Fish farming as a way for diversifying sources of income in the cocoa sector in Ivory Coast

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**Introduction**

**Cocoa: a key sector for the Ivorian economy**

- 1st producer country in the world since the 1970s (Kouassi, 2021)
- Over 2 million tonnes produced since 2017 (ICCO, 2021)
- Cocoa contributes to 12-15% of the GDP (World bank, 2019; Pany, 2020)
- 6 million people live from cocoa (FIRCA, 2010; Hewitt & Millard, 2010)

(FAOstat, 2022)
Introduction

Cocoa: a sector beset by many difficulties

- Ageing of plantations
- Declining soil fertility
- Pest pressure and plant protection treatments
- Climate change
- Land pressure
- Price instability

(Ruf & Agkpo, 2008)
Fish farming: A lever for diversifying cocoa farmers' income

Why fish farming?
- High local fish demand
- Availability of lowland areas
- The market exists
- Possibility to build ponds

Significant development of fish farming in the cocoa-producing areas of the South and Central West (Niamien et al., 2017; Kouadio & Assi-Kaudjhis, 2018)

(FAOstat, 2022)
Introduction

**General objective**

Assessment of fish farming practices as a means of diversification of cocoa production

**Key steps:**

- Describing cocoa production systems among cocoa farmers
- Characterise their fish production
- Identifying the contributions of fish farming to cocoa farms
Study areas

Area selection criteria:

- Agro-climatic gradient:
  - Significant differences in rainfall

- History of cocoa production:
  - From an old loop to a new one

- Development of fish farming:
  - Fish production areas in ponds
Surveys of cocoa and fish farmers

**Two series of surveys:**

From May to September 2021, 45 fish farmers interviewed
Direct and semi-structured interviews on each farm

**Two survey tools:**

- **Questionnaire**
  Collection of quantitative information on yields and incomes

- **Interview guide**
  Description of the systems and technical itineraries
Results and Discussion

Two main systems of cocoa production among cocoa-fish farmers

### Monoculture of cocoa

<table>
<thead>
<tr>
<th>Localities</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bédiala</td>
<td>18%</td>
</tr>
<tr>
<td>Sinfra</td>
<td>18%</td>
</tr>
<tr>
<td>Méagui</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Cocoa-cashew trees association

<table>
<thead>
<tr>
<th>Localities</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bédiala</td>
<td>85%</td>
</tr>
<tr>
<td>Sinfra</td>
<td>82%</td>
</tr>
<tr>
<td>Méagui</td>
<td>0%</td>
</tr>
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**Cocoa-cashew**: Diversification of income sources  
+ Mitigation of the effects of climate change on cocoa farms
Results and Discussion

Two major fish production systems based on polyculture of tilapia *Oreochromis niloticus*

**Rice-fish farming**: Additional source of income (fish) + Improvement of food security (rice)

**Fish farming**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Bédiala</td>
<td>100%</td>
</tr>
<tr>
<td>Sinfra</td>
<td>75%</td>
</tr>
<tr>
<td>Méagui</td>
<td>58%</td>
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</table>

<table>
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<td>Méagui</td>
<td>58%</td>
</tr>
</tbody>
</table>

Localities

- Bédiala:
  - Occurrence: 100%

- Sinfra:
  - Occurrence: 75%

- Méagui:
  - Occurrence: 58%
Results and Discussion

Contribution of fish farming to cocoa farming

Yields of cocoa farms (kg/ha/year)

<table>
<thead>
<tr>
<th></th>
<th>Bédiala</th>
<th>Sinfra</th>
<th>Méagui</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤100</td>
<td>50%</td>
<td>25%</td>
<td>50%</td>
</tr>
<tr>
<td>100-500</td>
<td>50%</td>
<td>25%</td>
<td>50%</td>
</tr>
<tr>
<td>&gt;500</td>
<td>50%</td>
<td></td>
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</tbody>
</table>

% of farms surveyed
Results and Discussion

Contribution of fish farming to cocoa farming

### Yields of cocoa farms (kg/ha/year)

- **Bédiala**: 50% ≤100, 50% 100-500
- **Sinfra**: 25% 100-500, 25% >500
- **Méagui**: 50% >500

### Fish farm yields (kg/ha/year)

<table>
<thead>
<tr>
<th>Product</th>
<th>Bédiala</th>
<th>Sinfra</th>
<th>Méagui</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish</td>
<td>~1000</td>
<td>~1500</td>
<td>~300</td>
</tr>
<tr>
<td>Rice</td>
<td>~3500</td>
<td>~3500</td>
<td>~2000</td>
</tr>
</tbody>
</table>
Results and Discussion

**Contribution of fish farming to cocoa farming**

**Annual income from cocoa and fish farming (US$)**

<table>
<thead>
<tr>
<th>Product</th>
<th>Bédiala</th>
<th>Sinfra</th>
<th>Méagui</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocoa</td>
<td>100-1300</td>
<td>80-1300</td>
<td>260-3900</td>
</tr>
<tr>
<td>Fish</td>
<td>470-4740</td>
<td>240-4740</td>
<td>100-1300</td>
</tr>
</tbody>
</table>

**Fish farming**: main source of incomes for 30%, 40% and 5% of cocoa farmers in Bédiala, Sinfra and Méagui, respectively.
Contribution of fish farming to cocoa farming

**Results and Discussion**

- Replanting of degraded cocoa farms
  - Cocoa nursery on the edge of a pond
  - Replanted nursery under cashew trees

- Ecological barrier against fires
  - Limitation of spread
  - Ease of extinction
Roles of fish farming:

1. Important source of incomes for cocoa farmers
2. Contributes to food security in rural areas
3. Contributes to the sustainability of cocoa production

Perspective

Assessment of the impacts of pesticides used in cocoa production on fish and the aquatic environment
Remettre l’Humain et l’Environnement au cœur de la cacaoculture de demain

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