



*Climate change: melting glaciers, diminishing water resources, trapped sunrays increase global warming*



# **REFRIGERATION AND MANAGEMENT OF AGRICULTURAL PRODUCTS IN AFRICA**

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## Introduction

Africa, as we know, is a culturally rich continent and above all raw materials. However, only few of us know that in Africa 70% of agricultural production remains in the fields due to the lack of the cold chain in the production of perishable foodstuffs. The shopping at the market for food cooking is daily, because they are unable to keep a surplus for the next few days.

In rural areas, the lack of traditional electricity is almost total. So even if you want, you cannot think of using a traditional refrigeration plant to conserve agricultural production.

## The Project

Given the evolution of technology in the refrigeration and renewable energy sector, we have conceived a project under construction in Bagré area. Bagré is located in the province of Boulgou, in the Central East Region in Burkina Faso, on the border with Ghana and Togo. Where the local government has reclaimed an area of more than 500,000 hectares for the development of activities in the field of Agriculture (Irrigated Agriculture, Fishing, Cattle Breeding, Trade and Tourism). The project takes into account another natural resource that the African continent has abundantly in both cities and rural areas: That is the Sun.

Then a refrigeration plant powered by a photovoltaic plant with accumulators. The refrigeration unit consumes “lot of energy”, especially during the start-up of the compressor. Talking about accumulators, means that the amount of accumulated energy decreases during the night or the rain where the sun is not present. As a result, we could not charge the batteries quickly if you used on / off moto-compressors.

Therefore, the right choice of moto-compressors drive by inverter. An electronic expansion valve will ensure more accurate handling of the evaporation temperature and in particular the delta T on the cold room air to favor an acceptable humidity for the storage of high volume water products.

Another consideration drives to the choice the evaporating system: the flexibility of using the cold rooms. In the Bagre area, tomatoes, onions, papaya, bananas, potatoes, garlic, cabbage ... besides the fish farming (Tilapia) are grown. The listed products have each an optimal temperature and humidity for good long-term storage.

For a careful management compatibly with the availability and smart use of the cold rooms, an electric board with PLC use will permit to change the set point according to the product that will be stored.

The entire system configuration makes flexible use of the 10 starting cold rooms provided in the first phase of the project. Each cold room will be equipped with a stand-alone refrigeration system to avoid any blackout and meet the need for available electricity.

On a surface of 10,000 m<sup>2</sup> (1 hectare), 10 cold rooms of 72 m<sup>3</sup> of internal volume will be realized. The photovoltaic power plant will consist of a field of 800 pieces of solar panels of 250 W by unit and 72 accumulators.

Taking into account the environmental impact, the photovoltaic power plant should cover all the electrical requirements of the whole structure, which is composed of the cold rooms and building (offices and process room).

## Summary

### 10 Medium Temp. Cold Rooms:

- Volume: 72 m<sup>3</sup> (6x4x3)
- Max. Quantity of product /Room: 15-40 Tons

Banana\_green (11/14°C – 85/90% RH) per 3-4 Weeks

Banana\_ripe (7°C – 85/90% RH) per 2-4 Weeks

Tomato (12°C – 90% RH) per 3-5 Weeks

Potato (6°C – 90% RH) per 4-8 Months

Papaya (7°C – 85/90% RH) per 2-3 Weeks

Onion (-3/0°C – 65/70% RH) per 6-8 Months

Garlic (-1/0°C – 70/75% RH) per 6-8 Months

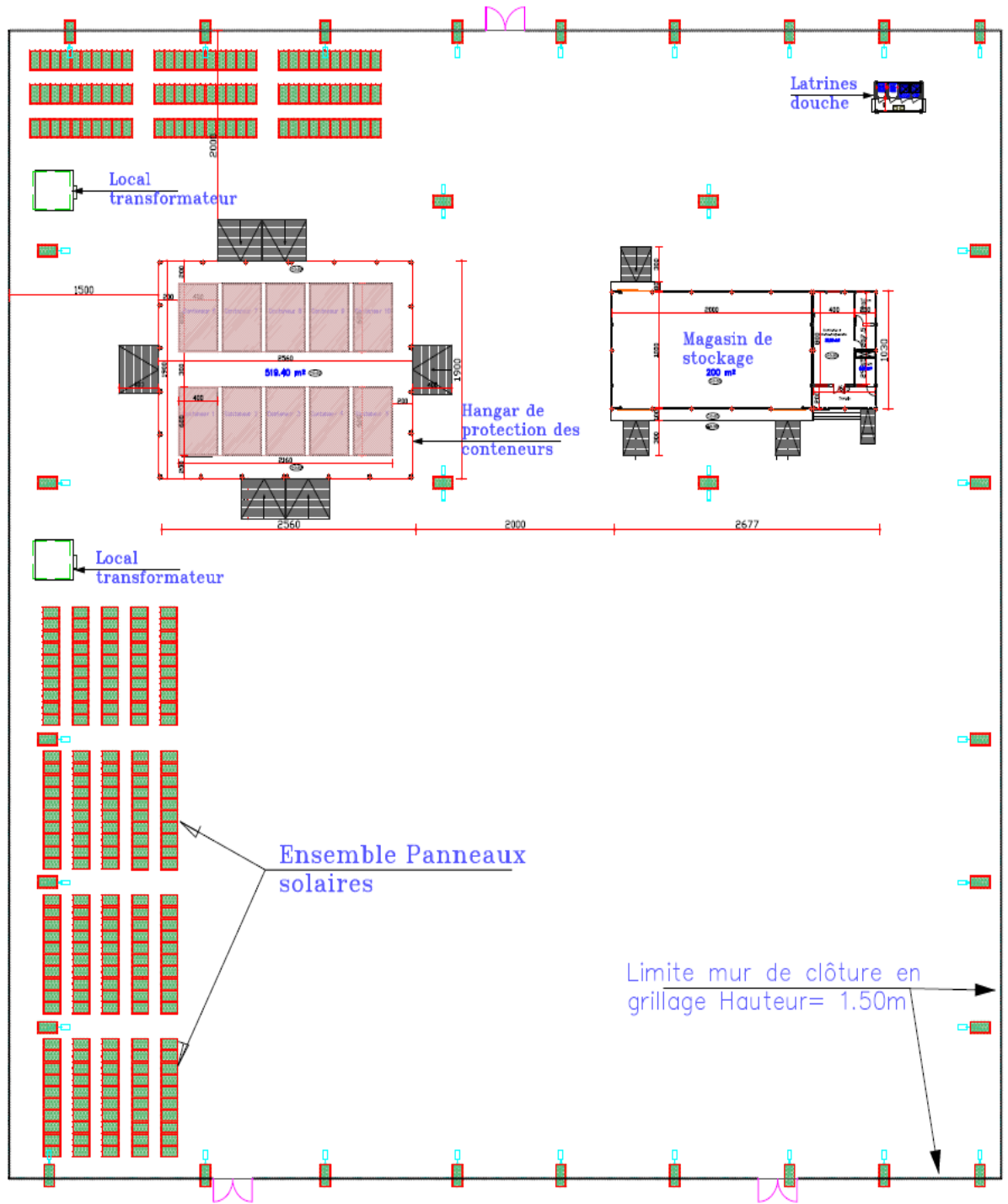
- Total cooling power: 120 kW
- Powered by PV system:

Capacity: 200 kW with 1.600 m<sup>2</sup> of solar panels

Covering 100% of electricity need of the whole structure

### Ref-System Configuration

- Tropical Air condensing unit with semi-hermetic compressor drives by inverter
- Electronic Expansion Valve will permit the flexible use of the cold room ( possibility to change the set point accordingly)
- Electronic board with PLC for remote control



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