

Mestic®:

Revolutionary biopolymers manufactured from manure.

The problem

THE DAIRY INDUSTRY. The manure problem is an acute one. In countries all around the world the 'phosphate ceiling' has been exceeded and sometimes by a wide margin. In the Netherlands, for example, there is a nutrient surplus of 28 kg of phosphate per hectare of land per year and for nitrogen there is a surplus of 119 kg per hectare per year (WUR). Because of the adverse effect of excess nutrients on the environment, authorities have defined international requirements in phosphate reduction plans. Dutch dairy farmers are struggling to meet these, and are paying between five and twenty euros per tonne to process their manure or transport their excess manure to arable farms (WUR). On top of that, the farmers are forced to intensify their business because of unfavourable milk prices. The fact that the Netherlands is the 1st largest exporter of agri- & food products in the EU and the 2nd largest in the world, with a total revenue of 101 billion euros in 2017, underlines the scope of the problem (CBS).

THE TEXTILE INDUSTRY. Growing raw materials for fashion is taking a toll on our planet. It involves high water, chemical and fossil fuel use, and it is often associated with poor working conditions and high greenhouse gas emissions. To put that into perspective: traditional fibre production uses 0,45 hectares per ton and 20.000.000 liters of water per ton. Practices such as child and forced labor remain the norm rather than the exception, and concerns around land rights issues are abundant. Processing raw materials might be even worse. Millions of people work in factories for the textile industry, 65% of whom are women. Issues with health and safety, social security, wages, working hours and freedom of association and collective bargaining are all jeopardizing human rights. Furthermore, the processing of textile as well involves high water and chemical use, and 95% of the industry relies on fossil fuel.

Our solution

Late 2015, we were approached by the agricultural sector of Noord-Brabant to find a solution for the surplus cow manure that is being produced. Jalila Essaïdi, director of Inspidere B.V., developed a method and technology to solve this problem by transforming cow manure directly into bioplastics (Mestic®). She managed to completely deconstruct manure and to utilize the obtained cellulose for new biomaterials. This revolutionary technology directly transforms manure into bioplastic, biotextile and biopaper. A circular solution that will not only solve the present cow manure problem, but will also provide a sustainable source of biomaterials to the manufacturing industry.

The impact

By providing farmers with a revenue stream other than milk production, they will become less dependent on the scale of their agricultural business for a good income. This reduces the need to expand current agricultural operations which directly results in a reduction of excess manure and increased animal welfare. By influencing the homogeneity of manure through cattle feeding we are reducing methane output of cows by 70% (Kinley, 2016). By generating 1 ton of fibre from manure, we reduce 149 kg methane to 44 kg, resulting in a reduced GWP of 2940 kg CO² eq per ton.

Using manure, Mestic[®] does not need crop cultivation for virgin material, unlike cotton or wood-based cellulose fibers. With regards to the fibre production for Mestic[®], we intend to use a plant design with integrated production of pulp and fibres, powered by sustainable energy sources. Comparing versus an Asian-based plant employing the most generally used fibre-production process, energy is recovered from the pulping process, use off fossil fuels for energy is minimized, material use is optimized and transportation is avoided. This minimizes the abiotic depletion (-23 kg Sbeq./t), acidification (-29,5 kg SO₂ eq./t), ozone layer depletion (-0,21*10⁻³ kg CFC11 eq./t) and GWP (-3800kg eq./t)(Shen & Patel, 2010).

Manure is a local source material and allows for a local manure based economy. Local production of Mestic[®] will make international trade unnecessary. Comparing local road cartage (400 km with 100g CO₂/ton) with sea transport (20.000 km with 20g CO₂/ton), a reduction in GWP of 360 kg CO₂ eq./t is achieved. Furthermore, by implementing factories locally we adhere to western norms with regards to social security, wages, health and safety and all other human rights.