

## Project objectives



The **general objective** of BioStar, is to contribute to energy and food security as well as to the mitigation of the impacts of climate change through the development of a bioenergy sector meeting the needs of small and medium-sized enterprises (SMEs) of transformation food industry.

Its **specific objective** is to promote the sustainable development of agrifood processing SMEs in rural areas through innovation in the production of sustainable bioenergy and the optimization of food processing. It also aims to bring out a bioenergy sector by creating an organization and a concerted framework for this sector.

## Context

In rural West Africa, access to energy is expensive and unreliable. In rural areas, the energy supply depends either on autonomous systems based on heat engines and / or solar photovoltaic devices, or, more rarely, on a connection to the national electricity network. In the case of autonomous fossil fuel systems, the supply of fuel is irregular in quantity and quality. Photovoltaic systems can be unsuitable as soon as the requested power levels exceed one hundred kilowatts. As for the national electricity network, it is unreliable and often inaccessible in rural areas. These different situations limit the development of agrifood SMEs in rural areas and force them to settle in peri-urban areas with the consequence of high transport costs and significant post-harvest losses. At the same time, many food processing units generate organic residues, the management of which can be problematic in terms of public health or environmental contamination, even though they represent a potential source for producing energy. The specificities of African contexts (in terms of biomass, seasonality, type of final energy and stakeholder organization) must be better taken into account when designing bioenergy equipment, which requires research to i) adapt technologies for bioenergy and food processing equipment in SMEs, and for ii) promoting support and the emergence of a bioenergy ecosystem, or even an inter-branch, in order to achieve a satisfactory deployment of technologies bioenergy production in the Sahel and in West Africa.

## Theory of change to achieve goals

The energy recovery of agro-food residues will bring energy autonomy to companies which ultimately makes possible the establishment and development of new agro-food SMEs (AF SMEs) in rural areas, as close as possible to agricultural production. Developing AF SMEs is a major challenge to create decent jobs, especially for young rural people and women, support public investments in rural infrastructure and contribute to the attractiveness of rural areas.

The BIOSTAR project aims to generate three key changes to overcome the obstacles to the establishment of small and medium-sized businesses in rural areas in West Africa: 1) The sustainable organization of the supply of agro-food residues of small and medium-sized businesses for their bioenergy production ; 2) The mastery by AF SMEs of the efficiency of their processes and the implementation of innovative solutions for producing energy





from residues; 3) Sustainable development of the bioenergy sector thanks to a favorable institutional framework and capacity building of stakeholders.

To do this, support for technical and organizational innovation and multidisciplinary knowledge management are necessary. The intervention logic of the project is structured around three key stages:

1. First of all, the identification and mobilization of AF SMEs experimenters in the sectors selected for the Action. This involves analyzing (i) the characteristics of AF SMEs and their capacity to innovate (ii) the energy needs of AF SMEs, (iii) residues potentially available for bioenergy production, (iv) strategies and scenarios for mobilizing these residues. This stage involves researchers, AF SMEs, stakeholders from the territories concerned and professional organizations from the selected sectors. They will make it possible to ensure the presence and buy-in of the players concerned by the energy issue in the selected AF SMEs.
2. Next, the adaptation and experimentation with selected AF SMEs of different prototypes of equipment for the production of energy from agro-food residues. This stage will involve collaboration between researchers, technical players, service providers and political decision-makers for the identification, development and implementation of improvements in agrifood processing and in bioenergy production. It will demonstrate the technical viability of the solutions proposed and identify the technical, organizational and institutional arrangements necessary for their implementation.
3. Finally, the identification and promotion of conditions favorable to the appropriation of these innovative solutions by the AF SMEs concerned and the various companies in the bioenergy sector: this stage will involve players in research, education, professional training and supply chains to ensure the development of skills in bioenergy and the organization of technical services for AF SMEs and supply chains. Political and institutional actors will participate in the sustainable structuring of this bioenergy sector.

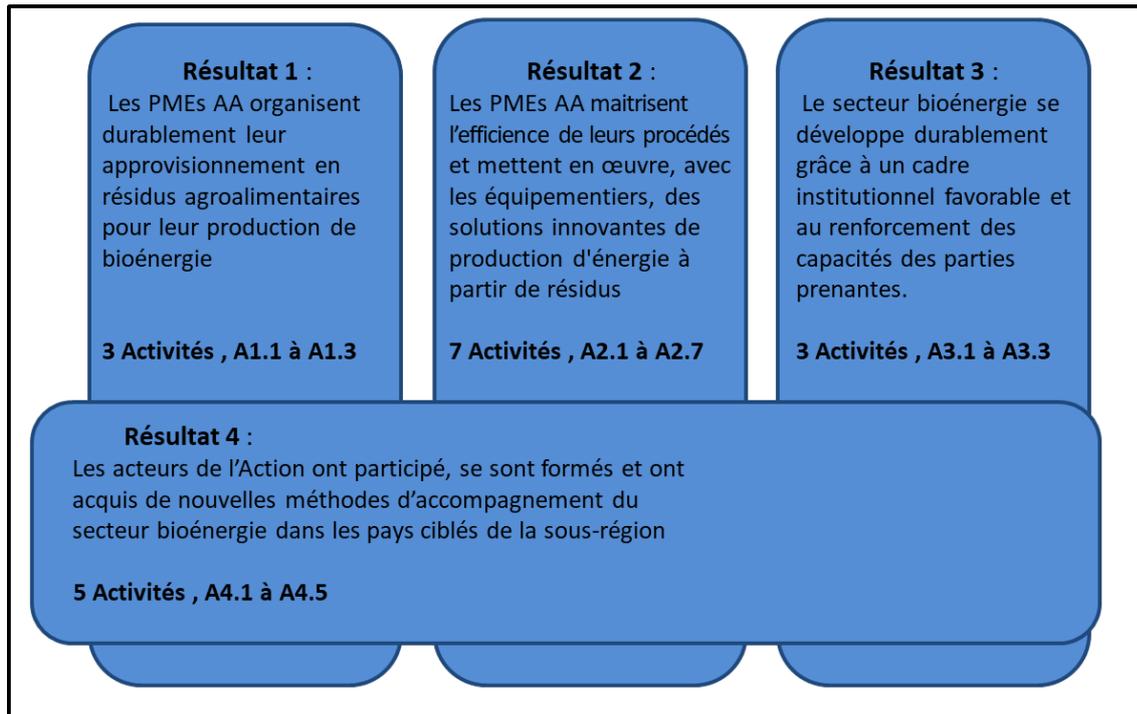
The implementation of these three stages will allow small and medium-sized businesses to settle permanently in rural areas and reduce the costs of processing agricultural products. Cross-cutting actions aim to monitor, implement and evaluate the changes planned within the framework of BioStar.

Three risk factors are identified:

1. Security situation in the areas of action, in particular in Burkina Faso.
2. Technological risk (lack of technical expertise of local equipment manufacturers and difficulty in appropriating technologies due to the technical complexity of their use).
3. Economic risk (profitability of innovation, vagaries of international trade which make the processing of products on the spot more or less interesting).

### **Main activities**

The activities are grouped into four main results as described in the diagram below.



**For the supply of SMEs with residues for the production of bioenergy: A 1.1.:** Selection of agrifood SMEs according to a multi-criteria approach shared by the partners of Action **A 1.2.:** Participatory construction of sustainable supply models for agro-food residues at the scale of the SME and / or the territory. **A 1.3.:** Impact of climate change on the sustainability of agricultural production in the sectors selected for the Action

**For the development of innovative bioenergy production solutions: A 2.1.:** In the selected AF SMEs, diagnosis of potential energy savings and improvements in agrifood processes. **A 2.2.:** Support for the innovative system of each of the experimental sites. **A 2.3.:** Identification and inventory of bioenergy equipment manufacturers and / or for agro-food processing in the Sahel or in Europe. **A 2.4.:** Understanding and predicting the behavior of agro-food residues of interest in energy conversion processes. **A 2.5.:** Multi-criteria selection of technical solutions for bioenergy production coupled with agrifood processing, best meeting the needs of each site. **A 2.6.:** R & D with equipment manufacturers for the adaptation and / or manufacturing of bioenergy technologies and detailed design of installations. **A 2.7.:** Installation, start-up and operation in agro-food SMEs of bioenergy equipment.

**For the development of an institutional framework favorable to the bioenergy sector: A 3.1.:** Contribution to the emergence of an environment favorable to the development of the biomass energy sector. **A 3.2.:** Capacity building for bioenergy stakeholders. **A 3.3.:** Contribution to academic training.

**For the implementation and evaluation of changes and the dissemination of results: A 4.1.:** Development of a monitoring and evaluation system for the changes induced by the project. **A 4.2.:** Assessment of the first social, economic and environmental effects linked to the changes induced by the project, measurable at the end of the Action. **A 4.3.:** Dissemination of the method and the results of the project aiming at a change of scale. **A 4.4.:** Communication on the implementation and results of the project. **A 4.5.:** Coordination, monitoring and support for the implementation of the project.

### Organization

The steering committee is the strategic decision-making body that will meet every year to review the implementation of the project, decide on the strategic and scientific orientation. The project coordination team is the operational arm of the steering committee. This team is in charge of the operational monitoring of the implementation of the Action. The four technical and scientific committees (one per result) include the actors involved in the implementation of the strategy by activity. These committees report annually on the progress towards achieving the result. An annual seminar will be organized once a year (before each steering committee) by all the scientific and technical committees, to assess and capitalize on the progress of the activities. A scientific coordination council bringing together all the research institutions involved in the project will also meet once a year in the wake of the annual seminars, in order to report on the progress of research work by results, as well as the monitoring of these.

### Implementing organization

CIRAD.

### Project partners

- ✓ Senegalese Institute for Agricultural Research (ISRA),
- ✓ 2iE Foundation,
- ✓ Gaston Berger University (UGB),
- ✓ Research Institute in Applied Sciences and Technologies of the National Center for Scientific and Technological Research (IRSAT-CNRST),
- ✓ Ouaga li University (UO2),
- ✓ Nitidae (Ong),
- ✓ Catholic University of Louvain (Ucl),
- ✓ Hohenheim University (UHOH),
- ✓ Università degli Studi Roma Tre

### Other stakeholders

- ✓ Agrifood SMEs in experimental sites.
- ✓ Selected bioenergy equipment manufacturers.
- ✓ Design offices and service providers that specialize in the installation and maintenance of bioenergy equipment and processes.

### Region

Burkina Faso and Senegal. Actions to identify other experimental sites and dissemination actions will be carried out in Ivory Coast and dissemination activities are planned in Mali and Niger.

### Funding and co-funding

|              |              |
|--------------|--------------|
| UE           | € 9,400,000  |
| CIRAD        | € 11,388     |
| AFD          | € 2,000,000  |
| Total budget | € 11,411,388 |

### Duration

5 years (2020-2024)