IMPROVING LIVELIHOODS IN AGRICULTURE-BASED ECONOMIES THROUGH PROCESSING SECTOR DEVELOPMENT: A CGE ANALYSIS ON BENIN

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Background (1/2)

• Most African countries: agriculture-based economies with a high share of GDP and employment provided by agriculture (OCED-FAO, 2016)

• Agriculture in these countries: Exporting raw materials to developed economies while importing large share of processed food

• Low investment level in agriculture

• To change, African Union (AU): Comprehensive African Agricultural Development Programme (CAADP) ➔ Zero hunger and less poverty

• Based on that: African countries set up agricultural development programs

• Benin: PNIASAN ➔ enhance productivity and value chain development (How?)
Background (2/2)

- Agricultural development without suitable value chain development → possibly negative effect on farmers (Johnson & Islam, 2004; Gunawardena, 2012; Cazcarro et al., 2016; Gupta et al., 2018)

- Increasing productivity → lower agricultural prices and income loss for poor rural households in Benin (Grethe et al., 2020)

- Processing not developed

- Research Question: to which extent can developing the food processing sector along with agricultural productivity gains contribute to sustained agricultural prices and how would this affect income distribution?

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Cashew, Pineapple and PNIASAN (1/1)

- **Cashew in Benin in 2019**
  - 130,220 t raw cashew nut (RCN)
  - Processing 25,100 t RCN in cashew nut kernel (CNK), 81% exported as RCN

- **Pineapple in Benin in 2019**
  - 400,000 t raw fruit
  - Processing 29%, export 56% (1% to the EU and 55% to West-Africa)

- **PNIASAN**
  - Reach 200,034 t RCN per year and 502,413 t pineapple per year
  - Process at least 50% of RCN ➔ 100,017 t: 300% increase in CNK (how?)
  - No specific target for pineapple processing in PNIASAN,
  - We target also 50% of production ➔ 251,206.5 t pineapple: 120% in juice (how?)
• 2019 Social Accounting Matrix (SAM) for Benin
  • 41 activities (19 agricultural and 10 agricultural processing)
    • Creation of agricultural sectors based on secondary data
    • Creation of agricultural processing sectors (e.g.: pineapple juice, cashew kernel, poultry slaughtering, etc.) based on empirical data collected for this research and available data from previews studies
  • 10 household groups (5 rural, 5 urban: Q1-Q5)
  • 4 production factors (unskilled and skilled labor, capital and land)
Fig. 1 Composition of agricultural output

- Intermediate input
- GDP at factor cost
- Production tax
Fig. 2 Composition of demand for agricultural products

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Fig. 3 Composition of demand for agricultural processed products
Modelling approach: Model setup (1/1)

- **Model**
  - Second version of Static Applied General Equilibrium (STAGE2) model (McDonald, 2015)

- **Closure rules**
  - Flexible exchange rate (ER) regime, fixed foreign savings and fixed CPI;
  - Savings-driven investment;
  - Fixed government saving and flexible household income tax rate (finance or distribute);
  - Fixed world market prices (small country assumption)

- **Simulations**
  - Scenario to increase agricultural productivity
  - Scenarios to develop processing for cashew and pineapple in order to reach at least 50% of production being processed (how?)

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### Modelling approach: Scenarios (1/1)

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Factor productivity Agriculture (%)</th>
<th>Processed export tax reduction (%)</th>
<th>Subsidy to pineapple processing (%)</th>
<th>Subsidy to cashew processing (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA</td>
<td>+5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPET</td>
<td>+5</td>
<td>-100</td>
<td></td>
<td>Flexible (-4.1)</td>
</tr>
<tr>
<td>PAPET_SP</td>
<td>+5</td>
<td>-100</td>
<td>Flexible (-2.4)</td>
<td></td>
</tr>
</tbody>
</table>

**Description**

**BASE**: Status quo scenario showing Benin economy in 2019

**PA**: Productivity increase in Agriculture

**PAPET**: Abolishment of export tax for cashew nut kernel (0.7%) and pineapple juice (0.7%) on top of the PA scenario

**PAPET_SP**: Subsidy on processing of cashew and pineapple on top of the PAPET scenario
- Reach **PNIASAN** target for cashew (50% of production being processed \(\Rightarrow 100,017\) t RCN: 300% increase in cashew kernel)
- No specific target for pineapple processing in **PNIASAN**, we use the same target as cashew (50% of production being processed \(\Rightarrow 251,206.5\) t pineapple: 120% increase in industrial pineapple juice)

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Fig. 4 Production and price change for RNC and CNK; pineapple and its juice commodity relatively to the base.
Effects on productions and prices (2/3)

Fig. 5 Production change of other commodities relatively to the base

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Fig. 6 Average agricultural price change relatively to the base

- PA: -2.52%
- PAPET: -2.40%
- PAPET_SP: -2.25%
Fig. 7 Price change relatively to the quantity change for RNC and CNK; pineapple and pineapple juice
Macroeconomic effects (1/1)

Fig. 8 Change in macro indicators relatively to the base

- Total absorption
- GDP at factor cost
- Total export
- Total import

Fig. 8 Change in macro indicators relatively to the base
Fig. 9 Change in factor price relatively to the base

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Fig. 10 Change in income tax rate relatively to the base household income
Effects on Household welfare (1/1)

Fig. 11 Change in Household welfare relatively to the base household income (EV)

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Conclusion and implications (1/2)

- Processing development on top of the productivity increase \(\Rightarrow\) prices fall less (ratio price change/quantity change for agricultural products: 3-14 times lower than in case of only agricultural productivity increase)

- Benin’s economy better off with expanding food-processing

- The processing development in the PAPET scenario contributes to improved livelihood of rural and urban poor households \(\Rightarrow\) poverty reduction

- Subsidizing the processing sector may decrease the pro-poorness of the processing development depending on financing

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Conclusion and implications (2/2)

- **Policy implication for sustained agricultural development**
  - Invest in processing development to better sustain agricultural raw product prices

- **Limitations**
  - Financing the productivity increase not modelled
  - Influence on other crops not controlled (fully mobile production factors)

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Annex: Effects on other price change intensity (1/1)

Fig. A1 Price change relatively to the quantity change for other commodities