

Costa Rica pineapple residue valorisation

Results of project SMP18012

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Objective & activities

Objectives:

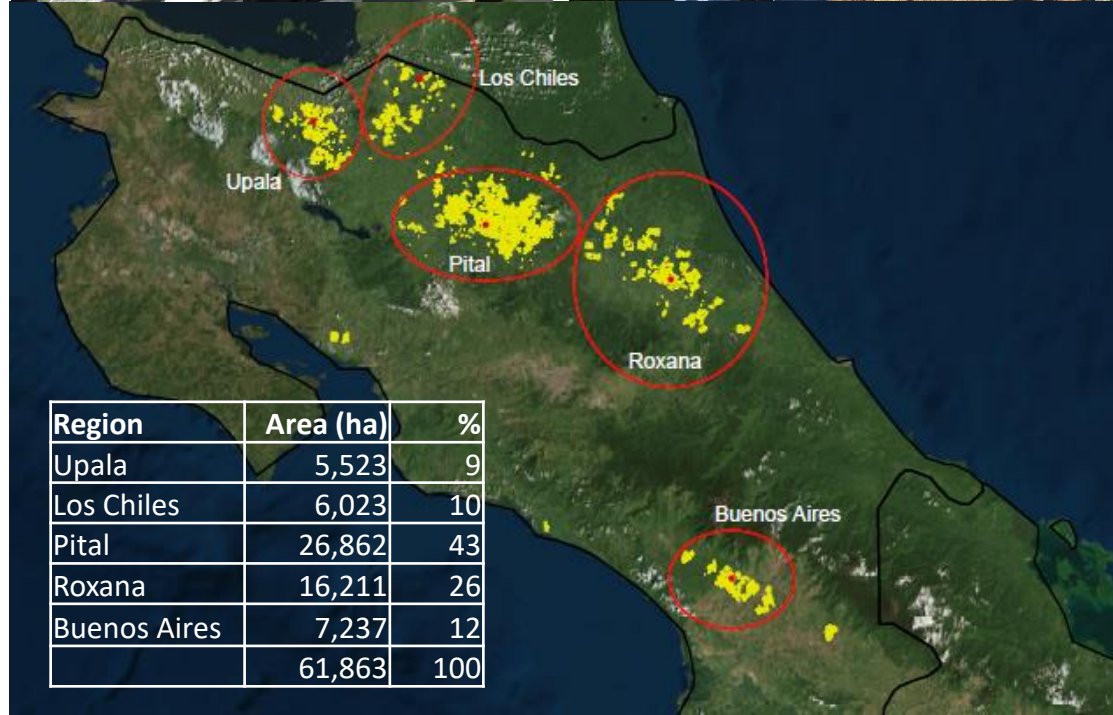
- Analyze the bottlenecks along the residue-to-product chain for valorization of pineapple crop residues (*rastrojo*)
- Identify opportunities for Costa Rican and Dutch companies

Activities:

- Building on market study MVO Nederland (July 2018)
- Desk study
- Field visit to Costa Rica early Nov. (with excellent support RNE)
- Data analyses (residue amount, biogas/energy production, spatial mapping of pineapple areas, physicochemical characteristics)
- Answering questions of companies (MVO study)
- Abstract for European Biomass Conference & Exhibition 2019

Pineapple in Costa Rica

- Largest global exporter fresh pineapples
- Exports 1 billion USD
- 62,000 hectares
- 30,000 people employed, 130,000 indirectly employed



The crop residue problem?

- Every 2 years, the pineapple crop needs to be replaced.
- Large amounts of very fiber-rich material (225 t FW/ha).
- The residue, especially the core provides substrate for blood-sucking stable fly (*Stomoxys calcitrans*) severely affecting cattle.



Current residue management



1. Paraquat to desiccate crop followed by burning



2. Shredding, pesticides and soil incorporation




3. Landfill

Disadvantages of current management:

- Costly (1500-2500 USD/ha for inputs, machine wearing, fuel)
- Environmentally unfriendly (herbicides, insecticides)
- Damaging soil structure (many machine passes)
- Time consuming
- Still no good control of stable fly!!!

Valorization: Turn a problem into opportunities

- 575,000 tons DM pineapple crop residues per year available
- Valorization options:
 - **Biogas** is promising but electricity and transport fuel market is now closed!
 - **Biorefinery** research is mostly on pineapple tops and peel – less on plant/leaves. It is not a total solution – needs to be combined with biogas
 - **Paper/fibers** no local interest?
 - **Thermal conversion** only feasible after drying/compaction biomass in the field
 - **Composting** how to avoid fly problem? limited market outside organic farming
 - **Animal feed** on-going R&D; tops/peels are used for feed, but supply > demand?
- Much research going on, but scattered. Integrated approach is needed including development of market(s) for residue products.
- Major bottleneck: crop residue harvesting technology

	Current methods				Removal and added value methods			
Assessment criteria	Herbicides / fire / shredding	Shredding / incorporation	Green burying	Field compost under plastic	Biogas for electricity	Biogas for transport	Tthermal conversion	Biorefinery + biogas
1. Control fly								
Effectiveness of control	1	1	2	2	2	2	2	2
Use of insecticides	-2	-1	2	2	2	2	2	2
Use of herbicides	-2	2	2	2	2	2	2	2
2 Disease control	1	-2	2	2	2	2	2	2
3. Soil effects								
nutrient recycling	-1	2	-2	2	2	2	-2	2
nutrient runoff/leaching	-1	-1	0	0	2	2	2	2
organic matter	-1	2	-2	2	2	2	-2	2
4. land use efficiency								
Cycle length	0	0	1	0	2	2	2	2
Biomass use	-2	-2	-2	0	2	2	2	2
5. Potential GHG saving								
Fossil fuel mitigation	-2	-1	-1	0	1	2	2	2
methane emission	0	0	-2	?	1	1	2	2
6. Costs and potential added value								
agro-chemical costs	-2	-1	2	2	2	2	2	2
fertilizer costs	-1	1	-2	2	0	0	-2	0
machinery costs	-1	-1	-1	-1	-1	-1	-1	-1
investment costs	2	2	2	1	-2	-2	-1	-2
Costs/benefits for farmer	-2	0	-2	1	1	1	0	1
7. Policy/legal interventions								
In line with regulations?	-1	-1	0	0	-2	-2	0	-2
In line with policy wishes?	-2	-2	-2	-2	2	2	1	2
Policy adaptation needed	2	2	2	2	-2	-2	0	-1
Added value for society	-2	-2	-2	-2	1	1	1	2
8. Employment effects	0	0	0	0	0	1	1	2
9. Research & Development								
State of development	2	2	2	-1	0	0	0	-1
Research investment need	2	2	2	0	0	-1	0	-2
Total score	-12	2	1	14	19	20	15	22

Benefits of pineapple residue removal and valorization

1. Removal of the biomass from the field solves the stable fly problem.
2. Shorter lag time, on average 2 months earlier planting (6% production increase).
3. No costs for insecticides and/or herbicides.
4. Less machinery passes required, saving fuel and soil texture.
5. Less nutrients are lost due to leaching, burning or disposal in a hole.
6. Digestate produced by biogas installation has better nutrient value and can be applied when the crop needs it.
7. Positive effect on soil borne diseases as removal of the biomass is a sanitary measure.
8. Biogas production contributes to carbon neutral economy of Costa Rica.

Improved image of pineapple sector!

Conclusions

- Market has to be created for residue products – biogas seems promising and is also key for adding value to the process residues of biorefinery options.
- Policy change needed to open-up electricity and energy market to stimulate biogas production and electricity generation from pineapple residues.
- Biorefinery needs R&D – now focus on pineapple tops and peels
- Valorization of residues needs R&D on harvesting techniques in an integrated way.

Opportunities for stimulating valorization options

- Study provides a state-of-the art analysis of bottlenecks and opportunities (quantitative, practical, legislation) for valorization of pineapple residues.
- To kick-start valorization Government of Costa Rica needs to develop:
 - i) economically viable electricity feed in tariff, or
 - ii) policy on the production and use of biofuels
- A public-private approach to solve issues in pineapple industry needs to be developed; The pineapple industry and Government need to be convinced that this issue is of joint interest.
- Advantage for NL companies for doing-business in Costa Rica: Relatively open economy and less competition compared to large countries in LA. NL companies with know-how have added value!

Follow up actions

- Finalize reporting
- Discuss with RNE lobby in Costa Rica
- Sharing results with Government of Costa Rica
- Explore funding opportunities (PIB? PSD? EU Green Fund?)
- Bilateral cooperation with pineapple companies (small scale)

Questions and suggestions?

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Partners:

- Greencovery BV
- Schut Papier BV
- Yellow pallet
- Ministry of Agriculture and Livestock
- Schouten Machines BV
- MVO Nederland/ De Groene Zaak

Network of MVO Nederland:

- Bas Rijs
- Fyffes
- Colsen
- Avantium

