BETA PROCESS bioenergy

ERA-NET Bioenergy

“Business case Direct Processing with Betaprocess”

Kiev - Ukraine,

Hans van Klink, 22 November 2018

Content presentation

1. Direct Processing concept;
2. Business case;
3. Conclusion;
4. Contact.

1.1 Direct processing

Cultivation

Cleaning

Crushing

BETAPROCESS

Yeast culture

Fermenter

CO_2

Reversed osmosis

Ethanol 99%

Ethanol 85%

Ethanol storage

Cellulose

Hemicellulose

Pectin

Water

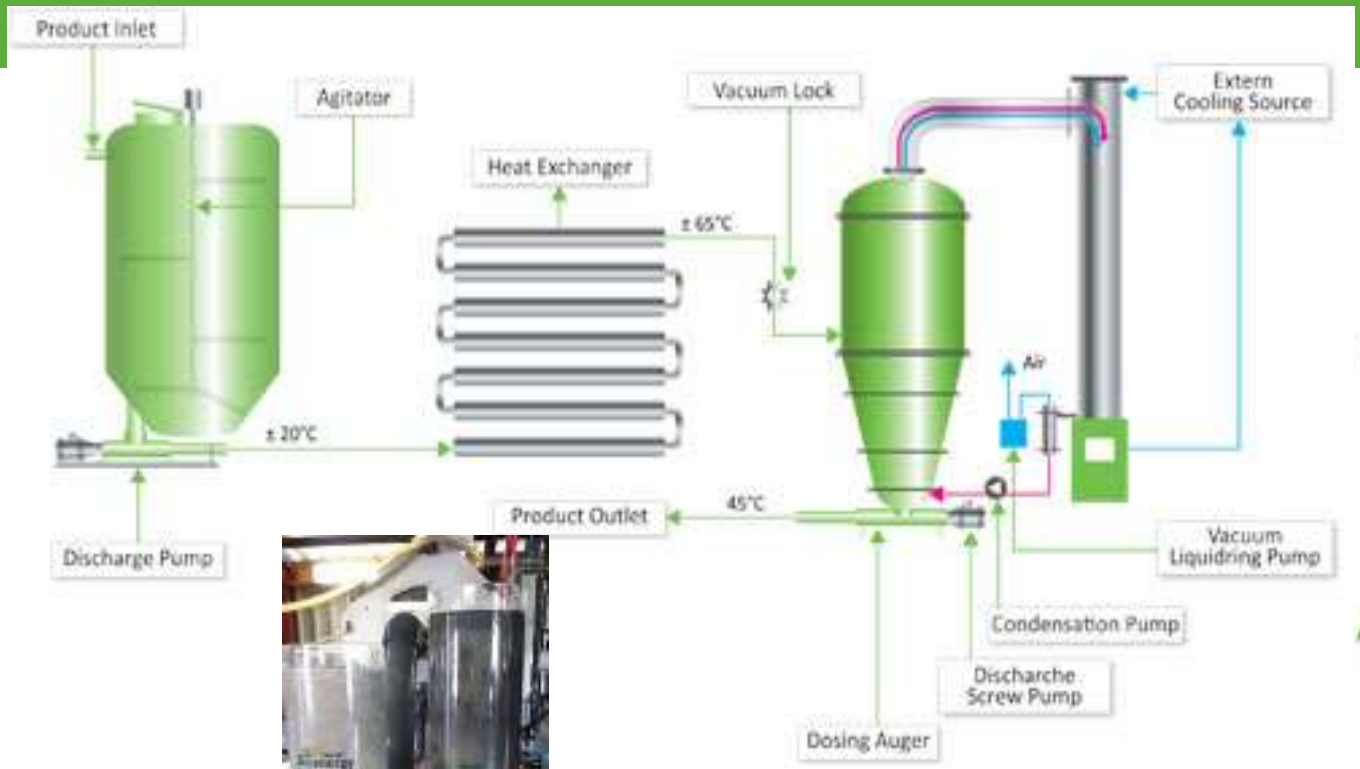
Other solids

Distillation

1.2 Direct processing

- Advantage in using Betaprocess Technology for Green Chemicals:
  - Processing of crops such as sugar beet and corn kernals, but also rest- and by-products such as fruit products, potato peels, French fries waste, etc.;
  - Higher yield EtOH;
  - Fermentation easier, shorter fermentation time and without enzymes;
  - 10 – 20% lower investment costs;
  - Cost price attractive and LCA very positive.
- Tested (proved by):
  - Ecole d'ingenieurs de Changings (Mr. Serge Hautier - Switzerland);
  - Wageningen University & Research – FBR and Acrres (the Netherlands);
  - University College Roosevelt (the Netherlands);
  - Demonstration plant by ACRRES (part of WUR), Lelystad (the Netherlands);
  - University of Warmia and Mazury , Olsztyn (Poland).

1.3 Betaprocess technology



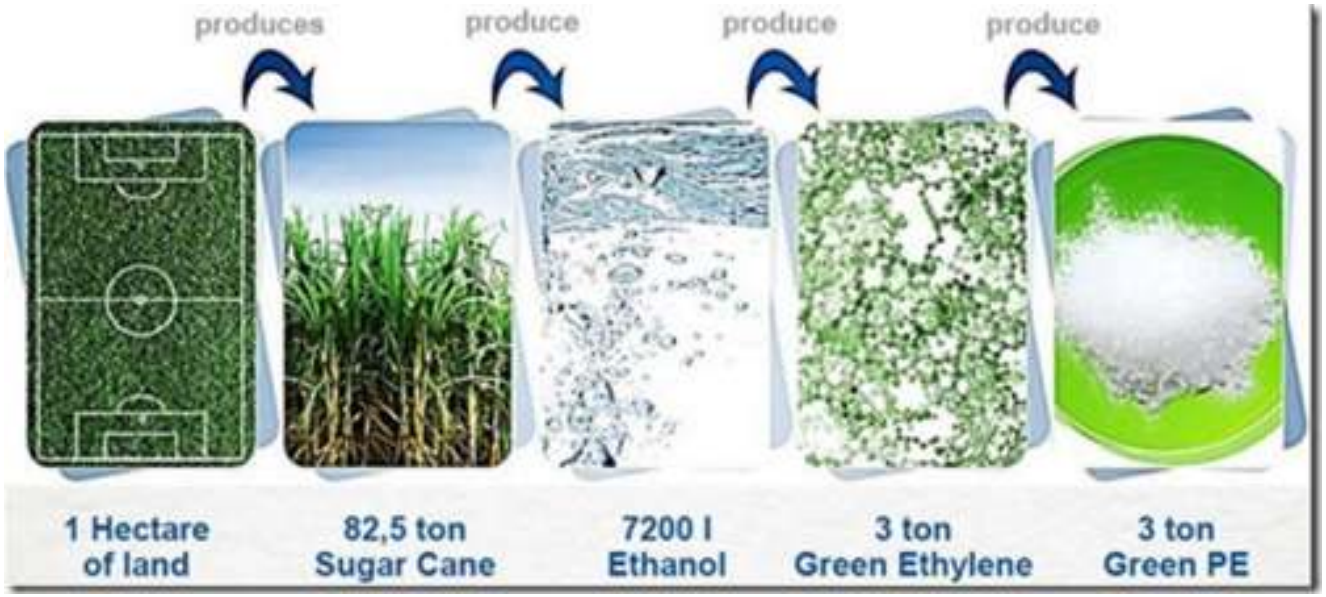
Before Betaprocess

After Betaprocess

1.4 Betaprocess pilot plant Acrres Lelystad

1.5 Ethanol production

1 HA sugar beet = 8.500 liter ethanol:
→ 20% higher output
1 ton sugar beet = > 100 liter EtOH



2.1 Business case

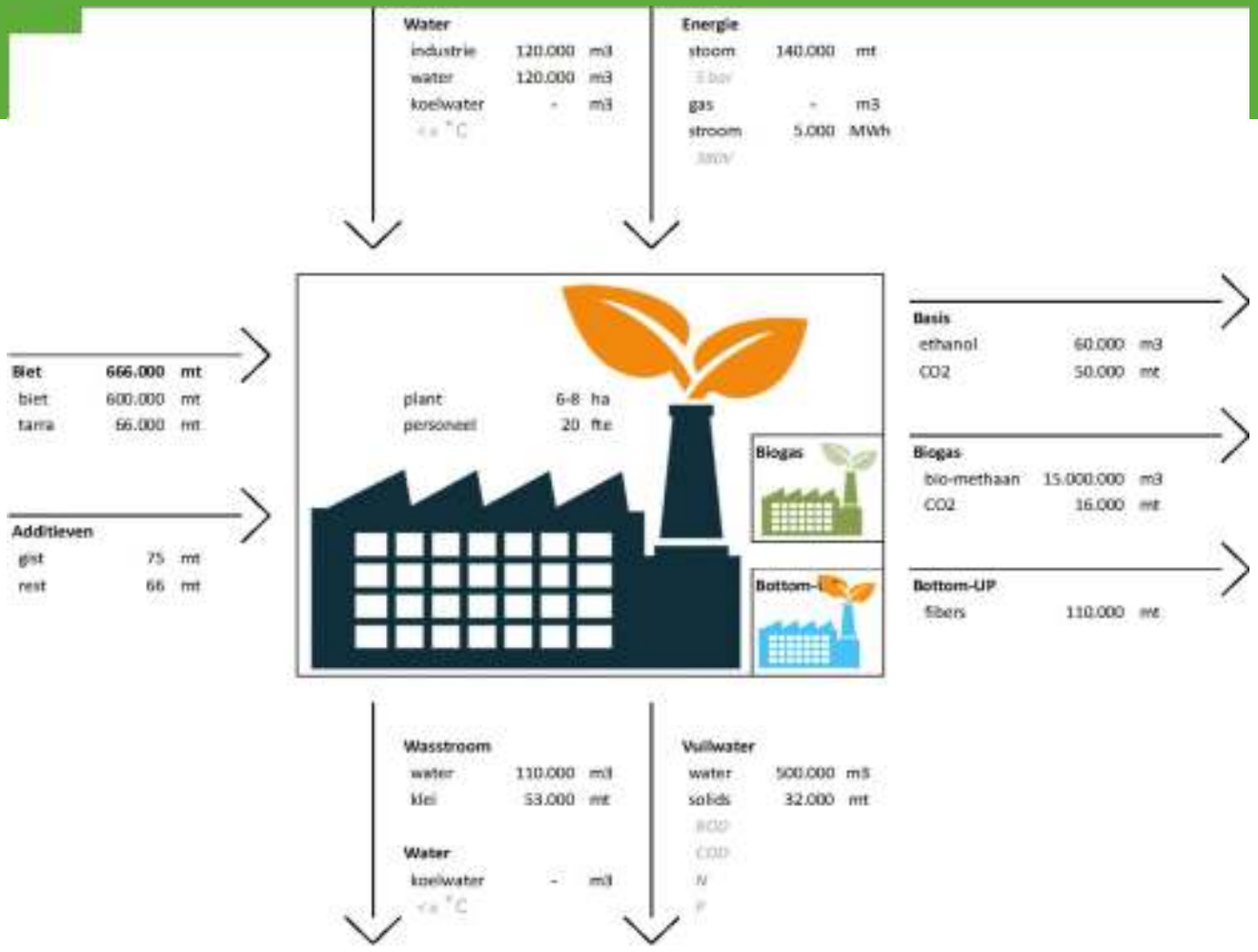
2.2 Business case

Starting points:

- Daily processing 2.000 mt sugar beet;
- Campaign 350 days (200 days beet and 150 days corn kernals);

- Needed 9.000 HA (45 ton/HA) sugar beet cultivation;
- Price farmer € 25 / ton for sugar beet and corn € 100 / ton;
- Objective production ethanol for biofuels;
- Optimalisation of by products.

2.3 Business case



Jaarproductie en consumptie van een DSD Bio-Refinery van 2.000mt bieten per dag. Biogas *of* Bottom-Up facultatief.

2.4 Business case

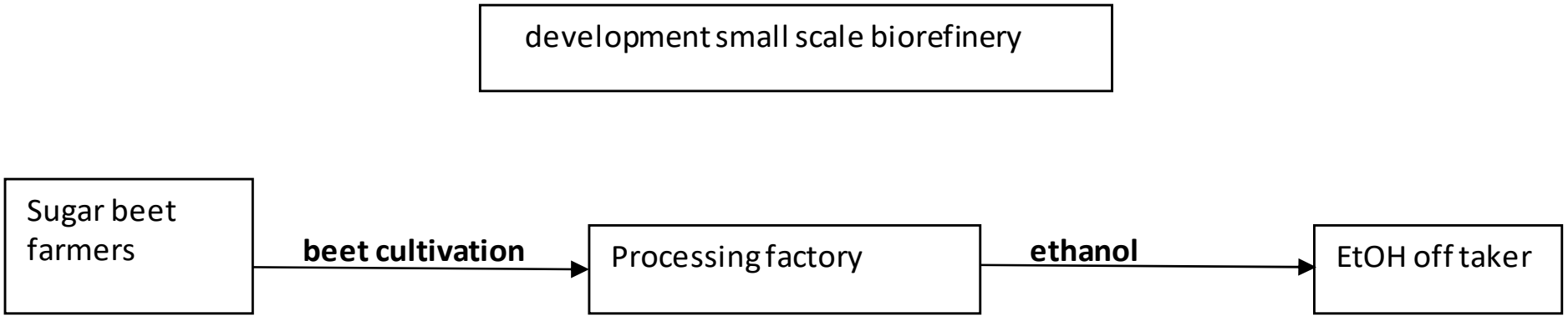
		Basic	*+Biogas*	*+Bottom-UP*
input sugar beets	ton	***600.000***	***600.000***	***600.000***
output ethanol	k liters	***63.000***	***63.000***	***63.000***
Ethanol	k€'s	29.000	29.000	29.000
Others	k€'s	2.400	8.400	13.700
Sales value total	k€'s	**31.400**	**37.400**	**42.700**
Variable Product Costs	k€'s	- 19.100	- 19.300	- 19.100
Gross Margin	k€'s	**12.300**	**18.100**	**23.600**
Gross Margin in %	%	**39,2%**	**48,4%**	**55,3%**
Fixed costs	k€'s	- 8.500	- 8.550	- 8.550
EBITDA	k€'s	**3.800**	**9.550**	**15.050**
EBITDA in % sales value	%	**12,1%**	**25,5%**	**35,2%**

2.5 Business case

- CAPEX (2.000 ton beet/day):
  - Complete factory installation € 45 – 50m;
  - Additional infrastructure € 2 – 5m;
  - Biogas plant € 4 – 8m;
  - Water treatment p.m.

- Construction time 18 months, incl. preparation 2 years (critical permits);
- Pay-back period 5 – 6 years, ROI > 20%.

2.6 Business case



* shareholder factory
* transport = logistics
* area with sugar beets
* sector wise promotion

* sugar beet = industrial crop

3.1 Conclusion

- Direct processing is very attractive (as well for the farmer as the factory);
- Example = 2.000 ton/day but design is also possible for 7.500 ton/day;
- Attractive price paid to farmers (net – income);
- Not only for ethanol but also for other green chemicals (future);
- For the Government: following RED implementation (Carbon footprint, CO2 reduction);
- No crop so efficient in fixation of CO2 and production of oxygen then sugar beet;
- Sugar beet in crop rotation = perfect.

3.2 Conclusion

- Partner in Ukraine for market implementation;
- New laws + support for sugar beet cultivation necessary;
- Amendment tax code bioethanol HS code 3814 (chemical products) and out of 2207 (ethyl alcohol) → duty 0%;
- Interest financial institutions / banks.

3.3 Conclusions Direct Processing / Betaprocess

Contact

Dutch Sustainable Development BV

- Choorhoekseweg 8b
- 4424 NW Wemeldinge
- The Netherlands
- Tel. + 31 113 62 1074
- www.dsdbv.com / www.betaprocess.eu

- Director Project Development:
  - Hans van Klink
  - + 31 65 34 04 721
  - hans@dsdbv.com

Local Representative:
Svetlana Demikova
+ 380 674 65 8867
sdemikova@gmail.com