

Nanollose Ltd | IPO Note

A TOAST TO THE FUTURE OF FABRIC

Cellulose is a naturally occurring organic compound found in the cellular structure of virtually all plant matter. Cellulose is often used as a bulking agent in processed food, but is also commonly used to produce paper and textile fabrics. Cellulose is currently derived from environmentally damaging and unsustainable cotton and wood sources. Nanollose has developed an environmentally sustainable alternative to source cellulose.

INVESTMENT HIGHLIGHTS

SUSTAINABLE | PLANT FREE production of cellulose

- ♦ Low-tech process requires very little land, water or energy to produce a highly sustainable alternative fabric without the need to grow plants.

MASSIVE INITIAL MARKET | Textile Industry US\$500 Billion

- ♦ Large international markets present several pathways for revenue, licensing and ultimate commercialisation of technology.

SCALABLE | Simple technology, naturally occurring process

- ♦ Naturally occurring bacterial process, optimal at 30°C, no sunlight required, capability to vertical farm, low cost inputs, high-value output.

STRONG INITIAL IP POSITION | Two patents lodged to date

- ♦ ‘Method for processing microbial cellulose’ and ‘Plant growth media and method for making same’ provides significant barriers to entry.

DEEP INDUSTRY NETWORKS | International Textile Connections

- ♦ Management has over 30 years’ experience in global textile industry sector.

BUSINESS OVERVIEW

Nanollose is developing a patented innovative industrial process that uses bacteria to convert sugar present in food, wine and beer waste streams to produce microbial cellulose.

It’s innovative yet intrinsically simple microbial cellulose production technology requires very little land, water or energy to produce a highly sustainable alternative to plant based cellulose without the need to use pesticides and harvest cotton or wood.

The microbial cellulose exhibits properties superior to plant based cellulose and has application across a broad spectrum of markets, including textiles, medical, hygiene, paper, seed germination and food.



creating Plant-Free™
nanocellulose technologies &
solutions

CURRENT CAPITAL STRUCTURE

Original shares on issue (m)	39.9
Seed shares (m)	10.0
Total shares post seed raising (m)	49.9
Total expected shares at IPO (m)	74.9

OFFER DETAILS

Shares to be issued in IPO (m)	25.0
Listing price (\$)	0.20
Amount to be raised at IPO (\$m)	5.0
Total shares at listing (m)	74.9
Market capitalisation (\$m)	14.9
Cash post IPO (\$m)	5.0
Enterprise value (\$m)	9.9

KEY MANAGEMENT

Wayne Best	Non-Exec Chairman
Alfie Germano	Chief Executive Officer
Terry Walsh	Non-Executive Director
Gary Cass	Head of Research and Development

MAC EQUITY PARTNERS

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THE PROBLEM: PLANT DERIVED CELLULOSE IS UNSUSTAINABLE

Cellulose for industrial use is currently obtained from two unsustainable and environmentally damaging sources, cotton plants and pulpwood plantations. Cotton is the second most water intensive crop in the Australian agricultural sub-division, is grown on vast areas of prime agricultural land in over 100 countries and accounts for 16% of global insecticide use. Pulpwood plantations on the other hand destroy forest environments and the chemical processes used to extract cellulose from wood are energy intensive, use toxic chemicals to separate cellulose from lignin and produce as much waste as they do cellulose.

COTTON

8 months to grow



PESTICIDES

33 million tonnes annually



WATER
CONSUMPTION

8,000L water to make 1 pair jeans

WOODPULP

18 years to grow



DEFORESTATION

40% of all industrial wood harvest



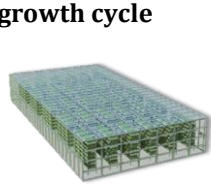
PULPING PROCESS

Toxic Process

THE SOLUTION: PLANT FREE MICROBIAL NANOCELLULOSE

Nanollose's microbial nanocellulose fibre is a plant-free, environmentally sustainable alternative to plant-based natural fibres and petroleum based synthetic fibres. The technology has already successfully produced high fashion dresses (one made from beer and one from wine), paper, soilless substrate/plant growth medium and has been used in tissue engineering as a scaffold for ear implants. The technology is highly scalable and capable of being vertically farmed to increase land utilisation.

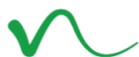
NANOLLOSE: ~10% of cotton land use (non vertical farmed), 18 day growth cycle



1 meter



10 meters



Plant-Free™



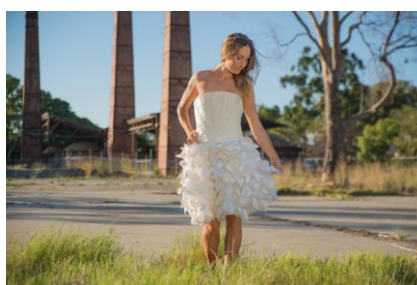
**312,000L WATER / Ha
~96% less than cotton**



TEST PRODUCTS NANOLLOSE HAS SUCCESSFULLY CREATED



Paper



High Fashion Beer and Wine Dresses



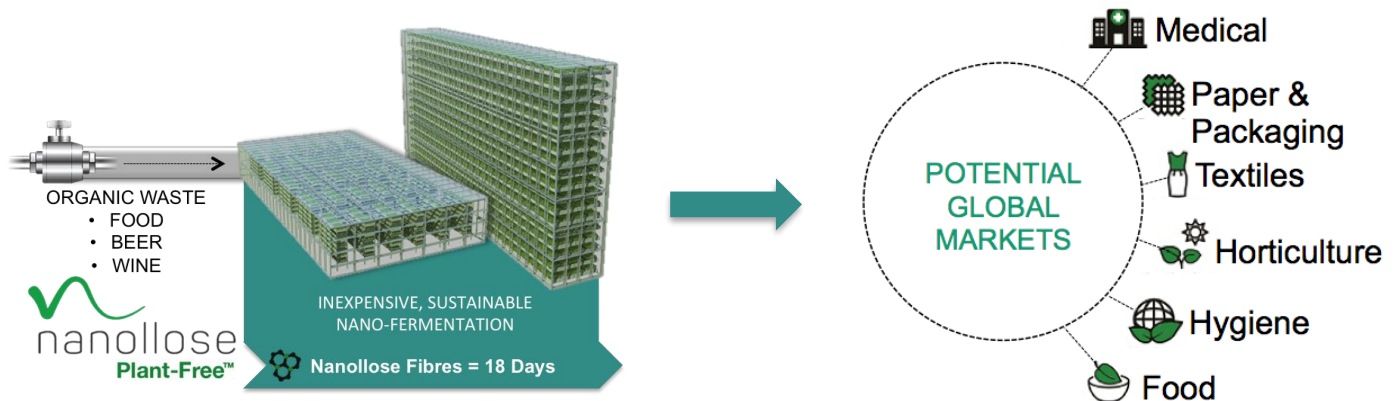
Soilless Substrate/Growth Medium

THE NANOLLOSE PROCESS

The intrinsically simple microbial cellulose production technology involves using *acetobactor xylinum*, a non-hazardous bacterium, to convert sugars present in organic by-products and waste streams (food, beer, wine etc) to allow microbial nanocellulose fibres to grow naturally in a sterile environment. The process requires very little land, energy or water and can use waste streams that would otherwise be discarded to produce a sustainable, environmentally friendly and potentially globally valuable fibre. Nanollose's processing technology then coagulates and freeze-dries nanocellulose into the final product; sheets of white, cotton like fabric that is strong, absorbent and flexible.

The production and processing technology are very simple in nature and operation, which bodes well for fast and problem free scale-up once listed.

- ✓ Low energy process is active between 20-40°C and does not require sunlight
- ✓ Process can be tailored for desirable fabric properties
- ✓ 18 day production cycle provides ~20 growth cycles per year
- ✓ Low (or no) cost inputs are plentiful; food, beer and wine
- ✓ Indicative production capability 2.5kg/m³ compared to cotton of 0.25kg/m²
- ✓ Process can be vertically farmed increasing m² production



SUPERIOR WEARABLE AND INDUSTRIAL PROPERTIES

Microbial cellulose has nano-sized fibre particles which are much smaller than the more fibrous particles found in plant and wood based cellulose. Nanollose's microbial nanocellulose exhibits many superior properties yet retains the softness, strength, and wearable characteristics of conventionally grown and produced cotton, rayon and synthetic fibres and fabrics.

Microbial nanocellulose is a natural, plant free, 100% biodegradable, environmentally sustainable alternative to plant-based natural fibres and petroleum based synthetic fabrics.

Plant-Free – Nanollose produces a cellulose-based fabric without the need to grow plants. The use of large amounts of pesticides, irrigation water and prime arable land that is commonly associated with cotton growing are simply not an issue when producing nanocellulose.

Super absorbent – Most useful in the medical and hygiene industry, microbial cellulose fibres arranged in a densely packed, non-woven structure exhibit super absorbent and high liquid retention properties.

Non-toxic & compatible with human tissue – Extremely valuable in the medical industry, nanocellulose is not harmful or toxic to living tissue or blood cells. Nanocellulose has shown to be a favourable substrate to support cellular activity. Laboratory testing has confirmed skin cells readily grow on nanocellulose fibres as a scaffold for tissue and cell growth.

Biodegradable – Landfills are being inundated with unprecedented amounts of natural and synthetic fabrics as a result of fast fashion trends and our materialistic lifestyles. Nanocellulose is a natural fibre and 100% biodegradable.

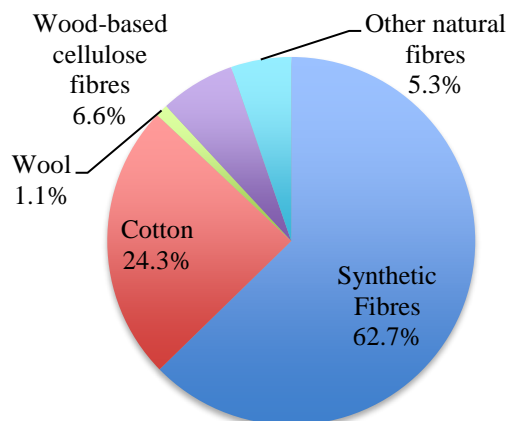
Short growth cycle – Production cycle of 18 days gives roughly 20 growth cycles per year. A shorter growth cycle reduces production risk and stabilises the supply of microbial nanocellulose. In comparison cotton takes 8 months and trees 5-20 years to grow.

Grown to shape – Microbial cellulose can be grown to shape resulting in one-piece seamless garments with no stitching, a valuable innovation to the fashion industry. The ability to grow sterile 3D shapes also presents potentially very useful applications in the medical industry as an implant and scaffold for tissue/cell growth.

MARKET OPPORTUNITIES

Textiles

Nanocellulose shares many of the favourable wearable characteristics of cotton, rayon and synthetic fabric such as softness, strength and breathability making it a viable and sustainable alternative fabric.



Global Fibre Consumption 2015¹

Cotton

Conventionally grown cotton uses 3% of the world's arable land, 10% of all agricultural chemicals and 25% of all insecticides.² Nanollose can produce an alternative to cotton fibre with the same properties as cotton through a sustainable and environmentally friendly bio-process that requires a fraction of the water, energy or land and zero pesticide or herbicide. The world cotton market is estimated to be an AU\$96 billion industry.³

26% of Australia's national irrigation total for the year was used to grow cotton in 2010-11.⁴

In response to a global trend away from unsustainable and environmentally damaging fibres, many international textile and fashion companies have turned to *organic cotton*. However, organic cotton can be three times as expensive as conventionally grown cotton and still requires vast amounts of water and land to produce. The demand for organic cotton remains low and does not present a feasible long-term solution to replace current unsustainable cotton production.

Rayon

Viscose (rayon) fabric is a manufactured regenerated cellulose fibre, commonly obtained from wood pulp. Rayon has been increasingly produced in various forms over the last ten years as a "sustainable" substitute to cotton. However, pulping processes used to extract cellulose from wood material can involve up to 19 steps and are energy intensive.⁵ Some processes also require the use of solvents, some of which can be toxic to both humans and the environment. The deforestation of old growth forest to make way for plantations is also a significant issue when extracting cellulose from wood sources for any industry.

Synthetic Fibre

The popularity of synthetic fibres such as nylon and polyester have increased over time due to cheaper manufacturing processes and increasing demand for "fast fashion" garments. Synthetic fibre consumption has increased in recent years to currently account for 62% of global fibre consumption.

Although synthetic garments are cheap to produce, the production process is energy intensive and uses toxic substances that are commonly expelled into water-ways. Synthetic based garments are made from petroleum pellets and are not biodegradable causing many issues at landfill sites across the globe. Nanollose's plant-free alternative uses waste streams as an input rather than producing them as an output. The fabric produced is also 100% biodegradable making it an ideal environmentally friendly alternative to synthetic fabric.

Personal Hygiene Products

Nanollose's super absorbent and high liquid retention properties make it suitable for use in an array of personal hygiene products.



Baby Diapers



Feminine Hygiene Products

US\$64bn by 2022⁷

US\$19bn 2016⁸

Nanollose has been in contact with a large-scale manufacturer of personal hygiene products who are very interested to receive samples for testing and analysis.

Currently most disposable nappies are not biodegradable and can take 500 years to decompose. Nanollose's non-woven fibres are a 100% biodegradable alternative and potentially offer superior absorption and liquid retention when compared to biodegradable or re-usable nappies. Increasing birth rates, rapid urbanisation and continuously improving economic conditions in developing countries is fuelling growth. The same factors are also driving growth in feminine hygiene products, such as sanitary pads and tampons.

MARKETS CONTINUED

Global Horticulture – Seed Germination

Faster and more efficient methods of germinating and growing seed/seedlings are required to feed an ever-increasing global population. Soilless substrates are becoming increasingly popular in horticulture as one way of increasing germination and growth rates by controlling water and nutrient supply as well as suppression of soil-borne diseases. *The global fruit and vegetable seeds market is estimated to be US\$14Bn by 2022 growing at CAGR of 8.1%.⁹*

Nanollose has developed a market ready soilless substrate growing kit that is intended to be sold through distributors such as Bunnings and Aldi. A provisional patent “plant growth media and method for making same” was filed in April 2017 protecting the use of microbial cellulose as a growth medium. Together with **marketing and developing Seeds to Serve for near term revenue**, Nanollose intend to engage with global seed germinators to **potentially license the use of their soilless substrate** as a new and more efficient growing medium.

Nanollose Seeds to Serve growing kit



Paper and Packaging

Microbial cellulose material has the potential to be used in paper for its superior strength properties and can also be used as a wet-end additive to enhance retention in coating and packaging applications. The global market for paper and paperboard packaging will grow to US\$213 billion in 2020¹⁰ accounting for 34% of global packaging materials.¹¹

Nanollose has successfully made paper from microbial nanocellulose fibres through collaboration with Westerlund Eco Services Australia.

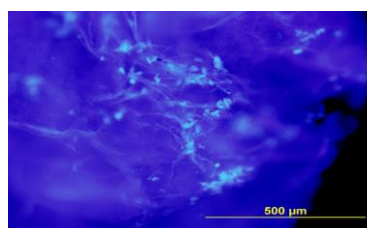
Further milestones will focus on producing a whiter thinner paper for use in the high-end decorative paper market.

Growth in the paper and paperboard packaging market is driven by the switch in packaging solutions from plastic packaging to paper and paperboard due to the environmental concerns over non-bio-degradable or very slow degradation of plastic and metal packaging. 100% bio-degradable nanocellulose produced from recycled liquid waste streams that has the ability to be grown to shape could provide a sustainable and environmentally friendly alternative.

Medical Textiles and Products

Nanollose’s microbial nanocellulose is non-toxic and compatible with human tissue making it potentially very useful throughout the medical textile/products industry.

Nanocellulose has already shown an **exceptional ability to propagate human skin and eardrum cells through collaborative testing with the Ear Science Institute of Australia**. Commonly used synthetic polymer scaffolds can invoke an adverse reaction in humans and must be removed in skin healing applications. Nanollose’s microbial cellulose scaffold does not adversely affect human cells. Further testing may be conducted to show how Nanollose’s scaffold can be left inside the body indefinitely post skin/tissue growth procedures.



Laboratory image of nanocellulose being used to propagate human skin cells

Nanollose’s non-woven nano fibres could also be used in a range of medical textile applications. Textile fabrics for healthcare and medical products range from simple bandage materials or gauze to complete surgeon gowns. The global medical textiles market is projected to reach US\$20 billion by 2022.⁶

Food

Cellulose produced from wood pulp is used in a range of foods to extend product shelf life, increase fibre content and fill out overly produced foods. One of the biggest users of cellulose in the food industry is in Nata de Coco production. Nata de Coco is a sweet dessert produced through the bacterial fermentation of coconut water. Common issues facing the industry are weather and the high cost of inputs; coconuts and sugar.

The unique properties of microbial cellulose, being both edible and ideal for use in tissue engineering lends itself to being used in genetically grown food. In 2013 a “bio burger” was grown from muscle fibres sourced from cow tissue and grown on an artificial scaffold at Maastricht University. Nanollose’s biocompatible and edible fibre, could be used as an ideal scaffold for bio food in the future.

MANAGEMENT

Raffaele (Alfie) Germano
Chief Executive Officer

Alfie is a 30-year veteran in the global textile industry sector. After working for his family garment manufacturing company, he moved to Hong Kong where he spent 24 years in the garment industry as a leader of large-scale global product development, sourcing and retail operations. He held Vice President and Director positions at GAP Inc, VF Corporation, Liz Claiborne Inc, Fila Inc and Carter's Inc. He is passionate about sustainability, strategy, performance, metrics, process and product.

**Dr Wayne Best**
Non-executive Chairman

Wayne has over 35 years' experience in organic chemistry and the biotechnology sector. Wayne spent 10 years at the Chemistry Centre (WA) where he was responsible for the formation and running of the Medicinal & Biological Chemistry Section which undertook collaborative R&D into drug discovery and contract synthesis for the pharmaceutical industries. In 2003 Wayne founded Epichem Pty Ltd, a contract research company, where he is currently the Managing Director.



KEY RISKS AND REFERENCES

IP and Competing Technologies Risk - There is a risk that the Company's attempts to secure IP protection through either patents or trade secrets may not be successful. Failure to adequately maintain suitable IP protection may enable other companies to more effectively compete with the Company and may impact the Company's future operations including revenue and profitability.

Funding Risk - The Company does not expect to earn significant revenue from its technology through its development stage. The Company's ability to attract additional capital is subject to a number of factors that are not within the control of the Company.

Technology Development Risk - Nanollose technology must be developed through a number of scale-up stages. There is significant risk with respect to the company's ability to develop and scale the Company's technology.

Licensing Risk - The main commercialisation goal of the Company is to license the technology. Failure to earn revenue through licensing agreements will significantly affect the Company's capital position.

Management Risk - The Company is dependent on the ability of management to advance their technology, and loss of personnel could impede its ability to do so.

1. <http://www.lenzing.com/en/investors/equity-story/global-fiber-market.html>
2. http://www.huffingtonpost.com/mattias-wallander/organic-cotton-threading-_b_4784430.html
3. [http://www.ey.com/Publication/vwLUAssets/Unwrapping_the_packaging_industry_-_seven_factors_for_success/\\$FILE/EY_Unwrapping_the_packaging_industry_-_seven_success_factors.pdf](http://www.ey.com/Publication/vwLUAssets/Unwrapping_the_packaging_industry_-_seven_factors_for_success/$FILE/EY_Unwrapping_the_packaging_industry_-_seven_success_factors.pdf)
4. <http://cottonaustralia.com.au/cotton-library/fact-sheets/cotton-fact-file-the-world-cotton-market>
5. <http://www.barnhardtcotton.net/blog/know-fibers-cotton-vs-viscose-rayon/>
6. <http://www.grandviewresearch.com/press-release/global-medical-textiles-market>
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8. <http://www.persistencemarketresearch.com/market-research/feminine-hygiene-product-market.asp>
9. <http://www.hortidaily.com/article/30435/Growing-world-population-driving-global-seed-market>
10. <http://www.marketsandmarkets.com/pressreleases/paper-paperboard-packaging.asp>
11. Ernst and Young, Unwrapping the packaging industry - Seven factors for success, pg 1.

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