



### **Purpose of the project**

The objectives of the project are twofold and complementary: a scientific objective which consists of exploring and operationalising the possibilities offered by the current supply of satellite images to produce new (regular and inexpensive) indicators and maps of the dynamics of agrarian systems and landscapes in central and northern Benin; and an operational objective that aims to set up a pilot observatory of agrarian systems and landscapes, in the form of a group of people sharing a service platform dedicated to capitalising on spatialised information, principally from satellite data.

The platform aims to strengthen the capacities of national and local agricultural stakeholders in infrastructure planning, agricultural advisory services and coordination within the value chains.

### **Background**

With the rapid development of cotton and cashew nuts, production systems in central and northern Benin are undergoing rapid change. The transformation of production systems and associated commodity chains is causing critical changes in ecosystems and in the spatial structure of rural landscapes.

Beyond the impacts on natural ecosystems and biodiversity, the expansion of agricultural land is leading to significant changes in agricultural and pastoral practices: the disappearance of fallow land, soil degradation and the increasing use of inputs, and the restriction of grazing land among others. Although these major problems have been identified in northern and central Benin, reliable information on the state of rural landscapes is still largely lacking or difficult to access.

In addition, the current supply of high and very high spatial resolution (HRS and THRS) satellite imagery is expanding and becoming increasingly available in West Africa. With the increase in spatial, temporal and spectral resolutions, these new satellite data offer the opportunity to develop new applications in agriculture and environment to characterise and monitor the evolution of landscapes according to agricultural practices.

Thus, the major challenge of the project is to take advantage of the possibilities offered by recent satellite images to monitor changes at the landscape level and provide information on the agricultural practices that drive them, in order to finally have more reliable and frequent agricultural statistics to guide agricultural advisory services and infrastructure planning.

### **The theory behind the change**

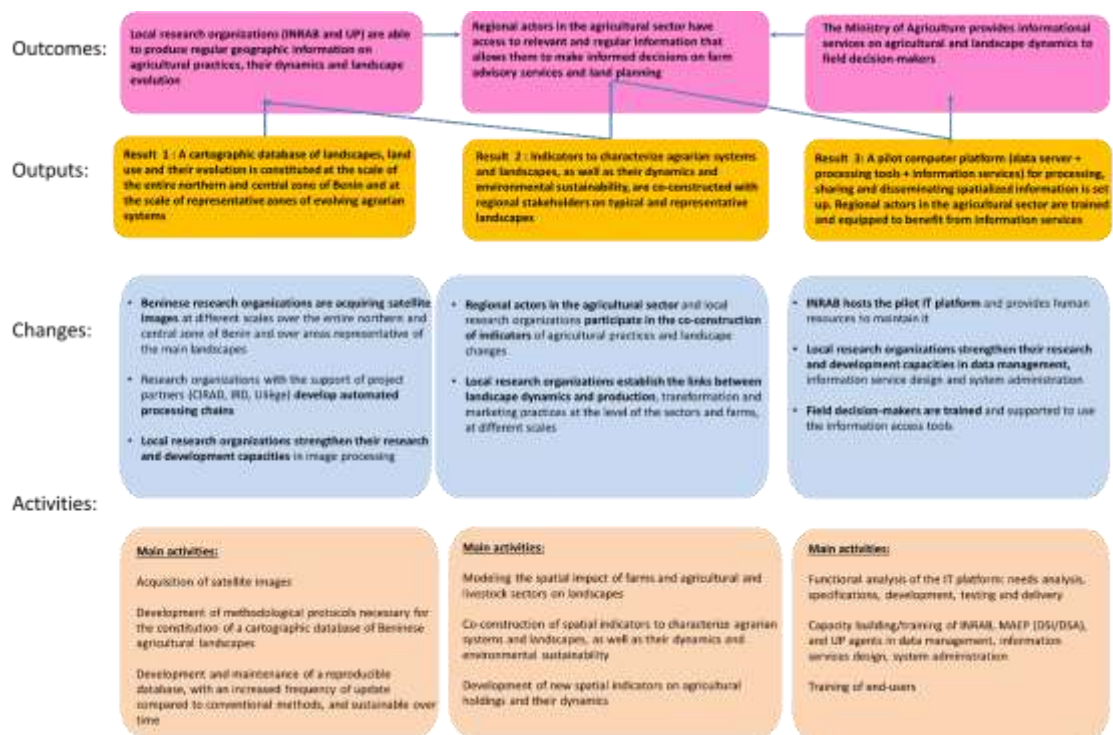
The project is fully in line with the concertation framework for the promotion of agricultural commodity chains set up by the Beninese government. It aims at:

- collecting the needs of farmers' organizations (FOs), producers and local elected officials in terms of geographical and statistical information: cultivated areas, location of production, agricultural practices, types of farms, state of vegetation, yield estimates, etc.
- strengthening agricultural research actors: Institut national des recherches agricoles du Bénin (INRAB) and the University of Parakou in the production of environmental and agricultural indicators from satellite images using new technologies (artificial intelligence);
- strengthening the capacities of three territorial agricultural development agencies (TADAs) in the provision of geographic and statistical information services to farmer organisations and agricultural advisory service providers, and in their planning strategies within their agricultural development pole (ADP): Niger Valley (Malanville), Southern Alibori (Kandi) et Southern Borgou (Parakou).

The project aims at proving the concept about the following impacts:

- local research organisations are able to produce regular geographic information from satellite images on agricultural practices, their dynamics and landscape evolution;
- the Ministry of Agriculture, through INRAB and its Information Systems Department (Direction des systèmes d'information), manages a computer platform for storing, processing, producing indicators and disseminating geographical and statistical information on agricultural dynamics;
- the Ministry of Agriculture provides information services on agricultural and landscape dynamics to TADAs, FOs, and agricultural advisory services providers in the three ADPs of the project;
- local and regional decision-makers in the sectors (TADAs, FOs, producers) have access to relevant and regular information that enables them to make informed decisions on agricultural advice and land-use planning;
- TADAs, FOs and agricultural advisory service providers adopt spatially differentiated intervention strategies according to the spatialized information provided by the platform.

The information services provided by the pilot platform will be integrated into the information and decision flows of the concertation framework for the promotion of the agricultural sectors and will complement the information on practices, technologies and farm typology for direct and indirect stakeholders in the agricultural sector.



## Main activities

The main activities of the project are:

- Creation of a cartographic database of landscapes and land use systems and their evolution over the last 20 years, over the whole of the northern and central zones of Benin and at the scale of representative zones of evolving agrarian systems;
- Co-construction with local stakeholders (FOs, producers, TADAs) of indicators to characterise agrarian systems and landscapes as well as their dynamics and environmental sustainability, on typical landscapes representative of the main current dynamics (development of cotton, development of tree plantations, evolution of forest cover, pioneer fronts, etc.). These indicators are subject to methodological tests to make them operational;
- Setting up of a pilot observatory (researchers, local actors, IT platform and information services) for processing, sharing, and disseminating spatialised information;
- Capacity-building of research and higher education actors (UP and INRAB) on new satellite image processing techniques and the production of information services: training, co-direction of theses and master students;
- Capacity-building of the Ministry of Agriculture (INRAB, DSI) for the provision of geographical and statistical information services to local actors: FOs, producers, and agricultural advisory service providers (equipment, training);
- Capacity-building of regional agricultural actors: FOs and TADAs to access and disseminate information (equipment, training).

## Organisation

The intervention team is composed of European and Beninese researchers chosen for their skills in geography, agronomy, forestry, agricultural economics, ecology, remote sensing, and computer science.

The governance of the project will be based on a steering committee, which includes a representative of CIRAD management, INRAB, UP, and the European Union Delegation in Benin. This steering committee is supported by

the elements provided by the coordination team. It will be composed of three people: a main coordinator from CIRAD and two local coordinators appointed by INRAB and UP.

The project is organised around three work packages (WPs) providing the three main results:

- WP1 : A cartographic database of landscapes, land use and their evolution is constituted at the scale of the entire northern and central zones of Benin, as well as at the scale of representative zones of agrarian systems in evolution.
- WP2 : Indicators to characterise agrarian systems and landscapes, as well as their dynamics and environmental sustainability, are constructed with regional stakeholders on typical and representative landscapes.
- WP3 : A pilot IT platform (data server + processing tools + information services) for processing, sharing and disseminating spatialised information is set up. Regional actors in the agricultural sector are trained and equipped to benefit from the information services

WP1 will be coordinated jointly by CIRAD and Université de Parakou (UP) ; WP2 and WP3 will be coordinated jointly by CIRAD and Institut national des recherches agricoles du Bénin (INRAB).

### Implementing organisation

The general coordination of the project will be ensured by Centre de coopération internationale en recherche agronomique pour le développement (CIRAD).

### Project partners

- Université de Parakou (UP),
- Institut National des Recherches Agricoles du Bénin (INRAB)
- Institut de Recherche pour le Développement (IRD),
- Université de Liège (U Liège),
- Information Systems Department of the Ministry of Agriculture, Livestock and Fisheries (MAEP).

### Other main stakeholders

- Agences territoriales de développement agricole (TADAs),
- Main OPAs from three agricultural development poles (ADPs): Niger Valley (Malanville), Southern Alibori (Kandi) et Southern Borgou (Parakou).

These institutions will benefit from tools that allow them to access the maps and indicators produced for monitoring landscapes and agrarian systems dynamics.

### Location

Benin

### Funding and co-funding

European Union: EUR 1 785 000

### Duration

April 2022 - May 2026 (4 years)



MINISTÈRE DE L'AGRICULTURE  
DE L'ÉLEVAGE ET DE LA PÊCHE  
RÉPUBLIQUE DU BÉNIN