

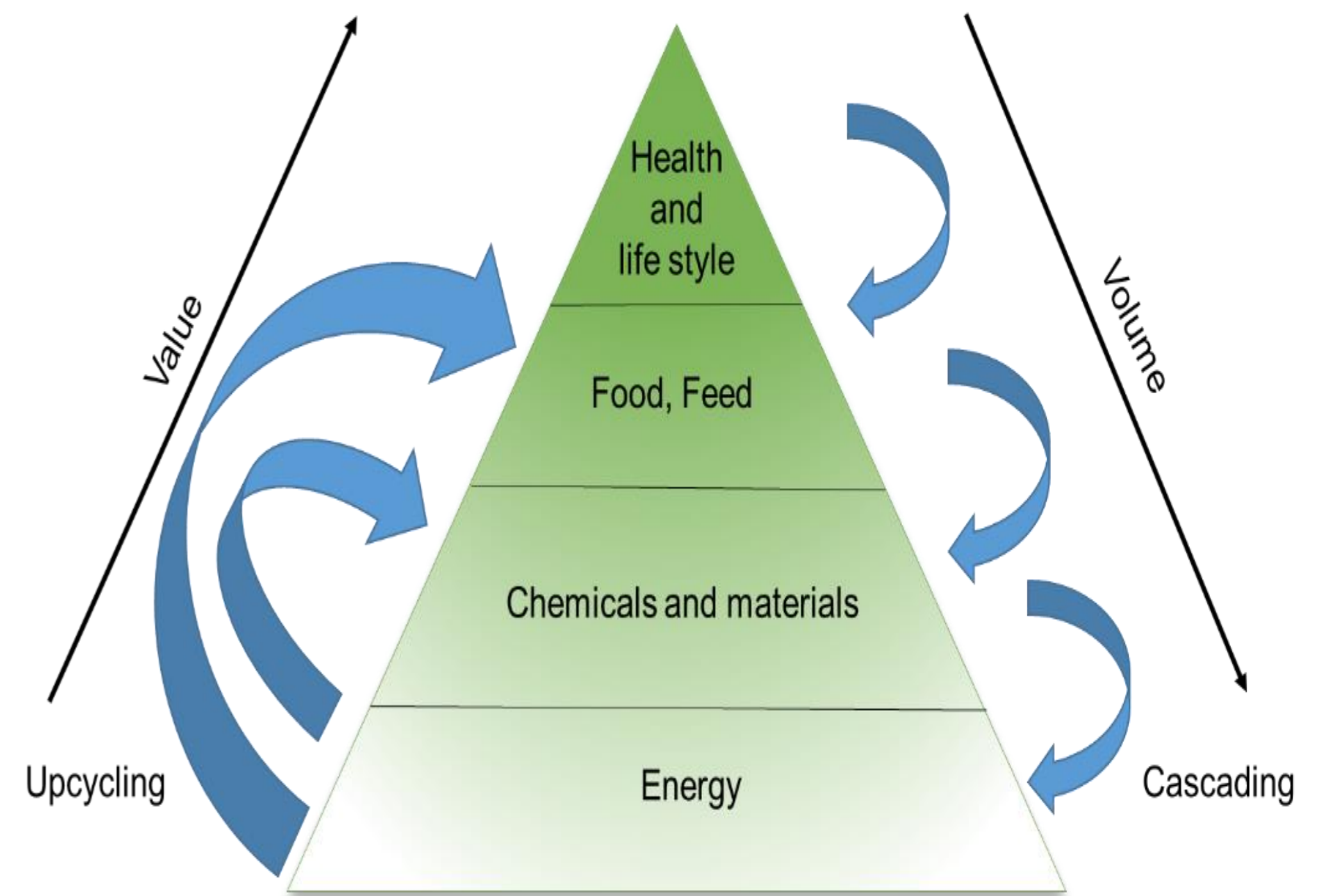
Biogas solutions in sustainable biorefineries

Biorefineries is a concept where biomass is transformed into several different products. For development of sustainable biorefineries it is important to include relevant waste/ waste water solutions. That is where biogas solutions could fit in. This study tries to address the development potential for sustainable biorefineries including a biogas component. Biogas solutions can contribute by upcycling waste to products in a biorefinery in addition to the traditional cascading (see below).

Materials and method

A literature review has been performed as well as interviews representing three specific biorefinery cases in Sweden.

Focus when retrieving the information has been on added values from biogas solutions and development potentials.



| RESULTS | Case: Agriculture | Literature: Agriculture | Case: Forest | Literature: Forest | Case: Marine | Literature: Marine |
|---|--------------------------------------|--|---|-----------------------------|---|---|
| Characterisation of biogas solutions | Biogas: Vehicle fuel | Biogas: Replace natural gas | Biogas: Heat and power, replace natural gas | Biogas: Heat and power | Biogas: Heat and power | Biogas: Heat and power |
| | Digestate: Biofertiliser (certified) | Digestate: Biofertiliser | Digestate: Discharged | Digestate: Biofertiliser | Digestate: Biofertiliser (certified) | Digestate: Nutrients used in algae farms |
| | | Other: Wastewater treatment | Other: Wastewater treatment | Other: Wastewater treatment | Other: Wastewater treatment | Other: Waste management; CO ₂ extraction |
| Contribution of biogas solutions to sustainability | Economic value | Reduce COD | Decrease water pollution | Reduce energy cost | Improve infrastructure | Reduce costs |
| | Organic farming. | Decrease drying needs | Increase production | Reduce sludge volume | Waste treatment | Solve a fish waste problem |
| | | Increase employment | Enable efficient process changes | Decrease needed chemicals | Decrease transportation need | Limit competition with food crops and fresh water use |
| Potential of biogas solutions to influence biorefinery growth and development | Expand production for ethanol plant | Use wet substrates and straw-like substrates | Increase production | New product development | Attract new companies to expand the biorefinery | Increase efficiency of the industry |
| | | Satisfy customers | New product development | Entrance into new market | Product development | Promote competitiveness |
| | | Enhance company image | Contribute to improved image | Enable simple operation | Marketing | Increase product flexibility |
| | | Marketing | Diversify product portfolio | | | |

Three types of biorefineries have been studied; agricultural, forest and marine based on the biomass which is used in the process.

Conclusions and impacts

- Biogas solutions contribute to development for biorefineries
- Biorefineries become more sustainable with biogas solutions

