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Critical Success Factors for Circular Business Models within the Agricultural Sector

Mechthild Donner, Anne Verniquet, Agnès de Souza, Jan Broeze, Jim Groot, Katrin Kayser, Romane Gohier, Hugo de Vries

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EU H2020 Project NoAW (No Agricultural Waste)

*Innovative approaches to turn agricultural waste into ecological and economic assets*

- NoAW (2016-2020): a EU-financed project involving 32 international partners, coordinated by INRA (France)

- NoAW develops a *circular economy approach* applicable to agricultural wastes on a territorial and seasonal basis

- NoAW investigates the potential of *agro-waste and by-products* to be converted into a portfolio of eco-efficient products: bio-energy, bio-fertilizers, bio-packaging and bio-molecules

- **WP5**: *New business concepts for a cross-sector valorization of agro-waste and by-products*

http://noaw2020.eu/
Valorizing agricultural waste and by-products

• Agricultural waste and by-products = plant or animal residues that are not (or not further) processed into food or feed (Gontard et al. 2018)

• Estimated amount of agro-waste annually: 998 million tons (Obi et al. 2016)

• Different valorisation opportunities in alternative sectors leading to new products and applications, with a lower or higher value, depending on volume (Rood et al. 2017)

• Challenging because of heterogeneity of resources, changes in volumes and quality over time

➤ Here, circular business models are meant to find innovative management and marketing solutions for adding value to agricultural waste and by-products

Figure: Value pyramid for biomass valorisation

Source: www.betaprocess.eu/the-value-pyramid
Research question and methodology

*Under which conditions can business models for the valorisation of agro-waste and by-products successfully contribute to the transition to a circular economy?*

➢ 33 case studies in 12 different countries:
- Mainly in project-partner countries from Europe and Asia
- Companies valorizing agro-waste and by-products
- Three chains: wine, cereals, manure

Semi-structured interviews and elaboration of factsheets for each case
Example factsheet: Association Bâtir en Balles

Association Bâtir en Balles / Marseille, France / Valorization of grain by-products (husks) / Status: started in 2015 / Initiative leader: Association Bâtir en Balles

Origination:
Key triggers of the initiative at the origin:
- An einkorn farmer started to valorize einkorn husk together with École des Mines d’Alès in 2009 – leading to the creation of the enterprise Archibale in 2013
- At the same time, since 1993, the Association Le Village valorized rice husk
- A meeting between einkorn husk and rice husk actors led to creation of Association Bâtir en Balles in 2015, combining various cereals

Key objectives of the initiative at the origin:
- Create a cooperation between the cereal and the eco-construction sectors
- Inform and train people in using by-products of cereals (rice, einkorn, spelt, buckwheat, barley)

Key historical milestones between origin and today:
- Performance of quality tests for insurances, promotional activities, construction of several houses

Key Impacts (current):
- Agro Waste valorized
  Until now, mainly rice and spelt husks
- CAPEX required / TRI
- Job created / typology
- Other expected impacts
  Contribution to local economic development, reduction of environmental impact by waste-valorization, creation of jobs

Key Actors & Partners:

<table>
<thead>
<tr>
<th>Category/Expertise</th>
<th>Motivation / Fears</th>
<th>Responsibility in initiative</th>
</tr>
</thead>
<tbody>
<tr>
<td>M. Loïc, Roso and Pierre Delot as chairmen of the association</td>
<td>Foster a new cross-sector cooperation, Fear: be able to get the initiative financed (until now voluntary work)</td>
<td>Initiators and leaders of the initiative</td>
</tr>
<tr>
<td>4 other members of the Association</td>
<td>Administrative and advisory support</td>
<td>Administrative and advisory support</td>
</tr>
<tr>
<td>Farmers, cooperatives, huskers</td>
<td>Waste disposal</td>
<td>Waste delivery</td>
</tr>
<tr>
<td>Constructors</td>
<td>By-product valorisation</td>
<td>Eco-construction</td>
</tr>
<tr>
<td>Architects, research institutions</td>
<td></td>
<td>Technological support</td>
</tr>
</tbody>
</table>
Example factsheet: Association Bâtir en Balles

<table>
<thead>
<tr>
<th>ORGANIZATIONAL MODEL</th>
<th>KEY SIDE-STREAM VALORIZATION (Agro waste)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance / coordination</td>
<td>Waste typology / Yearly volume / Seasonality</td>
</tr>
<tr>
<td>Shared infrastructure / financing</td>
<td>150 tons of einkorn husk</td>
</tr>
<tr>
<td>Cooperation with Science &amp; technology</td>
<td>15,000 tons of rice husk</td>
</tr>
<tr>
<td>Support mechanisms</td>
<td>ValORIZATION processes / key technologies</td>
</tr>
<tr>
<td></td>
<td>Husking + insulation of houses</td>
</tr>
<tr>
<td></td>
<td>Maturity of technologies used / critical size for feasibility</td>
</tr>
<tr>
<td></td>
<td>Immature technology for husking</td>
</tr>
<tr>
<td></td>
<td>Key outputs and markets</td>
</tr>
<tr>
<td></td>
<td>Panels and bricks for insulation or decoration of houses</td>
</tr>
</tbody>
</table>

**ILLUSTRATION**

Example of cascade of valorization:

**SUCCESS & FAILURE FACTORS**

- Organizational / Spatial: Build on existing clusters e.g. of rice farmers / cooperatives in the Camargue
- Technical / Logistic
- Economic / Financial / market: Public financial support is difficult to get, particularly compared to the straw chain which is already established
- Social / skills: High motivation; interest by various actors
- Others

Key links: [http://www.batirenballes.fr/index.html](http://www.batirenballes.fr/index.html)

H2020 NoAW project
WP 5.1. International benchmark
Author: Mechthild Donner
## Results: Critical success factors

The success of circular business models depends on various internal + external factors:

<table>
<thead>
<tr>
<th>Category</th>
<th>Success factors</th>
</tr>
</thead>
</table>
| (1) technical and logistic    | - innovative and proven technologies for agro-waste conversion  
                                 | - optimal in and out logistics adapted to the specificities of agricultural resources (variable, perishable, seasonal)                  |
| (2) economic, financial and marketing | - economies of scale for clusters  
                                        | - strong public-private partnerships with long-term contracts  
                                        | - co-investments and/or financial support  
                                        | - open and differentiating communication  
                                        | - price competitiveness of new bio-based products |
| (3) organisational and spatial | - successful cooperation  
                                | - geographical proximity of actors  
                                | - sufficient space with efficient infrastructure (clusters) |
| (4) institutional and legal   | - awareness creation for ecological products among consumers  
                                | - transparent and traceable production processes |
| (5) environmental, social and cultural | - acceptance by or even involvement of local stakeholders  
                                         | - creation of local jobs |

Most often named: factors from category 2, followed by 3 and 4, then 1 and 5
Conclusion

1. **Success factors specific for the agricultural sector:**
   - innovative technologies for agro-waste conversion
   - flexible in and out logistics
   - stakeholder acceptance of bio-based products and production processes
   - price competitiveness for bio-based products as substitutes

2. The transition from linear chains to closing loops in the agricultural sector let individual business models evolve towards **new, dynamic and integrated business models**, in which the macro-environment sets the boundary conditions (context-dependent)

3. Examples of circular business model types for agro-waste and by-product valorisation: biogas plants, upcycling entrepreneurship, environmental biorefineries, support structures, agricultural cooperatives and agroparks (→ *next presentation*)
Thank you very much for your attention!

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