



# CAN A CIRCULAR ECONOMY CREATE ADDED VALUE FOR NEW ZEALAND AGRICULTURE?

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# **EXECUTIVE SUMMARY**

The aim of this paper is to clearly define the Circular Economy (CE) concept and showing its potential for NZ agribusiness using mini case studies to provide insights on how we can improve our sustainability and add economic value in an ethically values-based way. The research methods used for this report involve a literature review and thematic analysis. The report includes comprehensive recommendations for the primary sector to assist in the transition to a CE.

At a high level, the CE is based on designing out waste and pollution, keeping products and materials in use, and decoupling growth from environmental pressure. The model distinguishes between technical and biological cycles (where consumption occurs). Key features of a CE include; the power of circling longer, and the power of cascaded use, closed loops, renewable energy, circular inputs, tight loops, and circular design.

Cradle to Cradle sits at the heart of CE and is a framework that aims to create production techniques that are not just efficient but are essentially waste free. With Cradle to Cradle the aim is for a positive footprint.

Technology is a key enabler for unlocking the potential of a CE, and this includes disruptive economies such as like Blockchain & Artificial Intelligence. Examples of this are explored in the report. The CE will enable new customer relationships as 'consumers' become 'users'. With leasing or 'performance' contracts in place, more customer insights are generated for improved personalisation, customisation, and retention.

Consumers need to become more aware of the true environmental and social costs of their purchases and become more conscious consumers as they choose products and services from a CE. The challenge here is educating consumers and validating the authenticity of the product or service that comes from the CE. The consumer helps take responsibility for the waste they create. Consumers can potentially champion change in good behaviour through a CE.

I see the CE providing an important platform for us to disseminate our shared values and purpose with the consumer who in turn must recognise what comes before and goes after their use in the cycle. Our objective for the CE must be aspirational to enable transformational change.

The circular advantage value can be shown in a greater preparedness to pay for high standards of animal welfare and environmental stewardship in a CE. The transition to a circular approach for the economy will be improved with the right mix of incentives and investment from government. Reducing taxation of labour, especially at the lower end, would help repair activities and other kinds of services in a Circular Economy. Regulation needs to be adjusted to fit circular business models. This will frequently require changes to existing regulation, which is a challenge requiring bi-partisan commitment to ensure agile enduring policy which aids the CE uptake.

We need to attract the best talent into the primary sector to enable the change to a CE. Benefits from a CE are not just improved profitability and environmental outcomes. Benefits from having high production standards that include positive feedback loops will enable agility and risk mitigation. Positive feedback loops can provide strategic advantages over competitors giving us greater market access. This will position us to capture value when mainstream users shift demand. Benefits could go even further providing ability to influence future regulation as we gain back our social license. Aligning our values and practices with the consumer demands through a Circular Economy will enable us to capitalise on this transparency. There is a need to collaborate to create joint value by working together throughout the supply chain.

Wool is the second most volatile global commodity after sugar so alleviating this cannot be underestimated in underpinning stable farming systems. Wool can become an essential 'ingredient' in CE, transforming it to a valuable renewable resource that is respected for its attributes and positive impact on the environment. A CE can allow us to tell our story in a coherent manner, showing our primary industries are working with nature. The primary sector needs strong leadership, clarity in vision and premise for the wool industry to become a successful Circular Economy. Wool can contribute positively to products that are safe and circular. It is a great fit for a CE in that it is a renewable fibre with many unique attributes and superior performance to synthetic fibres. Wool can be safely returned to the environment after multiple uses, biodegrading in under twelve months.

Examining the entire agri-food and fibre chain reveals opportunities at all stages, from primary production using precision agricultural techniques, to the retail-consumer, through to the utilisation of agri-food wastes in the bio economy. Greater innovation around farm inputs would be demanded by a CE.

When was the last time we as farmers made any significant number of changes because of our customers' demands? We reluctantly make changes because of enforced compliance or social pressure rather than leading the way.

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# PREFACE

In July 2018 I was fortunate to spend two days at Stanford University in Palo Alto, California with the NZ Merino company where I first heard about the Circular Economy concept from the following two presenters:

- Chris Grantham from IDEO, who is their CE portfolio director. Chris has been working with the Ellen MacArthur Foundation to generate innovative solutions and new business models that move toward a more Circular Economy.
- 2. William McDonough who is a thought leader and author on the concept of Cradle to Cradle which sits at the heart of the CE.

In reflecting on these presentations, the following questions came to mind:

- Could we use the CE to get our story and values communicated effectively to the consumer in a way that would add value to our products?
- 2. Everyone is always talking about sustainability, but the term has been overused and is often not validated, can we use the CE as a way of 'raising the sustainability bar'?

As a nation we are constantly talking about adding value to our primary produce but with limited effect and even less scalability. *Rather than a supermarket-driven system that drives prices down and has no connection to the actual and varying costs of production, we need a food system in which family farmers can make a dignified living producing a diversity of nutritious food while also protecting the environment. (Holt-Gimenez, 2018)* 

*'We prioritise the current much more than the future'*, William MacDonough – This really struck a chord with me, in a world of fast fashion, fast food and technology how do we stop this ever-growing demand for consumption and turn it into something more positive?

# INTRODUCTION

The Circular Economy is a complex concept, but it will be transformative, and we need to move away from its counterpart, which is the linear economy of Take – Make – Dispose. Applying the Circular Economy to New Zealand's primary industries is a real challenge and requires buy-in throughout its cycle.

At its core the Circular Economy (CE) protects the environment, drives innovation and helps the industry stay competitive. With the circular approach where waste is minimised, and resources are re-used efficiently it can and will create an economy that's both sustainable and profitable. The implementation of CE worldwide still seems in the early stages and is mainly focused on primitive recycling rather than reuse.

From a Maori cultural view Kaitiakitanga has similar values to the CE in respect to guardianship and protection of the environment. This is important for NZ to retain some of its identity and heritage in our part of the circular flows which gives us the opportunity to extract more value.

Tim Brown from All Birds says 'People don't buy sustainability they buy great products'. Our messaging must be on point and consumers require authentication behind products which will validate their impacts. We need to shift away from a world of instant gratification and ensure that we don't present sustainability in a boring way, so that we create consumer and producer change.

NZ doesn't have scale to feed and clothe the world, and there is a continued call for us to add value to our products. Ian Proudfoot (2015) talks about the importance of the intangibles like brand, culture, shared values, purpose and experience. We need to move to a consumer who is prepared to pay a premium for the values behind our products. Can the CE provide the opportunity to add value to our products?

The prospect for technology advances is difficult to account for. Furthermore, the impact of social media is real and affects consumer trends. We are heading towards a new era of radical transparency, as a sector we have been too defensive rather than celebrating positive stories.

# "You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete." Buckminster-Fuller

# AIMS

The aim of this paper is to clearly define the Circular Economy concept showing its potential for NZ agribusiness. I will use mini case studies as examples of how we can improve our sustainability and add economic value in a values-based way. I aim to provide insights for application to the New Zealand agriculture and in particular the wool sector.

# METHOD

The research used for this report involved a literature review and thematic analysis. The literature review was the major component of the research. Through the literature, I focused on thematic analysis to discover trends and strengths in interpretations of the CE and its cause and effect. The literature review allowed evaluation of the current available information on the CE and relate it back to real examples in our sector. This was looked at from both a consumer and producer perspective.

# DEFINING THE CIRCULAR ECONOMY

There are numerous definitions of the Circular Economy (CE) as the model is constantly evolving. The idea of the Circular Economy has been around since the late 1960s, and it has helped to shape the sustainable business movement. The emergence of new technologies will now combine with CE models to potentially disrupt entire industries. Walter Stahel (Swiss architect and founder of the 'Product Life Institute') argues that the 'Circular economy should be considered a framework: as a generic notion, and the Circular Economy draws on several more specific approaches that gravitate around a set of basic principles'.

At a high level the CE is based on three principles:

- 1. Design out waste and pollution (as waste is a valuable resource)
- 2. Keep products and materials in use, as everything is an input to everything else
- 3. Regenerate natural systems by decoupling growth and environmental pressure

#### Simple Definition

"The Circular Economy is a regenerative system in which resource input, waste, emission, and energy leakage are minimised by slowing, closing, and narrowing energy and material loops; this can be achieved through long-lasting design, maintenance, repair, reuse, re-manufacturing, refurbishing, recycling, and upcycling. This contrasts with a linear economy which is a 'take, make, dispose' model of production" (Government Europa). A more recent proposed revised definition of the Circular Economy as *"an economic model wherein planning, resourcing, procurement, production and reprocessing are designed and managed, as both process and output, to maximize ecosystem functioning and human well-being"* (Murray et al, 2017).

Further to this "The CE is an industrial system that is restorative by intention and design. "The idea is that rather than discarding products before the value is fully utilized, we should use and re-use them" (Wijkman et al, 2015).

To look at the CE through a NZ lens or more specifically a Maori one that has strong parallels is the term Kaitiakitanga. Kaitiakitanga means guardianship and protection in managing the environment. Traditionally, Māori believe there is a deep kinship between humans and the natural world. There is growing interest in kaitiakitanga as iwi restore their environment and their culture.

#### The Circular Economy Model

The model distinguishes between technical and biological cycles. Consumption only occurs in the biological cycles, where waste food and biologically-based materials (such wool or timber) are designed to feed back into the system through processes like composting and anaerobic digestion. These cycles regenerate living systems such as soil which provide renewable resources for the economy. Technical cycles recover and restore products, components, and materials through strategies like reuse, repair, remanufacture or as a last resort recycling.

The outcome is a CE package that brings the pieces together – production, consumption, secondary raw materials, waste management, innovation, and investment – to cover the whole product life cycle.



#### Figure 1: Circular Economy Diagram (Source - Ellen MacArthur Foundation).

# Features of the CE Diagram:

The '**power of circling longer**' refers to maximising the number of consecutive cycles (be it reuse, remanufacturing, or recycling) and/or the time in each cycle. This involves extending the lifespan so that the cycle is slowed down, which means less product must be produced. Products can cycle more times if they are more easily restored.

The '**power of cascaded use'** refers to diversifying reuse across the value chain, such as when woollen apparel is reused first as second-hand apparel, then crosses to the furniture industry as fibre-fill in upholstery, and then the fibre-fill is later reused in wool insulation for construction—in each case substituting it for an inflow of virgin materials into the economy. Finally, wool can then be safely returned to the biosphere through biodegrading in the soil.

A key feature of the CE value chain is distinguished by a *closed loop* of material flow and is driven by **renewable energy**. Other possibilities are through Re-manufacture, or through Circular Inputs.

**Circular Inputs** are materials that last for longer than a single life-cycle and can easily be regenerated. Another beneficial element is **Tight loops** – which means the tighter the circle the less a product must be changed in reuse.

It is important to note that whilst recycling, waste management and reduction improve Circular Economy outcomes, as they are a small part of the CE. The economy should be **designed** so that these features are minimised. The idea is that everything that is made can be unmade, and waste from one part of the cycle can be 'food' for another part are additional key parts of the CE.

The CE should harbour innovation as we strive to solve problems of the linear model. There are plenty of good examples of innovation later in this report. Further to this a CE organisation should strive to make a profit, engage in ethical practices and be a good corporate citizen. This approach can also reenforce an industry's social licence to operate through verified efficient and sustainable resource use.

Innovative products and contracts designed for the Circular Economy are already available in a variety of forms—these examples have in common that they have focused on optimising the total system performance rather than that of a single component (de Wit, 2018). Design is a key feature. Within the next ten years not having an end-of-life solution may mean not having a marketable product (Parsons, 2016).

How do we define the need for a Circular Economy?

- Growing demand for consumer goods leading to resource scarcity
- Global competition is intensifying rapidly, trade wars appear to be intensifying.
- Unsustainable use of resources, causing market volatility
- Climate change is happening
- Energy supplies are dwindling

## **KEY ELEMENTS IN A CIRCULAR ECONOMY**

Building a Circular Economy requires complex efforts at the local, national, regional, and global levels. Rizos et al. (2017 - 15) identified eight Circular Economy processes: recycling; efficient use of resources; utilisation of renewable energy sources; remanufacturing; refurbishment and reuse of products and components; product life extension; product as service; sharing models; and shift in consumption patterns.

• **Recycling** by ensuring renewable, reusable, non-toxic resources are utilised as materials and energy in an efficient way. *"In 2010 a start-up called The RealReal has become a major online reseller of luxury designer clothing. The online marketplace has sold over six million pre-owned and the solution of the solut* 

*items since launch, keeping high quality clothing in use and worn for longer" (Iles, 2018).* This is an example of re-commerce in a CE extending use; as luxury goods tend to be well made, enabling multiple cycles and allowing those who may not normally be able to afford these brands access to them.

• *Efficient use of Resources* incorporates the use of fewer primary resources and changing utilisation patterns.

#### OLOW

A revolutionary new fabric uniting one of the world's most loved fibres – wool, with jute repurposed from the global coffee industry. This inspired blend captures the best properties of both fibres, high quality and hard-wearing. WoJo<sup>®</sup> is a beautiful textile that meets resource efficiency demands of today's interiors.

"The unique production process, which overcomes many previous technical barriers, and enables the reuse of coffee sacks and reintroduce them into our stores in a way that further enhances their interiors for our customers," Thom Breslin, Director of Design, Starbucks UK and Ireland

WoJo<sup>®</sup> was the result of a two-year, collaborative, product development project between the Formary & Starbucks to create innovative new fabrics from their own jute coffee sack stream.

Source – <u>http://www.theformary.com/#wojo</u>

- Utilisation of renewable Resources (Regeneration) The utilisation of renewable resources can include the shift to renewable energy and materials; reclaim, retain, and regenerate the health of ecosystems; and return recovered biological resources to the biosphere. Waste is seen as a Resource in a CE. NZAgbiz diverts waste from Fonterra and other dairy manufacturers and re-works this into animal nutrition products. Any excess is sold as ingredients for stock feeds, soaps and bio fuels.
- Remanufacturing and Refurbishment (Loop) Modular design has a role to play here, which will enable these two features to be completed more readily. This also encompasses Preserving and Extending what is already made; for resources that are in-use, maintain, repair and upgrade them to maximise their lifetime and give them a second life. All repair and maintenance jobs are considered circular. The Plasback scheme collects plastic, such as silage wrap, irrigation pipes and fertiliser bags, from the agriculture and horticulture sectors and processes it into new products, such as Tuffboard, an innovative plywood replacement used on farms.

- Product Life Extension and Optimise by Design for the future. This means ensuring design fully enables for an extended lifetime & for future use beyond the original product. Designing in appropriate production standards and communicating internationally via accreditation schemes works as conduit for this. Emerging companies like MaterialWise is a value chain collaboration to advance better chemistry as an essential building block of positive design.
- Product as a Service considers opportunities that create greater value and align incentives through business models that build on the interaction between products and services. Woollen carpet cleans the air, is less toxic than synthetic carpet, absorbs fine dust, and can reduce damage in a fire. If we look at selling carpet through a different lens we are no longer selling carpet but selling 10 years of healthier living insurance. There is also a move towards *subscription models* that reduces capital required in office 'fit outs', examples of this exist within the carpet industry also. This promotes unique customer engagement and provides and incentivises product life-extension in an innovative way.
- Sharing Models can mmaximize utilization of products through peer-to-peer sharing of privately-owned products or public sharing of pools of products; reuse them throughout their technical life spans; AirBnB is a great example of a sharing model maximising the use of property.
- Virtualize and Exchange by delivering utility virtually with autonomous tractors for farming, and drone usage. Exchange old materials with advanced renewable ones; by applying new technologies, such as 3-D printing and electric engines.

All these actions increase the utilization of physical assets, prolong their life spans, and shift the use of resources from finite to renewable ones. Each action reinforces and accelerates the performance of the others. Separately or together, they could have a significant impact, increasing cost competitiveness of substantially.

## **RELATED CONCEPTS**

The CE concept has been refined and developed by the following schools of thought: Cradle to Cradle, Performance Economy, Biomimicry, Industrial Ecology, Natural Capitalism, Blue Economy, Regenerative Design.

**Cradle to Cradle** sits at the heart of CE and is a framework that aims to create production techniques that are not just efficient but are essentially waste free. Minimising and reducing is optimising the current system, Cradle to Cradle (C 2 C) takes things a step further. 'Don't make the wrong things perfect, as they will only be perfectly wrong! There's no point in driving more slowly if you are still driving in the wrong direction!" Dr Michael Braungart EPEA Germany. Dr Brauggart is a thought leader

in the Cradle to Cradle concept along with William McDonnagh. He goes on to say 'Think not reduce our footprint but rethink for a positive footprint. It's not about zero waste, as you are still thinking about waste, think about everything as being beneficial'.

The C 2 C approach also has the two spheres of 'nutrients', biological and technical. The belief is if the two spheres stay separate the concept of waste will be obsolete.



Diagram @MBDC. Used with permission.

#### Figure 2: Two Spheres of the Cradle to Cradle Concept

The cradle-to-cradle philosophy states that all materials used after their life in one product can be usefully applied in another product. The difference with conventional reuse is that there is no loss of quality, and no residual products that are wasted. The saying 'waste equals food' refers to this circuit (Braungart, 2002).

**Woolchemy** processes disused wool and creates a superabsorbent wool fibre for the healthcare sector. These biodegradable, compostable and renewable material composites are sustainable alternatives to personal hygiene and sanitary products.

With a growing and ageing population, the need for healthcare products is immense. Woolchemy focuses on **a cradle to cradle** philosophy and recyclable innovation. Most personal hygiene and baby sanitary products are made from petroleum-based plastic that can't be composted and don't biodegrade.

The output of Woolchemy's patent-pending process can be recycled three times before the minimal waste output is distilled and re-used in another batch.

Source: http://woolchemy.com/

Other Influencers and schools of thought on which the CE concept builds include:

**2** - **Performance Economy** decouples growth, job and wealth creation from resource use. Resource costs are volatile and will constantly increase into the future.

**3** - **Biomimicry** relies on three key principles: Nature as model, measure, and mentor. Studying a leaf to invent a better solar cell is an example of this approach.

**4** - **Industrial Ecology** is a science that studies industrial systems by looking at material and energy flows with the goal of finding ways to lessen their environmental impact. This will eliminate undesirable by-product better reflecting natural living systems.

**5** - **Natural Capitalism** is any economic system that incentivizes profit based on proper care of the environment. This assigns an economic value to stewardship of the planet.

**6** - **Blue Economy** A sustainable blue economy as one that provides not just economic, but social benefits for present and future generations.

**7** - **Regenerative Design** offers a positive framing of environmental issues that can both inspire and create the cognitive space for transformative practices to emerge.

# TECHNOLOGY

Digital technology is a key enabler for unlocking the potential of the Circular Economy. Emerging disruptive technologies; Blockchain, Artificial Intelligence, Machine Learning, and Virtual Reality have the potential to activate mass behaviour change for the protection of the environment.

Technology can assist in the design of circular economies. Better use of tracking and data via Blockchain can facilitate improved supply chain control and product stewardship. This can also help connect businesses, making it easier for one company's 'waste' or by-product to become another's source material. DHL is a leading, global logistics service provider. The company is experimenting with integrating crowd-based logistics, drones and "parcelcopters" into its logistics systems and delivery chains.

Some technological advances will not reduce costs, but they may might improve performance instead. Remote sensors in agricultural machinery can alert us when parts need replacing or remanufacturing ensuring we are more efficient to avoid costly breakdowns.

Online platforms and technologies can provide insights that will enable earlier actors in the cycle to improve performance and agility.

# LIMITS OF THE LINEAR ECONOMY

A linear model comes from the industrial era of resource consumption that follows a 'take - make - dispose' pattern. Companies harvest and extract materials, use them to manufacture a product, and sell the product to a consumer— who then discards it when it no longer serves its purpose.

A linear system increases companies' exposure to risks, due to higher resource prices driven by scarcity and competition along with potential supply chain disruptions. At its worst the linear economy is a degenerative economy as it cuts against the cycles of the living world. At point of sale, liability for use of object is forgone, and no thought is given to what happens to the product at the end of its useful life.

We are increasingly seeing the effects of this Take, Make, Waste linear approach on the planet's resources through: Climate Change, Loss of Biodiversity, and Deforestation. Waste from the linear approach is visible in our oceans, soils and cities. Solutions such as recycling, beach clean ups and reducing consumption, barely address the issue at hand. (Retrieved from https://www.circularity.co.nz/).

# BENEFITS OF A CIRCULAR ECONOMY

The motivations for a CE can vary, from creating a more competitive economy or meeting the needs of a growing population, to complying with emissions targets and better social outcomes. Within the next ten years not having an end-of-life solution may mean not having a marketable product. (Parsons 2016).

The Circular Economy provides benefits in the following ways:

- Saves and values scarce resources
- Cuts greenhouse gas emissions and environmental impacts
- Breaks down silo thinking and promotes cross policy action
- Makes the economy more competitive, sustainable and fair
- Creates new business opportunities, jobs and growth.

Improved customer interaction and loyalty can be derived from getting products returned to the manufacturer at the end of the usage cycle. This requires a new customer relationship: 'consumers' become 'users'. With leasing or 'performance' contracts in place, more customer insights are generated for improved personalisation, customisation, and retention. This requires a customer facing approach, listening to what they are saying, helping to reduce wastage.

Brand leadership is important to inspire consumers and educate consumers creating the opportunity to demand a premium from the CE. In a CE shifting consumers from being a passive user to a passionate co-designer through feedback loops will mean they have a shared sense of responsibility and ownership. This will help to build a community of engaged consumers that will help minimise wastage. In a successful CE brands will be influencing neighbouring brands behaviour.

Secondary benefits accrue to the customer if products deliver more than their basic function—for example, packaging becomes fertiliser. The inherent innovativeness of the Circular Economy is a strong driver for the CE, and this can be through finding new uses for waste materials such as turning them into 'limited edition' items that can demand a premium. Innovation in *circular design* encourages us to rethink business models, whether it's improving the safety of users or ensuring that resources can be used again and again. Design will enable product life extension – through being adjustable, longer use, multi-functional, 100% repairable - sell spare parts, support 2nd hand market place -preloved products.

*Efficiency thinking* is 'how do we get more from the same amount of resources? or how do we minimise our foot print. *Effective resource use* differs in that it adds value in a positive sense by producing more from less resources. This is a change in how our footprint will impact on the environment and add more value as shown the figure below.



### Figure 3: Added Value via Eco Effectiveness and Eco Efficiency

A reduced environmental footprint (in red in figure 3) will mean Brighter Living Solutions, enable the transition to a more circular and bio-based economy, and the use of safer ingredients and materials.

Consumers need to become more aware of the true environmental and social costs of their purchases and become more conscious consumers and choose products and services from a CE. The challenge here is educating consumers and validating the authenticity of the product or service as coming from a CE.

The post care of a clothing garment can account for up to 70% of its lifetime footprint, woollen apparel tends to last longer and require less washing, meaning it is a more effective product for a CE. *The post purchase choices that consumers make, such as whether to wash clothes in cold, warm, or hot water, also make a big difference (Remy 2016).* 

The "circular advantage" is what the competitive edge companies gain is called. This comes through innovating for both resource efficiency and customer value—delivering at the heart of a company's strategy, technology and operations (Accenture 2014).

Trust is becoming harder and more important to win. A CE can promote trust within the cycle creating loyalty and long-term users of products and services.

#### Calculating the value of CE

Several studies have produced estimates of the overall value of the CE, often with diverging results. The lack of a common definition makes it challenging for calculations to be consistent, so the resulting estimates depend on the boundaries applied to the CE, key assumptions, and analytical approach.

The CE can provide short term cost benefits today and some significant longer-term strategic opportunities in highly competitive economies. The potential benefits from 'going circular' are immense, in the UK, it has been estimated that a circular economy could help generate 50,000 new jobs and  $\leq 12$  billion of investment (Kalmykova 2018).

The Sustainable Business Network recently produced two reports that identified how, by using circular economy principles, Auckland's economy could be up to \$NZ8.8 billion better off. The reports also concluded that, despite the increase in economic activity, there would be significantly lower carbon emissions (Sage 2018).

Research by Accenture found that for the global economy, the full set of Circular Economy approaches can add over five times the value of current best estimates by 2030 by reducing resource constraints to growth. The value returned from a CE can be derived from one the four areas below:

#### Figure 1: Areas of value creation in the circular economy



Lasting resources. Breaking the link between resource scarcity and economic activity by using only resources that can be continuously regenerated for productive use



Linked value chains Minimizing resource value destruction in a value chain by reclaiming and linking up waste outputs as useful inputs into a next life production process



#### Liquid markets

Eliminating idle time of products in the markets in order to grow the number of users that gain benefit from the same volume of goods



Longer life cycles Keeping products in economic use for longer to satisfy a greater demand and provide more utility without needing additional natural resources

Figure 4: Value Creation in the Circular Economy, (Accenture 2014).

# IMPLEMENTATION

## International scene

The Circular Economy in China and worldwide seem to follow very different patterns. CE in China is a direct outcome of the national political strategy of a top down approach (Feng and Yan 2007). In China analysis shows that applying circular economy principles at scale could save businesses and households approximately CNY 70 trillion by 2040 (16% of China's projected GDP) (EMF – 2018).

Other countries that have adopted CE into government policies, include Sweden and the Netherlands (several countries such as Slovenia, Italy and others have adopted "country-wide circular economy roadmaps"), plus there is the Circular Economy package within the European Union. These policies are typically putting measures into place that will enable a CE rather than prescribing it.

The world economy is only 9.1% circular, leaving a massive *circularity gap*. This alarming statistic is the main outcome of this first Circularity Gap Report to measure how the world is progressing on the pathway towards its ambition of becoming more circular (de Wit 2018).

## Transition

To transition to circular economies companies must undertake six actions: Regenerate, Share, Optimize, Loop, Virtualize, and Exchange— This is known as the ReSOLVE framework.

"The adoption of suitable, clear and stable policies will promote the transition to a CE. Success stories also point out the need for an economic return on investment, to provide suitable motivation to companies and investors" (Ghisellini et al 2016).

To assist the transition to a Circular Economy an industry needs to:

- Incubate start-ups, review assets at disposal and maximise their value. Forming alliances to create a strong network of partners is crucial when competition is shifting rapidly.
- Engage the world's best human talent. New competitors will emerge at a global scale, and businesses would have to anticipate new needs and attract the best talent.
- Avoid inertia. In a changing environment, maintaining the status quo is risky. A transition requires a culture change and break through ideas and objectives to gain any traction.
- Consumers need to become enlightened users in a CE, and education will be vital for uptake.

"When considering moving to a CE leaders need to ask themselves tough questions on the opportunity, value, capabilities, technology and timing of their investments on the journey to a Circular Advantage. The requirement becomes to concentrate on rethinking products and services from the bottom up to "future proof" their operations to prepare for inevitable resource constraints – all the way through to the customer value proposition" (Accenture Strategy, 2014).

# DISCUSSION

#### Government and Policy

CE will enable change in a greater way than just what individuals can achieve. New Zealand Inc needs to change its narrative, and assistance with policy at a government level is a way to ensure enduring change. The transition to a circular approach to the economy will be improved with the right mix of incentives and investment.

Walter Stahel talks about not taxing what is desirable – such as renewable energy and labour which will boost employment in that sector. One example in NZ is grants from the Waste Minimisation Fund, funded by the landfill levy. These grants can be used to minimise and divert waste from landfills, and to invest in activities that support reduction, recovery, reuse, remanufacturing, repurposing, recycling and composting. All of these things represent a good start on the pathway to a CE.

"Government policies that alter incentive structures, for instance by pricing in externalities, such as carbon, or opening the door to labour-intensive circular business models, by lowering employment taxes" (de Wit 2018). Policies of this nature can help with the transition process and incentivise the transformation, particularly where re-manufacture and refurbishment is important to the CE. Providing enterprises with knowledge, relevant networks and useful tools are ways governments can further enhance the establishment of circular economies.

"Good policy offers short- and long-term economic, social, and environmental benefits. But success in increasing our overall resilience ultimately depends on the private sector's ability to adopt and profitably develop a CE business models" (EMF 2012).

## CONSUMER AWARENESS

There becomes a host liability contract within the CE. This is where a shared sense of responsibility for products within the loop is beneficial. The consumer helps take responsibility for the waste they create. Consumers will champion change in good behaviour through a CE. There is a need to think how might we engage communities to create behavioural change and mass adoption? Can we create circular economies that consumers aspire to be a part of?

Sam Lang (2016) in his Nuffield report says 'Consumers are interested in what is at work in the products they eat, how these products were produced and delivered, and what is their effect on the body. I believe there is a ladder of brand equity in food. There is a lot attached to the values and culture. Ultimately, the brand should be the link with the consumer and tell the story' (Lang, Nuffield, 2016).

Is the onus on businesses to supply environmental alternatives for customers, or on consumers to be more environmentally inclined? (Buchanan 2018). It appears that the two are not mutually exclusive and both need to occur. Consumer demand will help shape the CE and ultimately contribute to its long-term viability. As we shift consumers from being passive users to passionate co-designers, they will have a more vested interest in the products and services associated with the CE.

As the millennial generation gains purchasing power, their high expectations that businesses will operate in a sustainable manner could have a big influence on shopping trends. Production methods that are more sustainable may cost slightly more, but they can also spur innovation and protect businesses from supply-chain shocks and reputation risks, resulting in greater resilience and profitability (Remy 2016).

Businesses will need to realign their growth strategies and their products and services to tap into the new markets and consumer pools which the CE will deliver. They will need to *Collaborate to Create* 

*Joint Value* by working together throughout the supply chain, internally within organisations and with the public sector to increase transparency and create joint value. It will require strategic alliances with committed and like-minded partners to get there.

Social media platforms exist that can be used to mobilise millions of customers around new products and services instantaneously. In a related vein, social networks have increased the levels of transparency and consumers' ability to advocate responsible products and business practices (EMF 2012).

Consumer behaviour is ultimately the decisive factor. Particularly when it comes to reuse, longer use and lower consumption, consumers will have to change their current behaviour. So far, consumers use the money they save on certain products mainly to purchase new products and services. This does not ultimately lead to a Circular Economy.

The key will be consumers' willingness to pay for certain attributes which rate highly for sustainability and ethical production; no longer can we rely on 'grass fed' to demand a premium. We must look further to ensure consumer alignment and consistency.

#### Agriculture:

Examining the entire agri-food and fibre chain reveals opportunities at all stages, from primary production using precision agricultural techniques, to the retail-consumer, and through to the utilisation of agri-food wastes in the bio economy.

Closing nutrient loops will significantly reduce agriculture's dependence on continuous inputs of synthetic fertilisers. A CE in agriculture will require recovering and reusing nutrients at scale and promoting advanced soil research. There is a need for better collection of human excreta, animal manure, and waste water for nutrient replacement (fertiliser). *One option is to lower taxes on secondary materials (e.g. recovered nutrients), which might stimulate the scaling up of recovery techniques and markets* (McKinsey 2016).

I believe that involvement in a CE will enable agriculture to demand a premium, de-risking our businesses through creating certainty around longer term pricing that we could establish with 'brand partners'. These relationships such as the ones the New Zealand Merino company develops with companies such as Icebreaker and SmartWool are mutually beneficial and deliver a fully integrated supply chain.

**Regenerative agriculture** is a good fit within the CE; however, we need to better understand the definition and interpretation of the term to see if it is scalable. There is a requirement to innovate more in this space to unlock regenerative farming providing access to it on a larger scale. Doug

Eadmeades from Agknowledge, an independent soil scientist, in a recent newsletter challenges the definition of regenerative farming 'It is a broadly defined system of principles and practises focused on biodiversity, soil health, ecosystem function, carbon sequestration, improving yields, climatic resilience and health and vitality for farming communities. This in my opinion is what most farmers strive for already, it's a matter of definition.' (Edmeades, 2018).

An evolving concept called **sustainable intensification** could bridge this gap between conventional agriculture and organic farming. Sustainable intensification takes the best ideas from both sides and minimizing their weaknesses, such as conventional agriculture's fertilizer overuse and organic farming's tendency toward lower yields.

A strategy of improving crop varieties by developing pest- and disease-resistant seeds through traditional breeding or genetic engineering can increase yields and reduce pesticide use. Cultivars suited to local conditions and weather extremes, such as drought and heat, can also help farmers produce more food without degrading ecosystems.

Efficient use of inputs is a common goal in sustainable intensification practices. Integrated pest management, which employs strategies such as biological controls to combat pests, can protect crops without harming beneficial insects. A 2015 meta-analysis of 85 integrated pest management projects found a "mean yield increase across projects and crops of 41 percent, combined with a decline in pesticide use to 31 percent." Conservation agriculture practices — such as no-till farming, cover cropping and crop rotations — improve soil quality and reduce weeds, cutting costs and storing carbon underground.

Systems that integrate livestock with vegetable production, use perennial pastureland, long crop rotations, leguminous crops and cover crops and manure produced by livestock as fertilizer can all contribute to a CE. There is a need to create a blue print for the implementation of the CE in NZ agriculture showing the emphasis on the importance of local, healthy food supply chains with less waste.

A corner stone for agriculture in the CE will be environmental management that limits production to what can be sustainably produced without wasting water, losing soil or allowing nutrient runoff. Farmers need to take ownership and champion a new sustainability movement to a CE. This will be pivotal in the way the industry adapts in the future. A CE can allow us to tell our story in a coherent manner, showing our primary industries are working with nature.

## **Energy Generation and Bio Fuels**

"75% of all energy use is in raw material production and remainder in manufacturing, remanufacturing is high in labour, so we replace energy cost with man-power. This all reduces greenhouse gas emissions, water and energy savings driving profitability" (Forsch 1989).

We need to focus on how agriculture can reduce energy consumption particularly regarding inputs. If we genetically edited or bred sheep to make them more resistant to fly strike for instance this would reduce chemical inputs making production more circular. Animal effluent can be used to generate energy. *"Methane from dairy farm effluent can provide about 75% of the farm's electrical requirements as well as all process heating - hot water requirements - for the farm." (ODT, 2014).* 

# WOOL IN A CIRCULAR ECONOMY

The wool story has all the ingredients for a CE, but it will require leadership to get it there. Wool can contribute positively to products that are safe and circular. Wool is a great fit for a CE in that it is a renewable fibre with many unique attributes with superior performance to synthetic fibres. Wool can be safely returned to the environment after use.



Figure 5: Wool Cycle - Source NZ Merino Co.

Wool is the second most volatile commodity after sugar, moving it into a CE will help to alleviate this volatility. The NZ Merino company has changed the way wool is sold brokering long-term contracts

with brand partners. Icebreaker now has 10-year contacts with its grower suppliers giving farmers certainty in the long term to plan and grow their business. In return brand partners require farmers to adhere to high social, environmental and animal welfare standards through an accreditation program called ZQ.

#### VF Corporation (owner of SmartWool and Icebreaker)

VF Corporation believe there's more to being circular than recycling. They focus on three areas that sit at the intersection of what their consumers want, what environmental constraints demand, and where they have identified untapped business opportunity: Recommerce, Rental and Circular Design.

In apparel, these business models are already proving to be successful. U.S. apparel Recommerce (resale) is an \$18B industry today, and is expected to grow to \$33B by 2021. Meanwhile, apparel rental is already a first choice for many consumers. Building circular products and systems requires us to disrupt current processes and push ourselves to think differently. And this shift in approach has the potential to result in more innovative products and better consumer experiences.

Smart use of online platforms is fuelling an invigorated online second-hand clothing market that is growing four times the rate of the total apparel sector. Recommerce presents a large and vibrant resale market for VF's brands – a market that could add new revenue streams to complement our existing sales models and channels. Recommerce can also encourage new consumers to experience our iconic brands and allow them to access high-quality products at lower price points. (VF Corporation, 2018).

The average life of a wool garment is 2-10 years depending on use, compared to 2-3 years for a typical cotton or synthetic garment. Surveys show that consumers use woollen products longer between washes due to wool's natural ability to keep itself clean or be refreshed by airing, which reduces the energy and water impacts of woollen garments contributing positively to a CE.

Part of the natural atmospheric carbon cycle, the carbon in wool comes from plants consumed by grazing sheep, rather than petrochemicals. Wool easily decomposes at end of life, releasing its valuable nutrients into the ground in a relatively short period, unlike synthetics. In the context of recycling, wool truly closes the loop.

We need to limit the amount of agri-chemicals used in sheep production systems. Greater innovation around farm inputs would be demanded by a CE. Ground breaking research by The University of Queensland's Samantha Nixon has discovered spider venom can be used as a drug against parasitic worms in sheep. Innovative discoveries such as this could significantly reduce the amount of synthetic and non-circular inputs in modern farming systems.

A real challenge for wool supply chains is that they are the longest in the world. It often takes ten months to a year from the time a brand purchases wool until they produce a finished garment. During that time fashion trends and consumer behaviour can change. This leads to waste and brands dumping product at a loss. All Birds shoes are challenging this 'norm', they have become very agile and responsive to what their consumer wants. For example, after recently releasing a new product they were able to make 35 changes to the shoe in the first 3 months of release by actively listening to their customers and responding. This ultimately leads to less wastage, loyalty of customers, and better product design. When was the last time farmers made any significant number of changes because of our customers' demands? We reluctantly make changes because of enforced compliance or social pressure rather than leading the way.

"Wool is already one of the most re-used fibres, accounting for up to 5% by weight of total clothing donated by consumers for recycling and re-use according to recent studies. This is substantially higher than wool's share of the virgin fibre supply which is about 1.3% "(Russell 2016).

#### THE FABRIC OF INNOVATION

Mi-bu in Mandarin means rice cloth and just like its namesake it's a brilliant staple. Rice straw fibre is woven with wool to create a new breed of interior textile that is both luxurious and resilient. Sumptuous and hard wearing, Mibu is a natural choice for upholstery that keeps looking good while going the distance. Creating textiles as a bi-product of food crops increases the value of the crop and the productivity of the land. Millions of tonnes of rice straw are burnt after harvest every year, loading the atmosphere with ash. Mibu breathes new life into rice straw, enriching interiors the world over.

#### From <http://www.theformary.com/#mibu>

We need to have a clarity in vision and premise for the wool industry with respect to the CE for it to deliver and be successful.

The Second Life SolidWool chairs have been created to inspire the change required to make sustainability desirable and profitable within the wool carpet industry. Designing products that embrace recycled fibre for its renewable credentials shows that sustainability can be both trendy and profitable (Parsons 2016).

# RECOMMENDATIONS

I firmly believe that if Agriculture can become more circular and collaborative with partners in the supply chain we can add value to our products and leave the commodity cycle behind. This will require a high level of leadership, innovation and strategy. I have formed the following recommendations based on my research:

# Policy Level and Government Influence

- Reduce taxation on renewable energy and labour which will boost employment in that sector.
- Provide enterprises with knowledge, as relevant networks and useful tools are ways governments can further enhance the establishment of circular economies.
- Create primary sector Innovation hubs. Incubate start-ups and form alliances to create a strong network of partners which will be crucial with shifting rapidly competition.

# Consumer

- Engage communities to create behavioural change and mass adoption.
- Make sure it is about genuine change rather than just branding, have a critical mass of companies to create momentum, government support, and to promote awareness of the CE.
- Consumers need to become enlightened users in a CE, education will be vital for uptake.
- Mobilise people around a purpose and create change through influence and design.

# Agriculture Sector

- Attract the best talent into the primary sector to enable the change to a CE.
- Get design teams involved with the most innovative thinkers to help with transition.
- Create a blue print for the implementation of the CE in NZ agriculture by showing the emphasis on the importance of local, healthy food supply chains with less waste.
- Have a clarity in vision and premise for the wool industry with respect to the CE for it to deliver and be successful. Analyse our supply chains systematically for circularity potential.
- Align with the consumer to build empathy, generate insights, and prototyping to experiment with the type of change we want to see.
- Embrace the idea of a CE and build a movement, not a mandate for change.
- Target sustainable intensification to bridge the gap between organic production and high input agriculture
- Federated Farmers, Beef + Lamb and other industry good bodies can advocate on our behalf to get government engaged with the above measures for us to transition to a CE.

## SUMMARY

"CE provides a reliable framework towards radically improving the present business model towards preventive and regenerative eco integrity, industrial development as well as increased wellbeing based on recovered environmental" (Ghisellini, 2016).

A real challenge is how we educate and train the next generation. With social media and the thirst for knowledge they could soon be leading the way and it could well be earlier generations who are left behind. Therefore, we need to be analysing our supply chains systematically for circularity potential.

A new generation of customers seem prepared to prefer access over ownership. When we analyse the early stages of a Circular Economy for agriculture there is little opportunity for this, however in the latter stages this changes.

The CE is not a niche-only solution, because the concept works and is economically viable and scalable for diverse products regardless of length of service life. However, it will take collaboration to scale it.

"More transformational change is needed from the corporate sector and from government given today's taxation, regulatory, and business climate. The mainstreaming phase will involve organising reverse-cycle markets, rethinking taxation, igniting innovation and entrepreneurship, stepping up education, and issuing a more suitable set of environmental guidelines and rules—especially with regards to properly accounting for externalities" (EMF 2012).

CE products could be more expensive, and therefore consumers need to be willing to pay more to achieve a better outcome. A change of mindset is required as many place convenience above anything else. There is a step change required to get over this hurdle. A sustainability calculator can be created that clearly shows the value of buying circular goods, i.e. "you have saved X amount over time and contributed to the environment in a positive way. We have a contract with customers to play the long game. *Within the next ten years not having an end-of-life solution may mean not having a marketable product (Parsons 2016).* 

It has become my belief that a CE creates an environment that can overturn the diminishing returns we are seeing over time in agriculture. However, it requires a mindset of innovation, regeneration, and prosperity to ensure success.

Being part of a CE will enable the agricultural sector to build social capital, and even get back some lost ground on the issue of social licence. We must have the vision to become trustworthy and reliable leaders in our sector, so regulators want to work with us. Not everything has to be perfect to get it across the line; it can evolve. Messaging could include 'this is what we are aiming for..."

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CE has the potential to create, hold and retain value in an ethical values-based way. There is a consensus that we need to add value to our products, but that value may not always be seen behind the farm gate. Complying with higher environmental, social and animal welfare standards could provide the opportunity for the CE to deliver better outcomes for all involved in the supply chain. CE delivers affirmative messaging around its entirety, creating trust in products. It requires the whole sector to be dedicated and remain on message by thinking about how to contribute to the greater good of the CE. We need to become good at disrupting ourselves to drive change and innovation. A CE model that is pointed to listen the consumer is highly desirable.

Challenges will be; How do we measure success? Is the circularity gap is reducing? We should see radical improvement of the recycling phase, and the sustainability bar should be raised. We are seeing change at a pace that we have never seen before. We must use it to create empathy with our consumers and users to help create a relationship with them that has longevity.

There are many attributes and principles in the CE and zero Carbon is a good measure of a products' realisation in a CE. Building an economy by design from the outset that is regenerative and transparent will ensure our production systems continue to lead the world.

It is time for change to introduce circularity efficient resource use and drastically reduce wastage throughout our production systems.

The innovation challenge of the century will be to foster prosperity in a world of finite resources. Coming up with answers to this challenge will create competitive advantage (EMF 2012).

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