Improving smallholder's income generation by the integration of DMC by-products into pig raising activities

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Objectives:

- Soil and environmental conservation
- Farmer’s income diversification
- Improvement of agricultural commercialization

Activities:

- Extension of DMC systems
- Improvement of livestock farming systems
- Structuring of agricultural production network
- Road rehabilitation
4 southern districts
Xayaburi province

- **Area of intervention**: Southern districts of Sayaboury Province, Lao PDR;
- **Local livelihoods** highly dependant on maize production;
- **Conventional practices** engender environmental degradation and make smallholder’s livelihoods unsustainable;
improving smallholder pig raising

- Diversify and increase incomes;
- Support recent intensification of the activity;
- Transform and enhance agricultural production;

Improvement involves all the production factors: Pig pen, feed, health and genetics with different levels of intensification depending on farmer’s strategy,
Implementation of short-term pig fattening with smallholders

- During 2006 and 2007, short-term pig fattening has been experimented with 32 families (a total of 155 pigs);
- Best results were obtained with the most intensive system: exotic breeds and use of protein concentrate aliment in feed intake;
- Average net benefice of 30 USD/head;
Improvement of pig pen, feed intake, healthcare, water access and genetics with different intensification levels

Local breed

Local / exotic cross-breed

Most of the farmers switched their strategy to the more intensive system

Industrial exotic cross-breed
With this intensive system, protein concentrate imported from Thailand is the main factor contributing to the total production costs.
Challenge:

Use DMC by-products in order to reduce protein concentrate content in feed intake

*Cajanus cajan* (pigeon pea)

- Existence of DMC systems associating maize and pigeon pea;
- Seeds of *C. cajan* have a protein content of 22%
Integration of DMC by-product into pig raising activities - PASS-PCADR

DMC system: Maize and *C. cajan* association

**May**

**June**
DMC system: Maize and Caj association

After two years of association, average yields of maize increased by 500kg/ha compared to the control maize monocroping system.
DMC system: Maize and *C. cajan* association

Average yields of 1.2 T/ha for Cajanus seeds
DMC system: Maize and C. cajan association

- Very effective on weeds control for the next cycle;
- Chemical and physical soil properties improvement;
- Total amount of dry biomass from 8 to 12 T/ha;
How can this DMC by-product be integrated in animal raising activities?

Objective of the study:

Assess the technical and economic performances of short-term pig fattening systems using Cajanus cajan as a main source of protein to feed intake
C. Cajan is known to have a high nutritional value but previous study had quite contradictory conclusion on the impact of anti-nutritional factor present in seeds meal (Amaefule, D’Mello, Ologhobo, …)
Methodology

• Short-term fattening were conducted with three different feed intakes:
  - G1: control intake
  - G2: 18 % of *C. Cajan*
  - G3: 18% of processed *C. Cajan*

• 18 piglets (industrial cross-breed) coming from 2 different litters;

• Experimental design was completely randomized;

• For each group, feed intake, weight gain, feed conversion ratio (FCR) and daily feed costs were measured
Methodology

Feed rations for each group (in average for a period of 150 days)

<table>
<thead>
<tr>
<th>Feed intake</th>
<th>G1 (n=4)</th>
<th>G2 (n=6)</th>
<th>G3 (n=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice bran</td>
<td>42%</td>
<td>35%</td>
<td>35%</td>
</tr>
<tr>
<td>Maize</td>
<td>34%</td>
<td>31%</td>
<td>31%</td>
</tr>
<tr>
<td>Protein concentrate</td>
<td>24%</td>
<td>16%</td>
<td>16%</td>
</tr>
<tr>
<td>Cajanus</td>
<td>-</td>
<td>18%</td>
<td>18%*</td>
</tr>
<tr>
<td>Average Protein content</td>
<td>15,6%</td>
<td>15,6%</td>
<td>15,6%</td>
</tr>
</tbody>
</table>

* Seeds of Cajanus for G3 were boiled during 2 min before milling
Technical performances

Average Daily Growth at 150 days:

- G1 = 464 g/day
- G2 = 523 g/day
- G3 = 529 g/day

Control: $y = 0.001x^2 + 0.3158x + 4.7742$

$R^2 = 0.9871$

G2: $y = 0.0014x^2 + 0.3167x + 4.8894$

$R^2 = 0.992$

G3: $y = 0.001x^2 + 0.3867x + 5.3522$

$R^2 = 0.9878$
Technical performances

<table>
<thead>
<tr>
<th></th>
<th>G1 (n=4)</th>
<th>G2 (n=6)</th>
<th>G3 (n=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total feed at 150 days (kg/pig)</td>
<td>252</td>
<td>250</td>
<td>259</td>
</tr>
<tr>
<td>ADG (gr/day) 7 - 25 kg</td>
<td>330</td>
<td>348</td>
<td>395</td>
</tr>
<tr>
<td>ADG (gr/day) 25 - 100 kg</td>
<td>559</td>
<td>628</td>
<td>602</td>
</tr>
<tr>
<td>ADG (gr/day) 150 days</td>
<td>464 (± 30)</td>
<td>523 (± 28)</td>
<td>529 (± 50)</td>
</tr>
<tr>
<td>FCR (Food Conversion Ratio)</td>
<td>3,6</td>
<td>3,2</td>
<td>3,3</td>
</tr>
<tr>
<td>Average weight at 150 days (kg)</td>
<td>76,6</td>
<td>85,5</td>
<td>86,4</td>
</tr>
</tbody>
</table>

- ADG are significantly higher for G2 et G3 than G1 (P<0,05);
- FCR are significantly lower for G2 et G3 than G1 (P<0,05);
- ADG between processed and non-processed *C.cajan* feed intake are not significantly different (P>0,05);
Economic performances

Price/kg in KIP

The use of Caj. allows reducing the use of imported protein concentrate by 30%

- Cajanus
- Protein concentrate
- Rice bran
- Corn

feed intake protein content

0 500 1000 1500 2000 2500

8% 14% 16% 16% 18%
## Economic performances

<table>
<thead>
<tr>
<th></th>
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<th>G2 (n=6)</th>
<th>G3 (n=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed production costs/kg (USD)</td>
<td>0,22</td>
<td>0,18</td>
<td>0,18</td>
</tr>
<tr>
<td>Mean feed production costs at 150 days (USD)</td>
<td>54,6</td>
<td>44</td>
<td>45,7</td>
</tr>
<tr>
<td>Mean net profit (USD/pig)</td>
<td>33,9</td>
<td>57,9</td>
<td>57,8</td>
</tr>
</tbody>
</table>

Average increase of 24 USD per head within 150 days for pigs receiving the *C.cajan* rations;
Discussion

The development of Maize/\textit{C. cajan} association in DMC systems can benefit smallholders in various ways:

- Improvement of the current mono-cropping systems;

- Reduced importation of protein concentrate, decreased production costs and increased Average Daily Growth by 60 g/day.
- The variety of Cajanus cajan used does not contain anti-nutritional factors that can affect pig ADG: no need for processing;
- Additional experiments should attempt using larger amounts of Ca, cajan (up to 30%) in order to further reduce production costs;
- The association requires a good technical control;
- Dissemination would be facilitated with the provision of hand seeders to farmers
Discussion

- Other research will be done in order to have more choice for protein or carbohydrate stuff for coming from DMC system for pig raising
THANK YOU