

# Food Trends in the Sheep and Beef Sector

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## 2 EXECUTIVE SUMMARY

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With a national sheep flock that has halved in size over the past 25 years, yet maintained output the Sheep and Beef sector is bursting with innovators and top producers, full of **passion** and **enthusiasm** to improve profitability. A cornerstone that drives the profitability beyond the farm gate is the consumer's decisions on what, when and how they want to eat, and the quantity of consumers in these markets. The world population is growing, expected to be at 9.7 billion by 2050, how can we as an exporting nation capture this growth and turn it into revenue. **Developing nations** continue to **grow their consumption**, expected to increase 107mmt by 2020, whilst developed countries will grow by 19mmt in the same period. Population growth, urbanization, infrastructure development and shifting incomes could all lead to a genuine **livestock revolution**. This growth will not come without pressures and expectations on environmental and animal welfare fronts, with one hectare feeding 22 people with potatoes, contrastingly only 1 and 2 people for beef and lamb respectively.

Global sheep flocks have declined by 5.3% from 1990 to 2013, a hybrid model of "**New Market Orientation**", "**Shrink-To-Fit**" and "**The Knowledge Industry**" are needed to shape the future of the industry.

The opportunity is to be the **farmers market of the world**, the **world artesian butchery**, the **corner retailer** for the rest of the world. It's how we pitch **our image, our reputation** and market it in savvy modern ways which will dictate the success of our future. The market changes and evolves, sheep farming was historically based on wool production, with no one thinking about synthetic carpets. Evolution of meat markets have seen the size of product decrease from a traditional leg roast, to a ready to eat or snackable meal. These measurable changes alongside emotive purchasing decisions, such as **environmental sustainability** and **animal welfare** which have had CAG of 72% and 42% respectively. We must pay special consideration to these attributes in our marketing package, but more importantly these have got to be driven from a farm level, and farmers must walk the talk and be proud of what they are improving, rather than see it as a compliance protocol.

We must be engaged in **extracting the value** of products we are selling through **engaging with consumers**. Ian Proudfoot quotes that industry exports worth \$37 billion, are worth \$.25 trillion at the consumer's level. For every dollar collected here in New Zealand, there are six or seven dollars added by the time it reaches the consumer. The selling market will change, and be segregated by the big industrial players (e.g. JBS) and the niche high value operators, we can't afford to be lost in the middle.

We must be prepared for a **livestock revolution**, have **data** and **information** on our stock to be able to use that data, to create a **quantum shift in quality** of products sold. We are on the verge of a quantum shift in livestock consumption and production. Our prerequisite is to **embrace the opportunity** to tell the story of our production cycle, where it's from and what it is. We have a great story, we must be happy, upbeat and proud of what we are doing, sharing with New Zealand what we do, so a sales team of **4.5 million New Zealanders** can sell to the world. The red meat sector needs to **get savvy and upmarket**, exit the dinosaurs currently employed and employ a fresh team of city born, **innovative young millennials** to drive this message. They are the face of what our future consumers, let them sell it to their peers. It's imperative **to learn from the past to prepare for the future**, it's a new way of doing business, don't be frightened by change, but be excited by the challenge.

### 3 ACKNOWLEDGEMENTS

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## 4 INTRODUCTION

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The red meat industry is one of New Zealand's major export earners, created by a partnership between 14,000 commercial sheep, cattle and deer farms and some of the country's largest companies. The export of red meat and related products earns export revenue of \$NZ6.5 billion annually (*Meat Industry Association, 2017*). The red meat sector is commonly plagued with negative press, connotations and derogatory comments by many of its owners and suppliers, over time its profitability has been inconsistent and often unsatisfactory. In my opinion it is an industry comprised of mavericks, participants who continue to look after their own interests, avoiding collaboration and relationships to get the last cent from every deal on an individual day.

For the past decade, this industry disharmony had led to groups being formed such as the Meat Industry Action Group (MIAG) to create mega-mergers, consolidation and apparent efficiencies that would be generated by one major co-operative owned player in the market. Some would argue this had led to further disharmony, as members of these groups such as their two former chairmen, Keith Milne and John Gregan, have both shown their displeasure at meat-industry performance by converting their farms to dairying. Mr Milne has leased his 170ha Otautau property in Southland to a neighbouring dairy farmer and Mr Gregan is milking 750 cows on his farm near Waimate (august 2010).

This rapid change in land use since the early 2000's can be illustrated by Dairy NZ figures showing that in 2007-08 there were 729 dairy farms in Canterbury and 1041 in Otago-Southland, but a year later there were 846 in Canterbury and 1264 in Otago-Southland. Further to this, by 2014 in Canterbury it had grown to 1101 (*New Zealand Institute of Economic Research (NZIER), NZ Dairy Statistics, Dec, 2014*) and continued to 1179 in 2016.

This alongside a growing world population, ever in demand for more food, which ironically is expected to be produced in a more sustainable and environmentally friendly manner. With 7.3 billion people in 2015, expected to grow to 9.7 billion in 2050, and 50% of this growth to occur in Africa (*The Economist, 2015*), we need to be at the cusp of feeding this growth

### Livestock numbers at 30 June (million)

	2005	2015p	% CHANGE
Sheep	39.88	29.48	-26%
Beef Cattle	4.42	3.58	-19%
Dairy Cattle	5.09	6.37	+25%
Deer	1.71	0.91	-47%
Total Stock Units <sup>1</sup>	93.27	85.77	-8%

<sup>1</sup> Includes goats.

Source: Beef + Lamb New Zealand Economic Service, Statistics New Zealand

Figure 1: Livestock numbers 30 June 2014.

Despite this change in land use from Sheep and Beef to Dairy, the red meat sector has improved its on farm performance remarkably, with an increase lambing percentage alongside average lamb weight as shown in figure 2, indicates how the red meat sector has had to be nimble and progressive, shifting on farm production and efficiencies to remain competitive and economical.

### Livestock productivity

	2004-05	2014-15p
Ewe Lambing Percentage	119%	127%
Average Lamb Wt (kg)	17.5	18.1
Lamb (kg/ewe)	16.4	19.5
Wool (kg/head)	5.5	5.2
Average Steer Wt (kg)	318	302
Milk solids (kg/cow)	308	377

Source: Beef + Lamb New Zealand Economic Service, Livestock Improvement Corporation Ltd, DairyNZ

Figure 2: Livestock productivity 2004-05 to 2014-15

This increase in efficiency and productivity on farm is outstanding to see, but where do we go from here for further productivity gains, once this initial on farm leap in performance is achieved. There must be an echelon where marginal returns are no longer attainable. The red meat sector strategy identified three key areas of improvement for the sector:

#### 1. In-market coordination

- i. creating a strong brand position in premium markets
- ii. Acting with scale through greater coordination of exports in target markets

#### 2. Efficient and aligned procurement

- i. Critically there is a need to shift the focus of competition from the farm gate to offshore competitors.
- ii. Ensuring suppliers are receiving a fair and sustainable reward for their performance

- iii. Increasing transparency of information

### 3. Sector best practice

- i. Improving productivity at all stages in the supply chain
- ii. Enabling a 'single voice' to provide clear leadership
- iii. Creating a strategy coordination group able to support sector initiatives
- iv. Developing New Zealand's farming systems
- v. Selling the New Zealand story

The red meat sector has been, and continues to be critical to New Zealand's economy, the NZIER predicts that if the Red Meat Strategy is implemented it would result in an increase of 1.3% of GDP or \$3.4 billion of increased real value change by 2025.

Underlying this on farm growth is the market and the changes which are out of our control as producers. What is the forever changing consumer demanding? How do they want their food to look in 2025? Is it an organic guinea pig? Or a prime lamb from coastal New Zealand?

The underlying factor is that the product in which we produce must be demanded and sought after by the consumer. We must ensure that we are consumer led and not production driven. The essence of my report and study is to follow the evolution and journey of food trends in the global space and find out what implications these have on us as a primary producer on farm, to get an indication of whether the future is clear or murky.

I seek to gain some clarification on what consumers are looking for, how food trends are changing and what the market may look like heading into the future and how we can adapt and be nimble in our business to harness the opportunities that a changing consumer demographic desire.



## 5 AIMS AND OBJECTIVES

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### 5.1 AIMS

The aim of the process is to identify what the consumer, and main determinant of profit for our farm business is after in their shopping trolley and what their trends are moving forward into the future in relation to sheep and beef products.

### 5.2 OBJECTIVE

The objective of this proposal is to identify what consumers are seeking in the way of red meat protein, specifically their movements in trends in relation to lamb and beef. I want to see how much (if possible) they are changing relative to their demographics of meat consumption, and where any growth is occurring. I want to look at the growing population and where the changes are occurring within that population. We have heard several times about the overall growth in food produced, but ascertaining who the consumers are and whether they can afford to eat high end red meat proteins is essential.

We want to achieve these objectives through looking at several sets of data, which are valid, accurate and then allow us to form an opinion on where we see the demand and consumption for red meat. This will give us more objective indicators to look at our on-farm policies and decisions to see whether we are focusing our production and marketing resources in the right areas to maximize profit and return on capital invested.

We must look at the trends rationally, understand what these trends mean regarding future value and demand for red meat. We must identify weakness's and turn them into strengths and likewise identify threats and turn them into opportunities.

In completing our objective, we must look at several aspects in our research, but I have summarized these into three categories contained within my method:

- 1. The Past**
- 2. The Present**
- 3. The Future**

By looking at these three time frames, and attributing SMART (Specific, Measurable, Attainable, Realistic and Time-bound) methodology to the facts, we will be able to get a clear indication if our aim is achievable. From this we will be able to adjust our business to best harness the changing food trends and realize maximum potential from our property.

## 6 LITERATURE REVIEW

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Poor people everywhere are eating more animal products as their incomes rise above poverty level and as they become urbanized. By 2020, the share of developing countries in total world meat consumption will expand from 52% currently to 63%. *Delgado, International Food Policy Research Institute, Washington, D.C. 2006*. This has been cited by 445 people, so we must argue that its validity is accurate. By 2020, developing countries will consume 107 million metric tons (mmt) more meat and 177 mmt more milk than they did in 1996/1998, dwarfing developed-country increases of 19 mmt for meat and 32 mmt for milk. *Delgado, International Food Policy Research Institute, Washington, D.C. 2006*. The population growth, urbanization and income growth that powered the increase in meat and milk consumption are expected to continue well into the new millennium, creating a veritable Livestock Revolution. This could be similar to what we seen as the Green revolution which occurred in America mainly between the 1930's and 1960's; "the introduction of high yielding seeds and modern agricultural techniques in developing countries" *Collins English Dictionary, 2015*. This period caused a quantum shift in food production, the technology moving the world from a period of fear and starvation into abundant food and new generations whom don't know what it's like to have food scarcity.

In developing countries, people consumed an annual average in 1996–1998 of 25 kg/capita meat and 44 kg/capita milk, one-third the meat and one-fifth the milk consumed by people in developed countries. There is a strong positive relationship between the level of income and the consumption of animal protein, with the consumption of meat, milk and eggs increasing at the expense of staple foods. Because of the recent steep decline in prices, developing countries are embarking on higher meat consumption at much lower levels of gross domestic product than the industrialized countries did some 20-30 years ago. *World Health Organization, 2015*. The shift in this per region is indicated in Figure 3 below, which outlines that developing countries have had growth (kg meat consumed/year) of 250% compared with transitional countries at 9% and industrial countries at 44% between the period 1964-66 and 1997-99.

Urbanization stimulates improvements in infrastructure, including cold chains, which permit trade in perishable goods. Compared with the less diversified diets of the rural communities,

city dwellers have a varied diet rich in animal proteins and fats, and characterized by higher consumption of meat, poultry, milk and other dairy products. *World Health Organization, 2015.*

Livestock products not only provide high-value protein but are also important sources of a wide range of essential micronutrients, particularly minerals such as iron and zinc, and vitamins such as vitamin A.

There are environmental pressures with delivering a high range of protein based on an animal production system, it has been estimated that the number of people fed in a year per hectare ranges from 22 for potatoes and 19 for rice to 1 and 2, respectively, for beef and lamb. *Spedding CRW. The effect of dietary changes on agriculture. In: Lewis B, Assmann G, eds. The social and economic contexts of coronary prevention. London, Current Medical Literature, 1990.* Likewise, land and water requirements for meat production are likely to become a major concern, as the increasing demand for animal products results in more intensive livestock production systems. *Pimental D et al. Water resources: agriculture, the environment and society. Bioscience, 1997, 47:97-106.*

Region	Meat (kg per year)			Milk (kg per year)		
	1964 - 1966	1997 - 1999	2030	1964 - 1966	1997 - 1999	2030
World	24.2	36.4	45.3	73.9	78.1	89.5
Developing countries	10.2	25.5	36.7	28.0	44.6	65.8
Near East and North Africa	11.9	21.2	35.0	68.6	72.3	89.9
Sub-Saharan Africa <sup>a</sup>	9.9	9.4	13.4	28.5	29.1	33.8
Latin America and the Caribbean	31.7	53.8	76.6	80.1	110.2	139.8
East Asia	8.7	37.7	58.5	3.6	10.0	17.8
South Asia	3.9	5.3	11.7	37.0	67.5	106.9
Industrialized countries	61.5	88.2	100.1	185.5	212.2	221.0
Transition countries	42.5	46.2	60.7	156.6	159.1	178.7

Figure 3: Source - **Bruinsma J, ed.** World agriculture: towards 2015/2030. An FAO perspective. Rome, Food and Agriculture Organization of the United Nations/London, Earthscan, 2003.

Region	Projected growth of consumption 1997-2020 (%/y)	Total consumption		Percent of world total 2020 (%)	Per capita consumption	
		1997	2020		1997	2020
		(million metric tons)			(kg)	
Developed world						
Beef	0.5	30	34	40	23	25
Pork	0.4	36	39	33	28	29
Poultry	1.5	28	39	36	22	29
Meat	0.8	98	117	35	75	87
Milk	0.6	251	286	43	194	210
Developing world						
Beef	2.9	27	52	61	6	9
Pork	2.4	47	81	67	10	13
Poultry	3.9	29	70	64	7	11
Meat	3.0	111	217	65	25	36
Milk	2.9	194	375	57	43	62

Figure 4: Predicted food intake by 2020. Sources: Total and per capita consumption for 1997 are calculated from the United Nations Food and Agriculture Organization database (FAO), 2002 (11) and are 3-y moving averages centered on 1997. The 2020 projections are. Consumption is direct use as food, uncooked weight bone-in. Meat includes beef, pork, mutton and goat, and poultry. Milk is milk and milk products in liquid milk equivalents. Metric tons and kilograms are 3-y moving averages centered on the year shown. WANA is Western Asia and North Africa.

In the developing countries, 71% of the additions to meat consumption are from pork and poultry; in the developed countries, the comparable figure is 74%. Poultry consumption in developing countries is projected to grow at 3.9% per annum through 2020, followed by beef at 2.9% and pork at 2.4%. In the developed countries, poultry consumption is projected to grow at 1.5% per annum through 2020. Rosegrant, M. W., Agcaoili-Sombilla, M. & Perez, N. (1995). *Global Food Projections to 2020: Implications for Investment. 2020 Vision Discussion Paper No. 5. International Food Policy Research Institute, Washington, D.C.*

Looking to the future, IMPACT projects the expected change in real prices to 2020 relative to 1996/1998. The overall picture for 2020 is a noticeable real decline for wheat and rice (8 and 11%), a similar decline for milk (8%), more modest decreases for meats (3%) and stability or slight increases for feed grains (+11 and -4% for maize and soybeans, respectively). The results

lend support to the view that the main effect of the Livestock Revolution on agricultural prices is to stem the fall in feed grain prices, such that maize and soybeans will increase in value over time compared to rice and wheat, whose real prices will fall. *Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S. & Courbois, C. (1999) Livestock to 2020: The Next Food Revolution. Food, Agriculture, and the Environment Discussion Paper 28. International Food Policy Research Institute, Washington, D.C.*

What does all this mean moving into the future? What are our markets going to look like? How does this affect the overall agriculture sector, and particularly the red meat sector? There are clear trends and firm data which compel the case, *Bruinsma* found per capita consumption growth of 250% in developing nations between 64-66 and 97-99, while predicting further growth through to the year 2030 of 11.2, 11.9 and 14.5kg meat consumed per year in developing, industrialized and transition countries respectively. This data is backed up with the United Nations food and Agriculture database indicating annual growth of consumption of 2.9% in beef and 3% in meat in the developing world, while the developed world will continue to grow, although at a slower rate of 0.5% and 0.6% respectively for beef and meat.

From these findings, we can only form a hypothesis that there is a future for growth in the red meat sector, developing countries will continue to increase their protein consumption, and at a level of growth far superior to that of the developed world. How do we harness these opportunities for growth, turn them into increased revenue at the farm gate? How do we ensure that we are maximizing returns and profits from a farming class (sheep and beef) that has downsized significantly with the switch of conversions to dairy over the past 20 years? With a reduced industry do we still have critical mass, or at what level does critical mass become an issue to access growth opportunities? How do food consumption trends influence our farm systems and sustainability of the sheep and beef sector in New Zealand? Or is a global lamb strategy collectively using several nations all working together the pathway forward to increase awareness and demand?

## 7 METHOD

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To achieve a thorough and concise picture of the industry, we must look at where we have come from (The Past), where we are at now (The Present) and what direction we will be led by consumers (The Future). This framework will ensure we are rational in the change that has occurred and how these trends indicate how we shape our individual business into the future.

### 7.1 THE PAST

New Zealand was founded as a colony of Great Britain, and soon after sheep flocks were established from the 1840s onwards, it was not until the late 1860s that the natural increase of the sheep population exceeded the numbers required for flock replacement. The establishment of new flocks, and the needs of the local market for lamb and mutton drove this. Once the local market was saturated, it became apparent an export avenue was needed. The British demand for mutton and lamb had exceeded the local sheep flock's production, it was eminent to maintain British supplies and to bolster the failing pastoral economy of the colonies they had to find a way to export lamb.

Following on from some Australian experiences, meat canning works were established at Timaru, Oamaru, and Woodlands in Southland from about 1869. The combined capacity of these works was small and the quality of the product unreliable. It soon became clear that preservation by freezing was a more promising venture. After initial difficulties caused by the breakdown of the refrigerating plant, the ship Dunedin sailed on 15 February 1882, and arrived in London on 24 May, the cargo being in sound condition. By 1889 exports exceeded 1 million carcasses. *Alexander Lindsay Rae, M.AGR.SC.(N.Z.), PH.D.(IOWA), Professor of Sheep Husbandry, Massey University of Manawatu. 23 April 2009.*

Despite the national sheep flock having halved during the past 25 years to around 29 million, the amount of lamb exported to world markets has remained relatively stable dropping just 2% to 385,000 tones. *Beef and Lamb NZ Economic Service, 2017.* Over the last 10 years, the average lamb farm-gate price has increased by 60% in nominal terms and 29% in inflation-adjusted (real) terms. Part of the increase has been the price signal to produce heavier lambs

and carcass weights have increased 5% (+0.85 kg) over the decade. Over the same period, inflation in the price of farm inputs has been 23%. *Fraser, H. NZIPIM, 2017*. It is truly remarkable that although some of the best sheep and beef farmland has been lost to other uses, and sheep numbers declining 50% over the last 25 years, lamb production on a carcass weight basis has only dropped around 3%. To me this indicates the tenacity and stubbornness alongside innovation exhibited by New Zealand sheep and beef farmers. Since 1990 all countries apart from China which have relied on wool as a major part of income, have retracted, this coincides with a wool industry which has been in recession for 40 years. Some of these attributes will be highly influential in the future shaping of the industry. New Zealand only produces five per cent of world sheep meat production, although significantly it supplies over half of world lamb exports. With only 5% of the worlds production, are we actually a major player in the market? If we look at figure 5, we can see a massive reduction in sheep numbers across all nations excluding China. But discussing China’s sheep population with Keith Woodford and visiting China in 2012; the degradation of their grasslands from over grazing and lack of nutrient application, they will not be able to sustainably sustain such growth and the sheep flock will only recede again. Overall reduction of 5.3% doesn’t look significant, but we must consider this includes several countries whose sheep population is based around subsistence farming.

<i>million head</i>	1990	2013	Change (%)
Australia	173	75.5	-56.4%
China	113	150	24.6%
New Zealand	57.8	30.8	-46.7%
South Africa	29.5	25	-2.9%
United Kingdom	44	32.8	-16.0%
Argentina	28.9	12	-58.5%
Uruguay	25	8.2	-67.2%
Brazil	20	15*	-17.0%
Peru	12.2	9.3	-23.4%
<b>Total</b>	<b>1,206</b>	<b>1,139</b>	<b>-5.3%</b>

\* Include 11 million head of fleecelless sheep  
 Source: Poimena, DELTA, IWTO (2014).

Figure 5: World sheep change in numbers 1990-2013. Source: Pomina, delta, IWTO, 2014

Figure 6 below shows (although it is 1996 data) how we are efficient per labor unit, carry the highest stocking rate per hectare and overall output per sheep (excluding milk in Greece) is the highest.



		New Zealand	Australia	United Kingdom	Greece	Algeria
Per ewe	Wool	8	12	3	1	4
	Meat	17	12	19	12	8
	Milk	-	-	-	95	-
Per labour unit	Wool	11,000	13,000	1,200	80	1,000
	Meat	24,000	13,000	7,600	960	2,000
	Milk	-	-	-	7,600	-
Per ha	Wool	48	5	15	4	2
	Meat	102	5	95	48	5
	Milk	-	-	-	380	-
Structural data						
	ha/lab unit	230	2,750	80	20	420
	ewe/ha	6	0.4	5	4	0.6
	ewe/lab unit	1,400	1,100	400	80	250

Sources: elaborated with data from NZ Ministry of Agriculture and Fisheries, ABARE Farm Survey, Ministry of Agriculture Fisheries and Food "Agriculture in the United Kingdom", EUROSTAT, and author's estimates.

Figure 6: Technical performance of sheep husbandry in comparative format of selected countries (1996)

In the UK, per capita sheep meat consumption in 2000 was 6.6kg but by 2014 had declined to 4.6kg. Lamb is the highest priced meat protein followed by beef, piglet and then poultry. This price relativity pattern is the same across most markets.

**Average export payment to farmers \$ per head**

Year ended 30 September	LAMB <sup>1</sup>	MUTTON <sup>1</sup>	BEEF
2005	68.25	47.15	787.93
2006	56.21	40.44	782.38
2007	53.89	36.30	776.20
2008	58.55	34.08	809.56
2009	89.83	50.01	818.68
2010	81.30	56.43	810.88
2011	117.64	91.76	970.89
2012	113.58	94.57	1,016.46
2013	85.30	60.79	933.43
2014	100.04	76.43	909.11
2015	93.92	66.80	1,144.16

<sup>1</sup> Per head returns including skin and wool pull payments net of processing charges.  
Source: Beef + Lamb New Zealand Economic Service

Figure 7: The average price paid per head for Lamb, Mutton and Beef, 2005-2015. Source: Beef and Lamb economic service

Figure 7 indicates the change in value of the three red meat contributors over the past ten years. The fluctuation of lamb has been steady, with the peaks of 2011-2012 followed by a trough in 2013. Generally speaking, the mutton price follows the lamb price, as the confidence of farmers from higher lamb returns reflects in the price of breeding stock.

## 7.2 THE PRESENT

The current state of the demand profile regarding food trends can be outlined by several sets of data in this report. They show the current significance of the Red Meat (focus on sheep and beef for this report) sector to industry to New Zealand. Figure 8 below outlines a total value of \$6.4 billion FOB for the year ended 2015. The relative contributions to this are 47% from Lamb and Mutton, 49.5% from Beef and Bobby, while the balance (3.5%) is from goat and offal products.

**Meat exports Year ended 30 September 2015**

	TOTAL TONNES SW	\$ 000 FOB	\$ PER TONNE SW
Carcases	7,577	51,414	6,786
Cuts	247,206	1,966,772	7,956
Boneless	47,307	548,910	11,603
<b>LAMB</b>	<b>302,090</b>	<b>2,567,096</b>	<b>8,498</b>
Carcases	16,867	77,236	4,579
Cuts	54,403	250,101	4,597
Boneless	16,128	122,361	7,587
<b>MUTTON</b>	<b>87,397</b>	<b>449,698</b>	<b>5,145</b>
Carcases	41	360	8,716
Cuts	37,364	161,893	4,333
Boneless	370,010	2,884,769	7,796
<b>BEEF</b>	<b>407,415</b>	<b>3,047,022</b>	<b>7,479</b>
Carcases	856	2,905	3,394
Cuts	7,874	25,919	3,292
Boneless	15,708	108,713	6,921
<b>BOBBY</b>	<b>24,438</b>	<b>137,538</b>	<b>5,628</b>
<b>GOAT</b>	<b>966</b>	<b>6,908</b>	<b>7,149</b>
<b>OFFALS</b>	<b>69,234</b>	<b>224,057</b>	<b>3,236</b>
<b>TOTAL</b>	<b>891,540</b>	<b>6,432,319</b>	<b>7,215</b>

Source: Beef + Lamb New Zealand Economic Service, Statistics New Zealand

Figure 8: Meat exports to year end 30 September 2015.

Figure 9 highlights how the returns for market products are directly affected by characteristics out of our immediate control as a producer, processor or exporter in New Zealand. Our dependence on exporting which was outlined in section 7.1, has always created a risk. Figure 9 shows how the price index dropped for a period of 6-7 years, this was following on from the GFC (Global Financial Crisis) in 2007. Forces completely out of our control can over-ride any branding, marketing, relationships and quality assurance scheme, this highlights the fact that despite any systems, environmental footprint dynamics or value added criteria we put around our produce, if an overriding lack of capital or market supply and demand complications can override everything else.

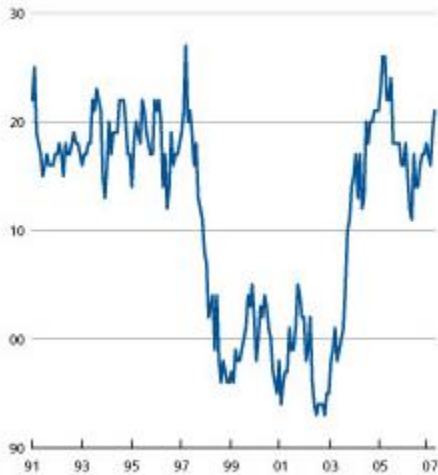


Figure 9: International price index for meat products, 1998-2000 = 100. Source FAO

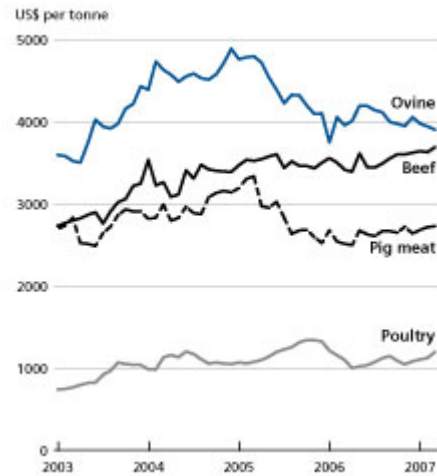


Figure 10: Prices of selected meat products, US\$/tonne. source FAO

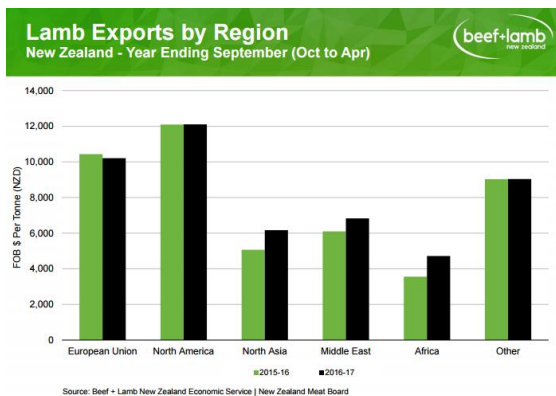


Figure 11: Lamb exports by region

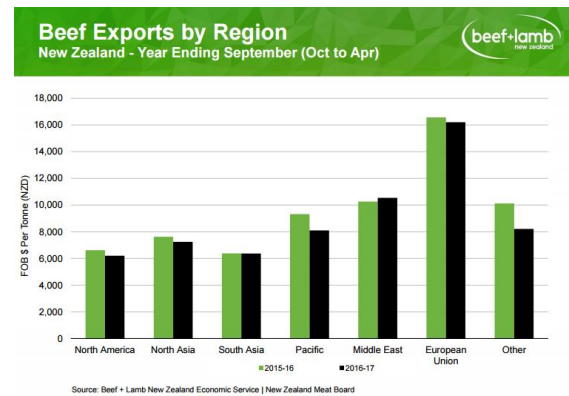


Figure 12: Beef exports by region

Figures 11 and 12 show the diversity of the present market sales of both lamb and beef respectively, showing the risk of the present state of the market break down and share. These are shown in the FOB \$ per tonne, so account for the value of the product in the market, and the actual return or “value” of the market. The European Union and North American markets, with \$10,000/t and \$12,000/t respectively are the high return options, showing their importance, taking the highest value cuts. Figure 12 shows once again the European Union is the highest value market, with the other six categories having similar lower value, driven by poorer cuts of beef and grinding beef.

**New Zealand meat consumption**  
Year ended September 2009

	KG PER CAPITA	%
Lamb	7.5	8%
Mutton	2.8	4%
Beef and Veal	28.0	31%
Poultry	31.3	35%
Pig meat	19.6	22%
<b>TOTAL</b>	<b>89.2</b>	<b>100%</b>

Source: Beef + Lamb New Zealand Economic Service, Poultry Industry Association of New Zealand, New Zealand Pork Industry

Figure 13: NZ Meat consumption year ended 2009

Figure 13 shows how little lamb and mutton New Zealanders eat domestically, beef at 28kg per capita is 31% of the protein diet. This in combination with figure 14 which shows the total production for the same calendar year, shows how much we must export as a nation. 98% of lamb products, and 91% of beef production. A huge reliance on outside markets, clearly showing we are exposed to international food trends, fads and the “latest craze”.

Total meat production on a bone-in-basis for the same period was:

	000 TONNES	% AVAILABLE FOR EXPORT <sup>1</sup>
Lamb	385.0	98%
Mutton	103.0	98%
Beef & Veal	695.0	91%
Pig meat	44.8	NA
Goat meat	1.3	72%
Venison	21.4	99%
<b>Total</b>	<b>1,250.5</b>	<b>90%</b>

<sup>1</sup> Some was consumed in New Zealand.

Source: Beef + Lamb New Zealand Economic Service, Statistics New Zealand, Deer Industry New Zealand

Figure 14: Meat production to year end 2009

Figure 15 shows where the percentage of meat is exported to what region on a volume basis, we outlined the value basis of this earlier in figures 11 and 12. The volume basis (Figure 15) allows us to see where the low value cuts are shifted, this is important as it adds a significant contribution to the overall value of the carcass to the producer. For example, we can see that 32% of volume of lamb (and 64% of mutton) is sent to North Asia, although this is the third largest by value, as they take the lower value cuts such as flaps for the hot pot. Likewise, with beef, the European Union takes only 2% of the volume, but it is the highest value market. This indicates how we must use this data collaboratively to get the best picture of what the actual present state of play is in the trends and demand of the current sector.

**Meat exports by region Year ended 30 September 2015 (%)**

% of total tonnes SW

	LAMB	MUTTON	BEEF & VEAL	OTHER <sup>1</sup>
Africa	1%	1%	0%	12%
European Union	41%	15%	2%	12%
Middle East	10%	2%	3%	14%
North America	10%	8%	58%	6%
North Asia	32%	64%	28%	29%
Pacific	2%	0%	2%	3%
South Asia	2%	8%	6%	13%
Other	2%	2%	1%	11%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

<sup>1</sup> Other meat and offal, variety meats, goat meat.

Source: Beef + Lamb New Zealand Economic Service, Statistics New Zealand

Figure 15: Meat exports by region on a volume basis

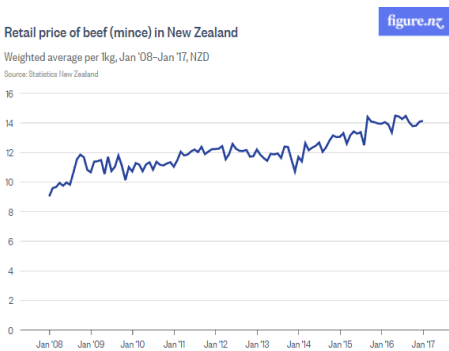


Figure 16: Retail price of beef mince in New Zealand 08-17



Figure 17: Retail prices in DOHA of ground mince. Source: Rebecca Hyde, May 2017

Figure 16 and 17 indicate the current distortion and confusion between farm gate prices, the retail price of beef, and the international market price. Figure 16 shows a slow and steady increase from 2008-17, in the range of \$4/kg over that time. Figure 17 was taken from a DOHA market, Egyptian Mince at \$34.35, Pakistani Mince \$17.75 and NZ mince \$9.35. This indicates the lack of value marketing and storytelling in the market place, is it happening at all under our current structure. I would question in my opinion that there is a lack of capturing the value we create in New Zealand, there are current demand trends, such as Paleo which we could argue follow the clean green pasture raised movement. But when we see NZ mince at the lowest price, it doesn't exactly scream value add and a premium product to me as a consumer.

Angus Pure is a branded Beef program owned 50 percent by the New Zealand Angus Association, the remaining 50 percent is privately owned. The objective of this program is to create a greater demand and awareness for Angus genetics throughout New Zealand, and obtain premiums for the commercial beef farmer and pedigree bull breeders

"Connecting with the conscientious consumer." Those involved in the food production industry are keenly aware that consumers are becoming increasingly discerning about the origins of their food. Of concern to consumers is the way 'meat is made'. This concept is reflected in several different signals and includes the consumers desire to understand the way their product was raised, what chemical and additives were used during the production process and the animal handling techniques employed during the lifespan. This is a good example of how collectively everyone can benefit by identifying market opportunity or trend in consumption behavior, and targeting a supply chain to exploit that area of demand. I believe through research and reading we are on the cusp of a quantum change in how meat is consumed and demanded. Proof of origin, rearing and quality assurance of paddock to plate of each individual animal, this leads us into the next point, 7.3, The Future.

### 7.3 THE FUTURE

Just what kind of meat will consumers be eating in 2017 and beyond? According to consumer research, more of it will be grass-fed and humanely raised. Recent research from Innova Market Insights lists "clean supreme" is its top food trend. Total transparency now incorporates the entire supply chain, as a clean label positioning becomes more holistic.

Clean supply chain claims include "environmentally friendly," which has shown a CAGR (compound annual growth rate) growth of 72% from 2011-2015 and "animal welfare," which has grown at 45% per year during this period," the company states. *Innova Market Insights*.

Research from Nielsen and the Wall Street Journal showed that sales of grass-fed products were \$400 million over a 52-week period ending July 2, 2016. That represents a 50.1% increase.

The International Dairy-Deli-Bakery Association shows that 83% of consumers are snacking daily, as opposed to 76% in 2014. While this is all food types, there can be a correlation between increased meat snacking and this taking a proportion of the snack based diet, so as snacking increases, meats proportion will increase alongside that growth. We must harness meat based products which are able to be snacked on such as Beef Jerky, due to the success of the Paleo and Atkins Diet, dried meat snacks have quickly become the snack of choice, Jacks Links exports 100 tonne/week (560,000 packets) from New Zealand.

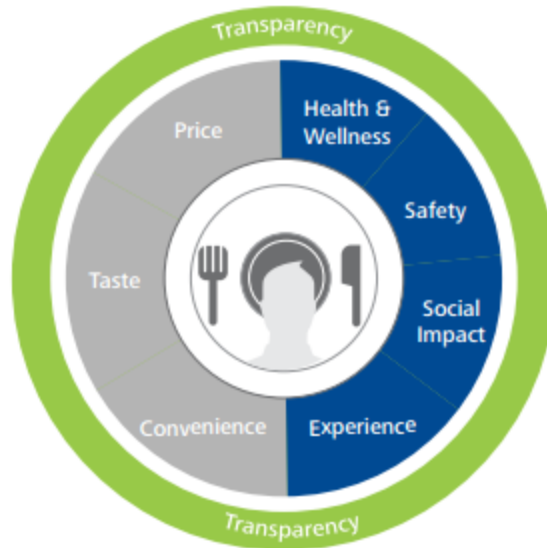
Global Ovine meat output is expected to reach 13.9 million tonnes in 2017, an increase of 2.1 percent from last year. For the most part, this growth is expected to be concentrated in Asia, which accounts for more than 60 percent of global production, particularly in China, the Islamic Republic of Iran and Pakistan. *FAO, 2017*. We must remember though that this growth includes subsistence farming, so some of that increase growth doesn't affect the tradable market conditions.

In the US, grass and pasture-fed products are growing by 30% - and consumers are paying a premium for them. Fresh Box Farms is disrupting the leafy green market by reducing the supply chain, growing greens organically, and delivering fresh within 24 hours of harvest – its products are always in season, always fresh, and fully traceable. *Callaghan Innovation, 2017*. Will this be the next movement, setting the expectation of picked today, delivered tomorrow? As consumer expectations move and shift we must as a sector or industry maintain nimbleness and activity and move with the change.

The Deloitte study of 'shifting consumer food value equation' revealed that transparency is an overarching driver and that health and wellbeing, experience, social impact and safety are the things consumers care about as much, if not more than taste and convenience.

The expenditure elasticity for poultry is estimated to be close to zero while meat has a more elastic expenditure effect (elasticity  $\approx 1$ ). This is much higher than was estimated by Court (1967). Meat (red) appears to have 'carved out' a premium niche at the expense of poultry. Poultry now appears to be a "basic need" meat with its marginal budget share falling short of its average budget share. *Khaled et al. 2004*.

Figure 18 shows the drivers of the consumer, Price, Taste and Convenience (tangible and rationale decision drivers) make up 50% of their decision making. Health, Safety, Social Impact and Experience make up the other 50%, these are all emotive and non-tangible aspects, but as you can see in the diagram, they influence half of the consumer's decision making.



Source: Deloitte Food Value Equation Survey 2015, Deloitte Analysis

Figure 18: The Consumer Value Driver Plate

“The future is in Asia”; we have read it, heard it, and the processors have drummed it into everyone whether it be meat or milk. The market is growing, but is it the only market we need to target? I suggest no, we risk having the blinkers on and missing opportunities in other markets, if we over emphasize Asia. Asia as a term can be flawed, A flight from Beijing to Tokyo is 3 hours, and its chalk and cheese, the culture is diverse between regions so we must not group the market as one. In East and Southeast Asia, where income grew at 4–8% per year between the early 1980s and 1998, population at 2–3% per year and urbanization at 4–6% per year, meat consumption grew between 4 and 8% per year. This is the same number as incomes changed, I don’t think this is a co-incidence.

For the 1996/1998–2020 period, IMPACT projects developing country aggregate consumption growth rates of meat and milk separately to be 3.0 and 2.9%/y, respectively, compared to 0.8 and 0.6%, respectively, in the developed countries.

If current trends continue, by 2050, caloric demand will increase by 70 percent, and crop demand for human consumption and animal feed will increase by at least 100 percent. *Goedde et al. 2015.*



Figure 19 shows the CAGR (Compounding annual Growth Rate) of clean supply trends and how they influence the decision process of farmers, at 45% and 72% respectively we must have Animal Welfare and Environmentally friendly practices at the forefront of our mind.

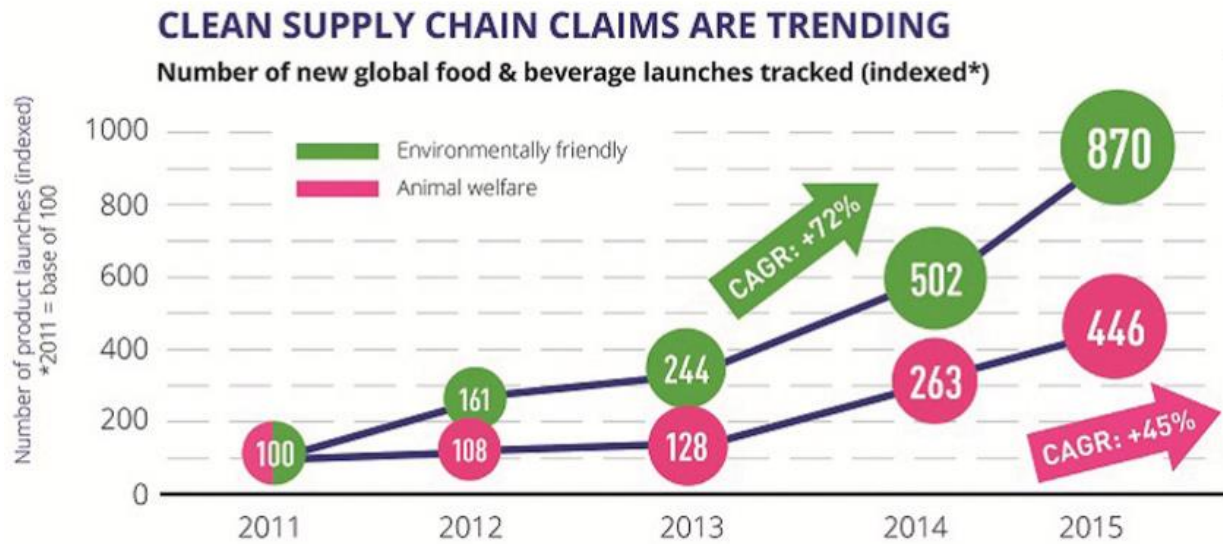


Figure 19: Innova Market Insights, 2006

Figure 20 shows how the disruptive nature of media can influence consumers, this is a Mother’s Day advertisement saying to support Mother’s Day, don’t drink milk. “mothers against dairy” is an organization set up by mothers who are against dairy farming and its practices. They claim practices being non-sustainable, exploitive on both environmental and animal welfare fronts. Doesn’t this show the level of disruptive media and how emotions and non-scientifically backed reasons can influence a group of consumers, and how it links to the compounding growth in figure 19.



Figure 20: Source: Globe and Mail, Canada, May 2017

The USDA projects that production of beef and pork will expand steadily between 2016 and 2025. Growing demand for premium New Zealand lamb cuts with affluent consumer groups in select international markets as well as increasing the value of other lamb cuts, offal, and lamb skins.

*The Journal* in December 2014 Sir Graeme Harrison (Chairman of ANZCO Foods Ltd) succinctly summed up the situation as follows, 'Important elements for success require developing a credible provenance story based on deep integrity systems, which are linked to specific consumers, often via a partnership value chain. For this to grow, true partnerships will be vital between farmers, processors and other links in the value-added chain. The trader and transactional relationship which has characterized the New Zealand meat industry to date will need to change.'

## 8 ANALYSIS AND RESULTS

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Through the previous sections, we have identified some key trends and threads of where the food trends for red meat are predicted to head. The essence of our results:

- National sheep flock has halved to 29 million over the past 25 years, the level of lamb exported has dropped by only 2% to 385,000 tonnes. *Beef and Lamb economic service 2017*.
- NZ lamb price has increased by 29% in real terms over the past 10 years.
- Developing countries will continue to grow, from 52% to 63% by 2020 in meat consumption, and addition of 107 mmt (million metric tonnes). With  $\frac{3}{4}$ 's of this growth coming from monogastric producers, there will be an imminent pressure on feed sources to grow these animals, namely corn, wheat and soybeans.
- Developed countries will increase by 19 mmt in the same time.

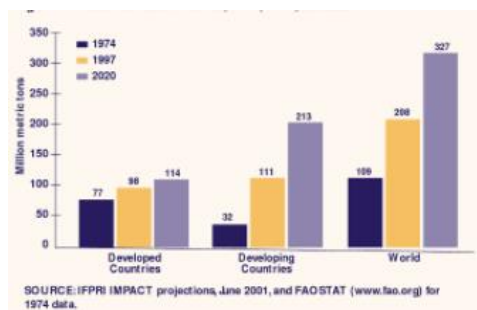


Figure 21: Meat demands globally (1997), and increase to 2020. Rosegrant et. al. 2001.

- Population growth, urbanization and income growth could lead to a genuine “livestock revolution”, comparable with the Green Revolution seen in America in the 1930’s and 1960’s. This would lead to a quantum shift in food production.
- Developing countries have had growth of meat consumed/year of 250% between 1964-66 and 97-99.
- Urbanization will improve infrastructure improvements and cold chains to facilitate to the distribution of perishable products.
- Environmental and Animal welfare pressures are extremely prevalent, one hectare will feed 22 people with potatoes, 19 for rice and 1 and 2 respectively for beef and lamb.

- Switching of proteins is an issue in developed countries, the UK has declined in consumption from 6.6kg to 4.6kg/head of lamb between 2000 and 2014.
- Global sheep flocks have decreased from 1990 to 2013, a total change of -5.3%, +24.6% in China, but notably, -56% in Australia, -47% in New Zealand and -58% and -67% in Argentina and Uruguay respectively.

Meat The Future identified four scenarios, scenarios which create great discussion and debate points, they aren't necessarily areas of direction to take, but indicate discussion points on where the industry will go, it's up to how we harness red meat trends to ensure we go in the right direction.

- **Slippery slope:** Failure to address key opportunities and challenges leads to a substantial reduction in the sector's size and scope. Profits not only retain their cyclical variations, but become systemically lower.
- **A new market orientation:** The sector can diversify into new markets and overcome the opportunities identified. This describes a vibrant sector that places New Zealand at the forefront of high-quality, sustainably produced meat and rewards farmers for meeting consumer expectations in both traditional and new markets. The Future the production challenges of greater year-round supply and product specification. Improved economies of scale lead to successful processor consolidation.
- **Shrink-to-fit:** The sector reduces in size, but can stabilize due to increased returns from reduced supply. Competitive advantages are achieved in areas such as environmental performance and the sector can meet exacting consumer requirements in traditional markets.
- **The knowledge industry:** The sector makes a step-change in innovation investment, allowing for greater product and process innovation. Strategic alliances are increasingly entered with customers, allowing greater transmission of customer requirements through the value chain. Increased capabilities and intellectual property from research and development allows for the internationalization of the meat sector and associated industries.

## 9 DISCUSSION

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We have the opportunity to be the farmers market of the world. But in being the farmers of the world, we must tell that story, live that story. In telling the story, we have an obligation to remember that marketing is only an amplifier of a story or a message, so the message must be clear from the beginning. Farmers are not traditionally good at conveying a message to the urban public, as an industry whole we need to get a team of savvy urban people on board and convey the message better, with empathy and understanding to ensure that

Forty years ago, sheep farming was based on wool production, and no one thought about buying synthetic carpets. Look at us now, the author as a sheep farmer has recently laid synthetic carpet through his house. The markets move and change, we can only base our decisions on information presented and researched. This illustrates how markets can and will change, this is evident in lamb, which was a traditional roast in the UK, but the meal size has continually decreased in size, become quicker to prepare, been more convenient heat and eat and now is heading towards a snack type experience.

Markets are highly influenced by the economic performance of the consumption nations. The GFC in 1997 dropped the international meat price index by 30 points, a direct correlation of dropping of incomes and a shift back to staple diets of cheaper foods. This poses a significant risk that on farm revenues are dictated by incomes and food trends, which essentially can be out of control of the consumers and producers.

New Zealand produces 5% of the worlds lamb, are we a major player in the market? Yes, we export 98% of our lamb and 91% of our beef and veal, but as a percentage of total production, we are genuinely minor. This puts us in perspective of what is happening globally, as such a small player it gives us the opportunity to create and tell a story, be value added and target the top end of the market.

“Clean supreme” and the “Artisanal Butcher Shops” are growing in popularity, consumers wanting to reconnect with the person over the counter, to hear, feel and taste the story of the meat they consume. These encompass environmentally friendly and animal welfare friendly

production, a growing trend with CAG of 72% and 45% respectively. In the US grass fed products are experiencing growth by 30%, and consumers are paying a premium for them.

Snack food trends are growing, making sure meat is part of this growth is important, as a proportion of high growth is growing the overall market sector.

How much are the distractions that the left-wing parties and consumers in the ever changing and evolving world going to have as an influence on consumption. *Wetshoek et al* found the following four highlights from their study, all in my opinion which indicate a slant away from meat consumption for health and environmental reasons. Although the health reasons are not substantiated, drawing several assumptions on a link to saturated fats being the prime driver of CVD (cardio vascular disease). The article also lacked citing's to other studies to validate the data in their study report, is this disruptive media information.

1. Halving meat and dairy lowers saturated fat intake to the maximum recommended level.
2. Lower livestock production lead to 40% lower nitrogen emissions.
3. Lower livestock production lead to 25–40% lower greenhouse gas emissions.
4. Lower meat and dairy consumption would make the EU an exporter of cereals.

- *Wetshoek et al, 2014.*

Disruptive media, focusing on people's morals and ethics will continue to play a major part in the contentious consumer's decision. How the producers and marketers react to this will dictate how effective the disturbances are. This will be another distraction in the already disruptive market place. This will further complicate purchasing decisions amongst competing proteins (lamb v chicken) and product lines within the same protein (SFF lamb and Atkins ranch lamb).

Synthetic foods could be a threat, but as Nuffield Scholar Richard Fowler found, they have been around since Winston Churchill quoted them in 1932. Its more about being aware and ensuring we strategically draw a line in the sand to ensure our value add proposition outweighs any negative environmental or health arguments against red meat.

## 10 CONCLUSIONS

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There is a clear desire for transparency in the context of a technological culture where feedback moves fast, access to information is easy, and open sources are expected. Facebook, Instagram, You Tube and Twitter are all real time, everyone has a camera, an 'opinion' and will happily transpire that to the global community with the touch of a screen. This attitude relates to the old saying, "it takes ten good experiences to tell one person, yet 1 poor experience to tell 100". The influence of the consumer has never been more dominant, more relevant and more influential on the products we produce. Farmers must be ever weary, and not underestimate the possibility of social media shutting down your operation.

We must realize that 60% of household in New Zealand and Australia have 2 or less people, and therefore want more convenient eating. The average time to prepare a meal has dropped from 60 minutes in 1980, to 45 minutes in 1990, to 32 minutes in 2013.

We must think is your product snackable, if not, how can we make it snackable? Watch as the food trend moves away from three main meals per day. The industry wants consumers to go out and eat big chunks of meat, but they don't want that, they want a quick convenient accessible product.

The key focus for producers in New Zealand should be not about ramping up production, but rather engaging with consumers to get the most value out of products already being produced. Ian Proudfoot quotes that primary industry exports are worth \$37 billion, whilst they are worth \$0.25 trillion at the consumer's level. For every dollar, we collect here in New Zealand, there are six or seven dollars added to that by the time the product reaches the consumer.

Markets will become more volatile; the climate, livestock disease events, food safety disasters, economic downturns and political instability will all effect the environment we trade in, and on a more regular basis.

We must encourage a new way of thinking in business, without dropping what has worked in the past. We must be efficient on farm, this will create more money, to sell at the best price, and allow for long term deals and relationships as the producer isn't fighting for the last cent

every time. We must do this with focus and discipline, always asking the customer and consumer what they want and when. We must keep away from industrial chicken and fish production, as we will struggle to compete on feed efficiency, and be blown out of the water by industrial production giants.

Product	Feed Efficiency (kg feed:Kg Meat)
Fish	1:1
Chicken	1.5:1
Pork	3.5:1
Beef	8:1

Figure 22: Feed efficiency maxima for conversion of Dry Matter to Meat. Source Prof. D. Hughes 2012

Red meat producers need to be ahead of the curve, be ready to adapt and change, data will allow them to change (e.g. Have the data of high marbling sires and cows in a herd) so that these animals can be identified as soon as possible to breed from. When the time is apparent to start to move, they must move first, move fast and move bold.

We must ensure the story is correct, “our lamb is natural, free range and herb fed, happy in open pastures”. The market will move to fewer, larger more sophisticated players, alongside niche high end high value lifestyle operators, the middle ground will become no man’s land between these two spectrums. The opportunity is intense to lift our game, sell our story and meet the growing red meat consumption trends.

The overall market is growing, alongside the wealth of the middle to top end consumers. This bodes well for the sheep and beef industry, who defragments the carcass to sell into different markets. The growth in developing countries will be able to consume to cheaper cuts whilst the increased demand will lift the value of them. Concurrently growth in consumer wealth, and the size of this sector will continue to demand the high value cuts, and subsequently grow the value of the entire carcass, and return to the New Zealand producer.



## 11 RECOMMENDATIONS

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Following the analysis of this report, some clear recommendations can be drawn upon:

1. Be prepared for a livestock revolution – a quantum shift in livestock consumption and production to meet this shift.
2. Embrace the opportunity to tell the story of our production cycle, where it's from and what it is. We have a great story, but are just poor at telling it, as farmers we like to exhibit a poor, moneyless rugged look. We must be happy, upbeat and proud of what we are doing, and not be shy to tell the world what a great job we do. Tell New Zealand what we do, and as a sales team of 4.5 million, lets sell New Zealand. Employ a team of city born, innovative young millennials to drive this message. They are the face of what our future consumers, let them sell it to their peers. We are the artesian butcher for the world.
3. Combat challenges on animal welfare and environmental footprints with facts. We need to again have millennials in front of that campaign, collectively showing the good story, but connecting with consumers.
4. We need to be public relation savvy, not the I can do anything from plumbing to crutching type of farmer, we need media experts. Use social media as a propaganda vehicle to achieve the great stories and messages of our 4.5 million people brand.
5. Adapt to meet new trends, quicker to prepare meals, smaller portions, heat and eat, ready to cook, snackable products. Don't be left on the shelf to expire like a kodak camera.
6. When one competitor zigs, you must zag. Learn from the past to prepare for the future, it's a new way of doing business, don't be frightened by change, but be excited by the challenge.
7. Collect data as quantifiable information for decisions, the data will dictate and allow us to shift as quickly as possible when the consumer demands something new.

8. Urbanization will improve to facilitate cold chains in developing markets – make sure we are able to assist these markets in developing the cold chains, so we are the first cab off the boat in delivering into them.
9. Meat the Future identified four directions the industry could go, we need to avoid the “slippery slope”, and create a hybrid direction which encompasses “A New Market Orientation”, “Shrink to Fit” and “The Knowledge Industry”.
10. Developing and Developed countries continue to grow – ensure that red meat options are in front of mind for these countries. Developing countries will not have the economic power to feed the increasing growth in consumption with high value cuts, but will be a vital purchaser of low value carcass cuts.

## 12 NEXT STEPS

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The investigation and analysis for this report has been somewhat insightful for our business. It has provided a good opportunity to analyze our markets, identify opportunities within the consumer trends which dictate the future direction of our operation.

Like any venture which sells product into a market, you can only work with what information you know, so without doing market analysis you are essentially flying blind.

We will sit on this information, reflect and review it. Understand what it means for the direction of our business going forward and how we can adapt and be more agile into the future to increase profitability by ensuring we are following consumer trends.

This project has allowed me to have confidence in our industry from the consumer demand perspective. Looking at the supply chain from that point back to us as a producer which we need to think how through information sharing we can add value to New Zealand Agribusiness.

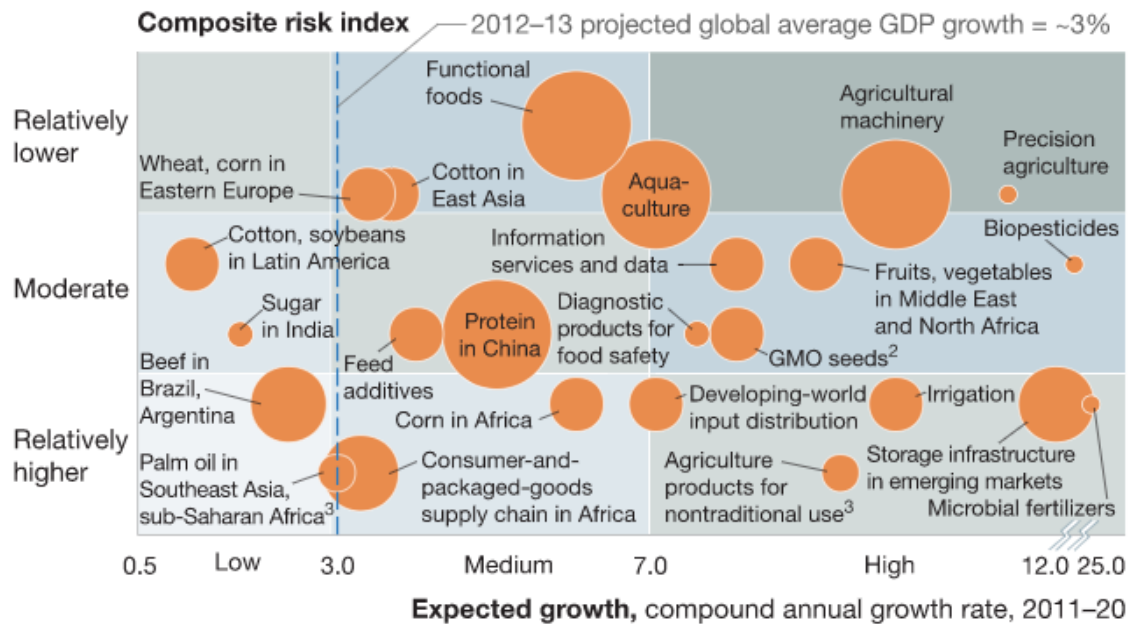
## 13 REFERENCES

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- Innova Market Insights, 2006
- Global and Regional food consumption patterns and trends, World Health Organisation, 14<sup>th</sup> June 2016.
- Beef and Lamb New Zealand, Compendium of New Zealand Farm Facts, 40<sup>th</sup> Edition, 2016.
- <http://www.mia.co.nz>
- Meat Industry Association, Unlocking Value-meat industry briefing, 2014.
- Trends in Meat consumption in the USA, C.R. Daniell. 12 November 2010.
- Deloitte, Beef and Lamb New Zealand, Meat Industry Association of New Zealand, Red Meat Strategy Sector Report, March, 2011.
- Will It Have Legs? An Investigation into Synthetic Food and the Implications for NZ Agriculture, Fowler, R. 2016.
- Meat: The Future, Ministry of Agriculture and Forestry, 2009
- Meat In Focus – A Closer look at a Key New Zealand Industry, November 2009.
- The perspective of the world sheep market and its influence on future productive systems and trends, J.P. Boutonnet, Asian-Aus. J. Anim. Sci. Vol. 12, No. 7, 1123-1128 (1999)
- Rising Consumption of Meat and Milk in Developing Countries Has Created a New Food Revolution. Delgalo, 2003.
- Global sheep flock – what happened and where to now? Roberto Cardellino, DELTA Consultants (Uruguay). July 16, 2015
- <http://www.jacklinks.co.nz/company.php>
- <http://www.callaghaninnovation.govt.nz>
- <http://www.aims2001.co.uk/>
- <http://freshboxfarms.com/>
- <https://mothersagainstdairy.org/>
- Unlocking Value, Meat Industry Association, Richie and Holding. 2014.

- Capitalizing on the shifting consumer food value equation, Deloitte. 2016
- 2020 Global Food Outlook. Rosegrant, Paisner, Meijer, Witcover. August 2001.
- Pursuing the Global Opportunity in food and Agribusiness, Goedde, Horii, DSanghvi. July, 2015.
- Rising Consumption of Meat and Milk in Developing Countries Has Created a New Food Revolution, Christopher L. Delgado. 2006
- Food choices, health and environment: Effects of cutting Europe's meat and dairy intake, *Westhoek et al.* 26 March 2014.
- Red Meat Sector Strategy Report, Deloitte. May 2011.
- Fragmenting Food Markets: Some New Zealand evidence from a Two-Stage Budget Model, Khaled, McWha, Lattimore. 6<sup>th</sup> March 2004
- meat: The future 2009 Opportunities and Challenges for the New Zealand Sheep Meat and Beef Sector over the next 10 to 15 Years, Ministry of Agriculture and Fisheries. 2009.
- [https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/5945/Miller\\_2007.pdf?sequence=1&isAllowed=y](https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/5945/Miller_2007.pdf?sequence=1&isAllowed=y) ORA LAMB
- [https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/5877/Argyle\\_2006.pdf?sequence=1&isAllowed=y](https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/5877/Argyle_2006.pdf?sequence=1&isAllowed=y) efficient bull farming systems – no relevance to project but good info
- [https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/5784/Allan\\_2012.pdf?sequence=1&isAllowed=y](https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/5784/Allan_2012.pdf?sequence=1&isAllowed=y) angus branding strategy
- <https://www.cambridge.org/core/journals/public-health-nutrition/article/trends-in-meat-consumption-in-the-usa/AF54FD0E4A321394C09BC8087640AA0C/core-reader>  
**good article**
- <http://jn.nutrition.org/content/133/11/3907S.full>
- <http://www.economist.com/blogs/graphicdetail/2015/08/daily-chart-growth-areas>

# 14 APPENDICES



<sup>1</sup>Growth segments (horizontal axis) are low, <3%; medium, 3–7%; high, >7%. Risk (vertical axis) is measured as the sum of scores across 4 types of risk assessed: execution, geopolitical, regulatory and market, and technological.

<sup>2</sup>Genetically modified organism (GMO) seeds have high regulatory risk in some regions and high acceptance in others (eg, North America). Palm oil has higher risk in sub-Saharan Africa, where most growth will come.

<sup>3</sup>Agriculture products used for construction and pharmaceuticals (not cotton, energy, food, tobacco, or wood).

Source: *Ag2020: Growth and investment opportunities in food and agribusiness*, a joint report from McKinsey and Paine + Partners, 2013

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