a better understanding of energy technologies and good practices in agriculture and food processing to local financing institutes, administrative bodies, equipment providers and system developers. This includes technology demonstrations to farmer groups, cooperatives and practitioner groups.
    - Build capacity of both women and men aiming to hold managerial and technical roles by liaising with professional organizations, universities and vocational training schools. The capacity building and technical assistance activities would include awareness levels of clean energy solutions, technical and financial assistance to raise awareness of the potential benefits, effective business models, particularly in rural areas. A range of activities could be foreseen, ranging from promotional campaigns, including radios advertisements, to demonstrations and extension officer support.

GENDER EQUALITY

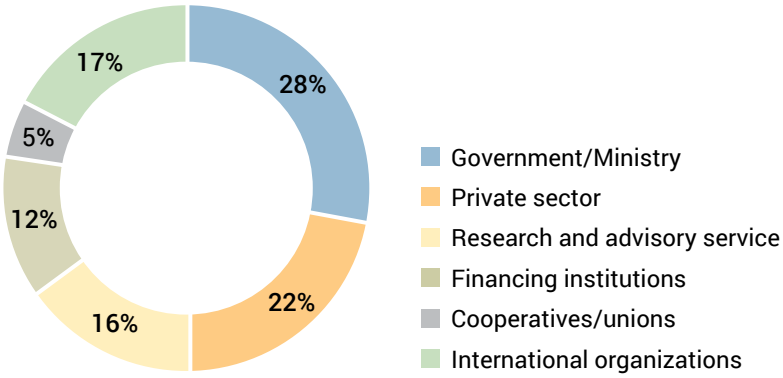
18. **Mainstream gender considerations throughout the innovation process** – concept development, research and development, piloting, early adoption/distribution, market growth, wide-scale adoption. Moreover, women should be empowered, as 'pull' motivation (opportunity-based entrepreneurship) seems to be more effective in engaging women than 'push' motivation (unemployment, job loss, etc.).
19. **Promote equal rights** for men and women in legal and customary land law at policy, institutional and community level; empower women to secure access to land; and support women's access to, and participation in, land initiatives. This includes the promotion of gender equitable and single-sex cooperatives.

DATA GAPS

20. **Support the collection, processing, storage and appropriate sharing of data and statistics on agriculture and the food industry in partnership with international organizations** such as the UN FAO.
21. National statistical offices should ensure that the data collected are **consistent with international standards**. This is necessary to ensure a sound comparison of assessments across countries. The SEEA-AFF should be considered as a reference for the combination of environmental and economic statistical data for the agriculture sector.
22. **Facilitate the collection of sex-disaggregated data** in agricultural sub-sectors, in the steps of agrifood value chains and throughout the adoption, use and outcomes of clean energy interventions.

STAKEHOLDER ENGAGEMENT

More than 200 stakeholders were involved in the INVESTA project, including government agencies, ministries, policy regulators, farmers, cooperatives, unions, clean energy technology providers, research institutions, consultancy, financing institutions, international organizations and NGOs.



If you would like to learn more about the INVESTA project and the methodology, please visit: **www.fao.org/energy/agrifood-chains/investa**

All information presented in this leaflet was sourced from the FAO INVESTA project and publications.