

"Ecological and organic plantain: A new model for income improvement and economic growth in Benin"

René Tokannou¹, Anicet G. Dassou², Silvère Tovignan³, Simplicie D. Vodouhè⁴,
Roch L Mongbo⁵.

rtokannou@yahoo.fr

1. Context of Banana and Plantain production in Benin (1/3)

Bénin is not known as a banana or plantain producing country

- FAOSTAT 2020 : About 4,066 ha are under banana and plantain production
- The annual total production was less than 20,000 tons when many African countries show very high level of banana and plantain production like Angola 4,115,023 T, Tanzania 3,419,436 T, followed by Cameroon and Ivory Coast as other exemples.
- In Benin, yields are less than 5 T/ha consequence of very extensive and neglected production systems (less than 900 plants per ha).
- Banana and plantain farmers were not assisted to adopt improved banana and plantain production systems and the state of this value chain was not attractive for investors.

An example of a rainfed traditional banana production system in Grand Popo (Benin)



1. Context of Banana and Plantain production in Benin (2/3)

- The observation of high yields of banana and plantain plants that benefit from special soil moisture conditions has led to the hypothesis that :
- « *if banana and plantain plants produced in Benin benefited from special conditions of planting, water supply and maintenance during their production cycles, they would give results similar to those observed in isolation where they benefit from good natural moisture and nutrients conditions without any synthetic mineral inputs* ».
- From these observations and hypothesis, trials started in 2019.

1. Context of Banana and Plantain production in Benin

(3/3)

- The Ecological and Organic banana and plantain production trials started in 2019 in Benin aimed to develop and disseminate improved production models as part of the implementation in Benin of the 2nd Phase of the Ecological Organic Agriculture (EOA) Project, which is an African Union Initiative, funded by the Swiss Agency for Development and Cooperation (SDC) and managed at continental level by BioVision Africa Trust (BiVAT) from Kenya.

2. Methodology Plan

1. Production Systems and Models developed
2. Description of the implementation operations
3. Method of data collection and analysis

2. Methodology. (1/4). The Systems and Models developed a)

Two improved production systems were developed in regard to farmers traditional production system : the improved rainfall system and the irrigated system with 2 models according to water access. The following table presents the synthesis

Production systems	Density and nutrient management	Water Source	Type of irrigation
1 : Farmers extensive system (traditional)	Extensive (3m x 3m) Without nutrient intake	Rainfall	Without irrigation
2 : Improved rainfall system	Intensive (2m x 2m) With organic intake	Rainfall	Without irrigation

2. Methodology. (2/4) : The systems and models developed b)

Production systems	Density and nutrient management	Water Source	Type of irrigation
3 : Irrigated system with easier access to water	Intensive (2m x 2m) With organic intake	30 m deep with solar extraction	Strip and flexible fitting irrigation
4 : Irrigated system with harder access to water	Intensive (2m x 2m) With organic intake	75 m deep with solar extraction	Strip and flexible fitting irrigation

2. Methodology (3/4) : The description of the implementation process

1. Ploughing the soil essentially with daba and removing of stumps (scaling)
2. Picketing the installation of stakes following a spatial arrangement of 2m x 2m.
3. Making holes of 60 cm x 60 cm x 60 cm taking care to put on one side the top soil and on the other the under soil.
4. Amendment of soil by returning the top soil into the hole supplemented by a contribution of animal droppings (more commonly poultry droppings), potting soil or compost.
5. Planting of banana seedlings (PIF) or suckers from healthy plantations.
6. Water supply every 2 days (i.e. 3 to 4 times a week) for irrigated systems

Methodology (4/4) : Method of data collection and analysis

- Data collection was carried out for the reference model from banana and plantain producers in the production areas visited during the diagnostic phase.
- Data on the improved models were collected from the 10 entrepreneurs accompanied for the reproduction of the experimental model tested at the training and action-research center of the NGO CRASTEDA in Somè (Abomey Calavi).
- The areas of improved plantations per entrepreneur vary from 0.5ha to 2ha.
- The first harvests are carried out between the 9th and 11th month and the following harvests between the 7th and 9th months after the first harvests; (nearly to 3 harvests are made during the 2 first years).
- The processing and analysis of the collected data were carried out with Excel software.
- The commun profitability calculation formula were used.

Results (1/7)

❖ Cost analysis of improved models

It appears that whatever the model (improved rainfall or irrigated from a shallow or deep aquifer) :

- The investment cost is quite high (more than **7,500,000 CFA francs (11,661 USD)** for irrigated models. (including in terms of investment a building for the permanent workers, the cost of seedlings, the protection device against strong winds and the cost of water mobilization and distribution).

Results (2/7)

Types	Improved Models description	Total production Cost (without financial costs)
Model 1	Rainfall production system	5,608,000 F CFA (8,719 USD) (mainly building for the permanent workers, the cost of seedlings, the protection device against strong winds)
Model 2	Irrigated system with shallow water	9,308,833 F CFA (14,473 USD) (additionally the cost of water mobilization and distribution for irrigated models).
Model 3	Irrigated with deep water system	11,168,833 F CFA (17,365 USD) (additionally the cost of water mobilization and distribution for irrigated models).



Results (3/7)

❖ Analysis of revenues and net margins

- Revenue sources are the same in all improved models (plantain fruits and plantain suckers)
- Revenue from the sale of organic and ecological plantain is on average **3,375,000 CFA francs (USD 5,247)** per ha per year for the improved rainfall system and **8,156,250 F CFA (USD 12,681)** per ha per year for irrigated systems (revenues from **sale fruits and suckers**)

Results (4/7)

❖ Analysis of revenues and net margins

Table: Net margin

Models	Model Features	Average annual net margins
Model 1	Rainfall model (Without irrigation)	1,473,000 CFA francs (2,290 USD)
Model 2	Irrigated model with shallow water table	5,152,500 CFA francs (8,011 USD)
Model 3	Irrigated model with deep water	4,857,500 CFA francs (7,552 USD)



Results (5/7)

Table: Internal rate of profitability (IRP), payback time and Net present value (NPV) of the models studied are the following

- **Profiability indicators**

Models	IRP	Payback time	NPV
Traditional system	28%	27.360	487 022
Improved Model 1	58%	20.00	3 782 780
Improved Model 2	71%	18.16	13 610 150
Improved Model 3	49%	22.43	12 161 375

Results (6/7)

Prospects for the impact of the development of the sector on the income of households/enterprises

- Average net margins of the 2nd and 3rd models are more than **400,000 CFA francs (622 USD) per month (4,857,500 CFA francs (7,552 USD) /12)**, exceeding the incomes of most employees in the public or even the private sector.

Results (7/7)

Prospects for the impact of the development of the ecological and organic plantain improved model 2 on the national economy (referring to Government Action Plan 2nd phase (2021-2026) planning 10 000 ha for banana and plantain production),

- An **annual added value of 83 Billion 250 million** (83 250 000 000) CFA francs (**129,434,995 USD**) will be generated for the national economy.
- A total of **20,000 direct jobs will be created just at the production level** alone (knowing well that other jobs will be created for trading and processing).
- The **main challenge for a large adoption of the improved model is access to credit just for 2 years** (all improved models' payback time are less than 24 months)

Conclusion (1/2)

- It appears that the three improved models presented are **demanding in terms of investment and operating expenses** for the first year. Installation and operating costs are therefore significant and their adoption difficult without recourse to credit.
- The three improved models presented generate **significant net margins almost unprecedented in the agricultural sector in Benin.**

Conclusion (2/2)

- The intensification of ecological and organic production of plantain will lead to an **unprecedented improvement in household and business incomes and Benin's economic growth**
- The production of ecological and organic plantain, the promotion of which is the responsibility of the Ecological and Organic Agriculture Initiative with the support of the Swiss Cooperation, constitutes "**A New Model for the improvement of incomes and economic growth in Benin**"
- **Credit access facilities are critically important for this intensification of the ecological and organic production of plantain.**

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