VALORISATION STRATEGIES OF SPENT COFFEE GROUND AS AN INGREDIENT FOR RUMINANTS

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NEW STRATEGIES FOR THE COFFEE BY-PRODUCTS RECOVERY AS A NEW RAW MATERIAL FOR ANIMAL FEED

PROJECT LOCATION: North of Spain (Basque Country and Navarre) and South of France (Aquitaine)

SCHEDULE: 01 / 09 / 2019 – 31 / 03 / 2024

CONSORTIUM:

Coordinator:  

Partners:
General objective:
Develop, demonstrate and implement at real scale an innovative and sustainable solution for the recovery of coffee by-products and recovery for their use as an ingredient in animal feed.

Specific objectives:
1. Implement a value option for HORECA channel coffee grounds and Vending capsules as an ingredient for animal feed
   → ↑ sustainability and competitiveness of the coffee producer and consumer sector.
2. Meet the growing demand for new raw materials for feed production and reduce dependence on the current market for raw materials.
   → ↑ sustainability and competitiveness of the feed sector
CHALLENGES

Challenge 1: Logistic
Management protocol in point generation
Grounds and capsules collection system
Coffee capsule collection systems
Synergies with other streams

Challenge 2: Decapsulation
Separation of fractions: organic vs. inorganic

Challenge 3: Enzymatic Hydrolysis
Increased fiber digestibility

Challenge 4: Dehydration
Energy optimization of the drying process using pellets from coffee grounds

Challenge 5: Pellets
Energy optimization of the drying process using pellets from coffee grounds

Challenge 6: Nutritional efficiency
Nutritional value of coffee grounds
Nutritional efficiency tests: dairy cattle and sheep

Business model
Value proposal
Investor search
Roadmap

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CHALLENGE 4

**Dehydration → Stabilization of the coffee grounds for its suitability as a feed ingredient**

*Stabilization of the coffee grounds for its suitability as a feed ingredient*

- Dehydration process to stabilize the coffee grounds over time (humidity <10%) → Thermal drying
- Trials:
  - Optimization: 1 trial of 500 kg
  - Ingredients production: 21 tons of SCG → 9.25 tons of SCG (about 3 months)
Dehydration → Stabilization of the coffee grounds for its suitability as a feed ingredient

**Stabilization of the hydrolysed coffee grounds for its suitability as a feed ingredient**

- Optimization of a dehydration process that stabilizes the hydrolyzed coffee grounds over time (humidity <10%) → Mechanic dewatering + Thermal drying

- Trials:
  - Optimization: 3 trials of 500 kg SCG + 500 kg water
  - Ingredients production: 0.6 ton of SCG → 0.2 ton of Hydrolyzed SCG
CHALLENGE 5

Pellets → Energy optimization of the drying process using pellets from coffee grounds

Energy optimization of the drying process using pellets from coffee grounds

- Optimization of a pellet production process from coffee grounds not suitable for animal feed.

Trials:
- Optimization: 3 trials of 200 kg
Nutritional efficiency → Nutritional value of coffee grounds
Nutritional efficiency tests: dairy cattle and sheep

Trials with dairy sheep

- Evaluation of the nutritional efficiency of ingredient prototypes in in vivo tests with animals.

Parameters to control:
• milk yield (l/d),
• milk chemical determinations: crude protein, fat, lactose and fatty acids
• urine determination,
• blood determinations: IGF, NEFA, BHBA; N; glucose
• methane production,
• rumen microbial populations
• rumen short chain volatile fatty acid contents
Nutritional efficiency → Nutritional value of coffee grounds

Nutritional efficiency tests: dairy cattle and sheep

Trials with dairy sheep

– Results & Conclusions:

1. Increases dry matter intake, and as a consequence daily methane emissions
2. Decreases methane emissions per unit of DMI due to a decrease in apparent digestibility
3. Does not affect fermentation efficiency
4. Formulate coffee grounds:
   ▪ Does not affect the productive yield of sheep and the physico-chemical quality of the milk obtained.
   ▪ Changes milk fatty acid profile towards a healthier one
   ▪ Reduces methane emissions of enteric origin by 19% without affecting ruminal fermentation.
   ▪ The regular consumer of curds is not able to differentiate the curds obtained with milk from ewes fed with coffee grounds from those that have not consumed them.

→ Spent coffee grounds can be formulated up to 15% in the concentrate without impairing productive performance under commercial conditions
Nutritional efficiency → Nutritional value of coffee grounds
Nutritional efficiency tests: dairy cattle and sheep

Trials with dairy cattle

- Evaluation of the nutritional efficiency of ingredient prototypes in in vivo tests with animals.

**Parameters to control:**
- milk yield (l/d),
- milk: crude protein and fat
- milk sensory analysis
- methane production,
- blood: IGF, NEFA, BHBA, N, Glucose
- rumen microbial populations
- rumen short chain volatile fatty acid contents
CHALLENGE 6

**Nutritional efficiency** → Nutritional value of coffee grounds

Nutritional efficiency tests: dairy cattle and sheep

**Trials with dairy cattle**

- Results & Conclusions:
  1. Reduces milk yield but does not affect milk composition or milk-fat corrected milk production.
  2. Does not affect milk antioxidant capacity.
  3. Does not affect ruminal fermentation or methane emissions.

→ Spent coffee grounds can be formulated up to 10% in the concentrate without impairing productive performance under commercial conditions.
IMPLEMENTATION AT REAL SCALE

1. TECHNICAL SIZING
   - Sizing of the case study (north Spain - south France)
   - Technical specifications of the necessary equipment

2. ECONOMIC ASSESSMENT (LCC)
   - 15-year financial balance; Financial indicators & Economic sensitivity analysis

3. ENVIRONMENTAL ASSESSMENT (LCA)
   - Life Cycle Analysis → Acidification potential; Global warming, Eutrophication;
     Competition for land use

4. SOCIAL ASSESSMENT
   - Job creation and maintenance; Industry and consumer awareness; Contribution to the
     sustainability of the primary sector

5. BUSINESS MODEL
   - Value proposal; Investors; Road map; Replication to other EU regions

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Thank you for your attention.

Any question?