KELLOGG
RURAL LEADERSHIP
PROGRAMME

Analysis of Triplet Lamb Survivability in New Zealand Sheep Systems

A study of current practices, perceptions, and opportunities

Kellogg Rural Leadership Programme
Course 55 2026

Julia Hardwick-Smith

I wish to thank the Kellogg Programme Investing Partners for their continued support.

Disclaimer

In submitting this report, the Kellogg Scholar has agreed to the publication of this material in its submitted form.

This report is a product of the learning journey taken by participants during the Kellogg Rural Leadership Programme, with the purpose of incorporating and developing tools and skills around research, critical analysis, network generation, synthesis and applying recommendations to a topic of their choice. The report also provides the background for a presentation made to colleagues and industry on the topic in the final phase of the Programme.

Scholars are encouraged to present their report findings in a style and structure that ensures accessibility and uptake by their target audience.

This publication has been produced by the scholar in good faith on the basis of information available at the date of publication. On occasions, data, information, and sources may be hidden or protected to ensure confidentially and that individuals and organisations cannot be identified.

Readers are responsible for assessing the relevance and accuracy of the content of this publication & the Programme or the scholar cannot be liable for any costs incurred or arising by reason of any person using or relying solely on the information in this publication.

Scholar contact details may be obtained through the New Zealand Rural Leadership Trust for media, speaking and research purposes.

Table of Contents

List of Equations, Figures and Tables

1. Executive Summary

The degree of lamb survivability in New Zealand is likely to become a consideration for consumers as they expect better quality product. This must equate to a balanced triple bottom line (people, planet and profit) for farming businesses. New Zealand has lower survivability outcomes for lambs than other parts of the world. The widely broadcast image of New Zealand lambs farmed on picturesque green hills, could be undercut by the animal welfare issue of preventable lamb deaths. Triplet lambs and greater birth ranks are the most at risk of not surviving to the point of becoming a product of value, compared to their single and twin counterparts.

This report therefore explores:

- Whether farmers believe there is an issue with lamb wastage in New Zealand and how it affects them personally.
- The strategies that are being used in New Zealand to improve triplet lamb survivability and their perceived effectiveness.
- A deeper dive into the opportunities that using artificial rearing of lambs and/or having ewes lamb indoors may provide, and what the interest is around using these strategies.
- What the implementation gap is for farmers to adopt using artificial rearing of lambs and/or having ewes lamb indoors as a strategy to improve triplet lamb survivability.

This study is important as it provides insight into the level of acceptance from the farmers point of view of lamb survivability. What farmers are currently doing and willing to do so that wider industry can gain insight into where sheep farmers are at in the lamb survivability story. Lastly, how industry groups might be able to support them better moving forward.

The method to complete this study included carrying out a literature review covering general lamb survivability, trend of increased number of triplets, factors affecting survivability of triplets, and strategies to improve triplet survivability. A survey was then written with 30 questions investigating the bullet points above. This was distributed electronically to farmers, mostly through email and social media. Results were analysed quantitively and qualitatively with Likert scale charts and graphs to better communicate the results.

Two interviews were conducted to present two different cases studies. They showcase two New Zealand farms, one using artificial rearing at scale, and the other lambing ewes indoors as well as using fostering strategies to improve the survivability outcomes of their triplet lambs.

The key findings from this study are:

- 84% of famers agree that lamb wastage is an issue for New Zealand farmers, 28% of them feel it negatively impacts their mental health and 38% are not satisfied with their triplet survival.
- The strategies farmers are mostly using to improve triplet survivability are having fewer ewes per paddock than twin bearing ewes, lambing beats, having shelter within a lambing paddock, and using smaller paddocks for triplet bearing ewes to lamb in than twins.
- However, farmers perceived artificially rearing of one triplet lamb, and having ewes lamb indoors as the most effective strategies to improve triplet lamb survivability.
- Almost half of famers surveyed are interested in adopting an artificial rearing system, and a quarter are interested in having ewes lamb indoors to improve triplet lamb survivability.
- Farmers want more information about the revenue, costs, having the infrastructure and seeing the system in action to persuade them to adopt either or both of these strategies.

The recommendations concluded from this study include:

- Lamb survivability benchmarks and KPIs to be formed by industry professionals for farmers to benchmark themselves against to encourage improvement of a farm's triple bottom line and encourage tracking of their lamb survivability trends.
- Farmer resources to be created by industry professionals to give farmers actionable, relevant and easily understood information on how to incorporate artificial rearing or indoor lambing into their sheep farming systems.
- Genetic improvement of commercial sheep flock's survivability merit should be measured to determine the impact of nProve Tracker and whether genetic survivability gain is being made.

2. Acknowledgements

I would like to thank New Zealand Rural Leaders and the Kellogg Rural Leadership Programme team for putting together a fantastic course and group of participants.

To K55, you are all amazing, thank you for being inspiring, supportive and just a great bunch of people to be amongst.

Thank you to Beef + Lamb New Zealand for awarding me a Rural Advancement Scholarship. This funding has been extremely valuable in allowing me to complete the programme. Thank you to the staff who have also helped me with aspects of putting this project together, including supplying the cover image.

Thank you to Silver Fern Farms for awarding me a Robbie Burnside Governance Scholarship. I really appreciate the contribution to the cost of the course and the confidence it has given me going forward.

Thank you to all the farmers and other rural professionals that completed my survey, I know surveys are not a top priority for you in your own lives.

Thank you to the farmers that allowed me to interview you to gather more insight into triplet survivability, and also those farmers willing to have chats about triplet survivability generally.

And of course thank you to my family, and supportive partner Zach, for your endless patience while I have been away from home, and hours spent in front of my laptop to complete the Kellogg Rural Leadership Programme and Project.

3. Introduction

The total food and fibre sector of New Zealand contributed 5.3% to the gross domestic product (GDP) for the year ending March 2024 (Ministry for Primary Industries, 2025). Sheep meat exports were valued at $4.5 billion in the year ending October 2025 (StatsNZ, 2025). That includes 95% of total sheep meat product being exported (B+LNZ, n.d.).

In order to maintain this access to the international market, New Zealand must maintain its social licence to farm.

An issue that threatens this licence is the degree of triplet survivability. "High lamb mortality may be considered by consumers and society in general, as both an animal welfare and ethical issue" (Mellor & Stafford, 2004; Ferguson et al., 2014; Dwyer et al., 2016).

Sheep meat is now worth more than it has been in the past, and over time an increase in the number of lambs per ewe has become more favourable. This selection pressure has resulted in an increase in triplet bearing ewes (Amer et al., 1999 and Erichsen et al., 2024).

Dwyer et al. (2016) reports that lamb mortality across the sheep flock worldwide is 15% on average, (Figure 1). This is an average across all lambs, and triplet mortality will be higher.

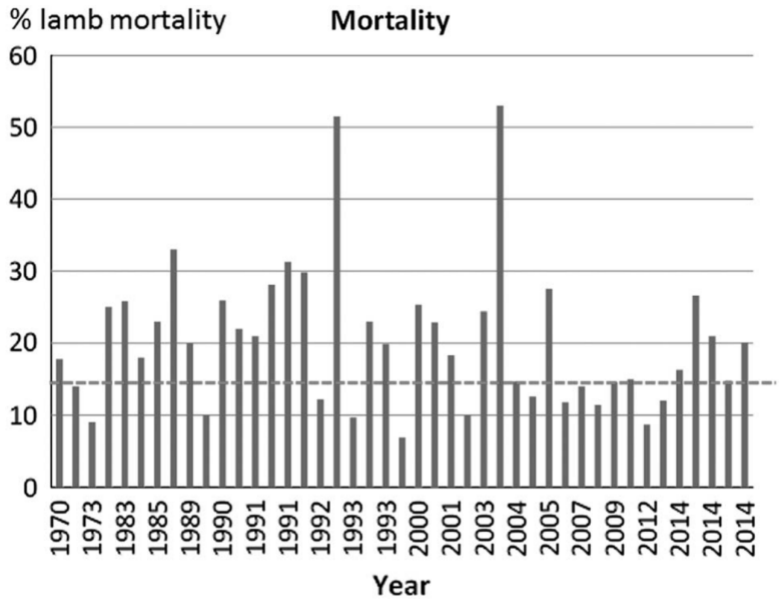


Figure 1. Average percentage lamb mortality from 1970 to 2014 worldwide. The dotted line is the average mortality over the years of 15% (Dwyer et al., 2016).

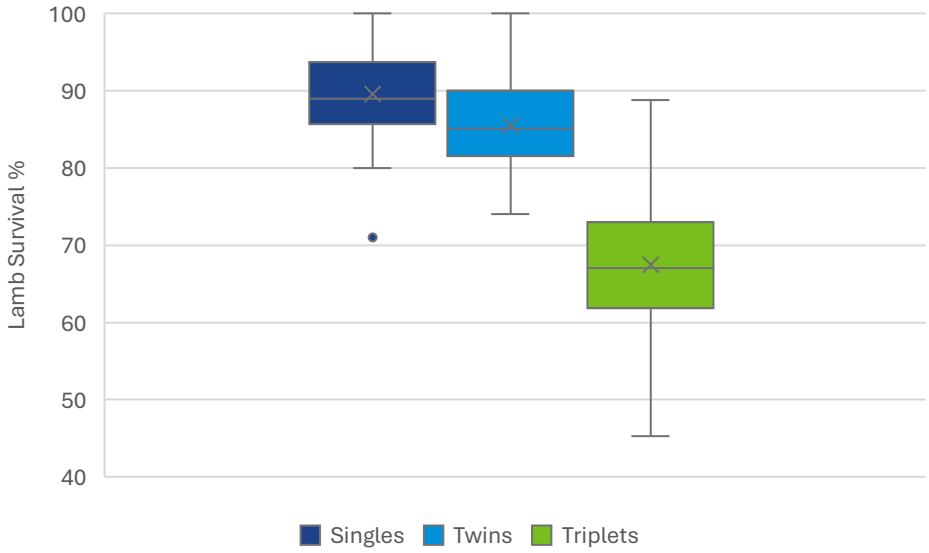


Figure 2. Survival percentage of lambs from single, twin and triplet birth ranks globally. Data retrieved from Kenyon et al. (2019) and adapted into a chart.

Figure 2 demonstrates that triplet survival includes a wider range of survival percentages than single and twin lambs and that triplet lambs have worse survival outcomes. In some cases triplet lambs are reported as having below 50% lamb survival (Kenyon et al., 2019).

Ewe efficiency increases when she is able to wean more live lambs, hence farmers incentive to increase scanning percentage to lift the number of lambs weaned. However, with an increase in scanning percentage, it also increases the proportion of triplet bearing ewes, particularly above 150% of lambs dropped. At 200%, at least 20% of births are expected to be triplets (Figure 3).

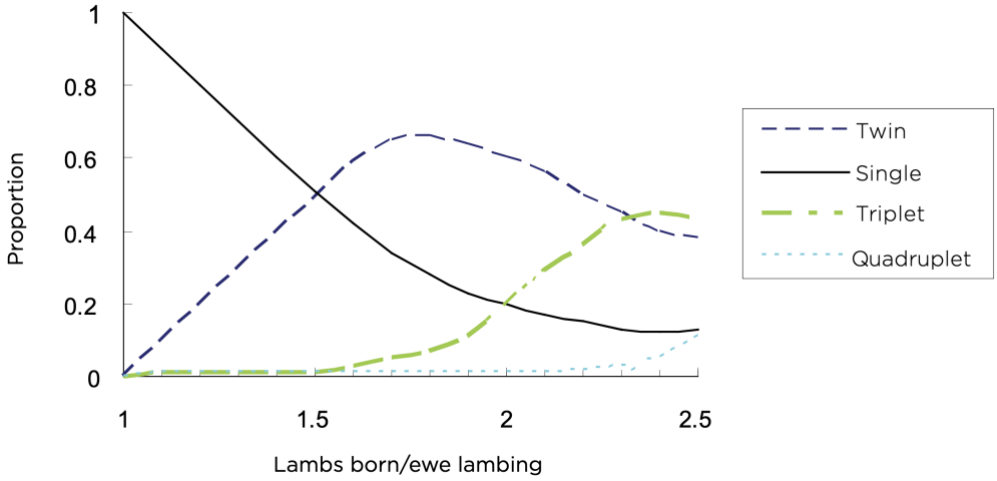


Figure 3. "Proportions of single, twin, triplet and quadruplet at different levels of average lamb drop." Figure adapted from Amer et al. (1999) and sourced from Beef + Lamb NZ (2013).

Erichsen et al. (2024) reported New Zealand flocks had 25% of lambs die between scanning and lambing. While the United Kingdom 14% and Ireland 15%. For triplets, New Zealand farmers were likely to leave all three lambs with the ewe, while United Kingdom and Ireland farmers would have another ewe rear the lamb or rear it artificially. They are also more likely to have ewes lamb indoors.

The New Zealand sheep system has been developed with breeding objectives of flocks that can breed outdoors, and with minimal input, compared to the indoor systems which allow for greater tailoring for the ewe including nutrition requirements, help with lambing, and keeping lambs from being exposed to extreme weather (Erichsen et al., 2024).

The hereditability of lamb survival is low (h^2 = 0.02-0.15) making genetic gain more difficult if not specifically targeted (Kelly et al., 2017; Kerslake et al., 2005).

Elliott et al. (2011) reported that Australian farmers were aware that consumer perception around lamb mortality rates could negatively impact their social licence to farm, but were willing to consider ways to improve lamb survivability while improving flock productivity. New Zealand farmers had a similar concern about the welfare of a more fecund flock (Small, 2005), and rated in a survey twin/triplet management, improved lamb growth, and survival as important areas in need of more research (Greer et al., 2015). However, Dywer et al. (2016) highlighted that lamb survival rates have not changed despite the increase in scientific research on the topic.

This study will therefore investigate triplet survivability (the most susceptible birth rank) management in New Zealand, what farmers are currently doing to improve their triplet survivability, perceptions on effectiveness of strategies, and the opportunity for using systems similar to those used overseas that include lambing indoors or more intense artificial rearing.

4. Aim

The aim of this report is to understand if lambing wastage is an issue from the farmer perspective and what sheep farmers in New Zealand are currently doing to maintain the survival of lambs from triplet bearing ewes in the first few days post-partum when they are most susceptible to dying. It also seeks to understand how indoor lambing and artificial rearing practices could be utilised in New Zealand.

4.1 - Research Questions

1. What is the situation around triplet survivability in New Zealand and how do sheep farmers feel about their ability to maintain the survival of triplet lambs?
2. What strategies are currently being used for triplet survivability management and what is their perceived effectiveness?
3. What opportunities are available to improve triplet survivability? Are farmers interested in using artificial rearing, or having ewes lamb indoors?
4. What would it take to increase the uptake of using artificial rearing and/or lambing ewes indoors?

See Appendix 1 for the question tree used to guide this study.

4.2 - Methodology

This research project began by analysing current information around the topic of triplet survivability, what causes them to die and how their deaths can be prevented in a literature review.

A survey was used to gather information from sheep farmers in regards to the four research questions under Section 4.1 and the results analysed using statistical analysis.

Semi-structured interviews were used to write up case studies of farmers using indoor lambing and artificial rearing methods successfully to improve their triplet management.

A discussion of the results finishing with recommendations concludes the report.

5. Literature Review

5.1 - Lamb survivability

Lamb survivability is becoming an area of interest for ewe efficiency and animal welfare reasons. As farms look to improve efficiency within their sheep flocks, one aspect is of doing so through improving lamb survivability. In doing so wastage is reduced, seen as limiting negative perceptions of farming and farmers social licence can be maintained.

Lambs are first identified during pregnancy scanning of ewes and farmers have the option of identifying the number of lambs each ewe will carry. Ewe health including body condition score must then be maintained throughout their pregnancy to sustain the pregnancy, although spontaneous abortions can occur or foetuses lost for various reasons (Beef + Lamb New Zealand, 2007). Ewes may also perish during this time or at the time of lambing of natural causes (Ospina, 2021).

Lambs are typically born in the spring in New Zealand outside on pasture (Erichsen et al., 2024). It is around the birthing period that this study will be focused on what strategies are available to farmers.

A lamb drop percentage is not usually collected by commercial farmers due to the difficulty in keeping track of ewes (they usually lack a form of individual identification) and lambs in a paddock. Therefore lamb survival will be described in this study as, unless otherwise stated, the difference in lamb numbers from scanning to docking/tailing (usually done by 6 weeks of age) as described in Equation 1. In some examples, survival is counted as to weaning. This can make comparison difficult at times.

Equation 1. Lamb Wastage

$$Lamb\ Survival\ \% = \frac{Number\ of\ ewes\ to\ the\ ram\ \times docking\ or\ tailing\ \%}{Number\ of\ ewes\ to\ the\ ram\ \times\ scanning\ \%}\ x\ 100$$

There are many ways for lambs to die at various times in their lives, including if the pregnant ewe dies, this will result in the death of her lambs too. To maintain a scope within a manageable size this study will focus on the survivability of lambs around the time of their birth.

5.2 - Triplets

Lambing percentage has increased over time. In the early 1990's the trend changed from being approximately 100%, and then raised to 120% in the early 2000's, to 131% in the 2024-2025 year, see Figure 4 (Beef + Lamb New Zealand, 2026). In part due to the decreased value of wool, this has driven the focus to sheep for meat production to provide more profit. The introduction of pregnancy scanning provided another key performance indicator (KPI) for farmers (Beef + Lamb New Zealand, 2013).

Increased knowledge around how genetics can also influence fecundity and fertility of ewes has improved over time. The Inverdale gene is one gene in particular that has increased lambing percentage by increasing the fertility of ewes with a single copy of the gene (Bioeconomy Science Institute, 2000).

To counter lamb deaths it has been suggested that increasing lambs born to make up for the deaths will increase lambs numbers at weaning and onwards, consequently driving scanning percentage increases (Willingham et al., 1986).

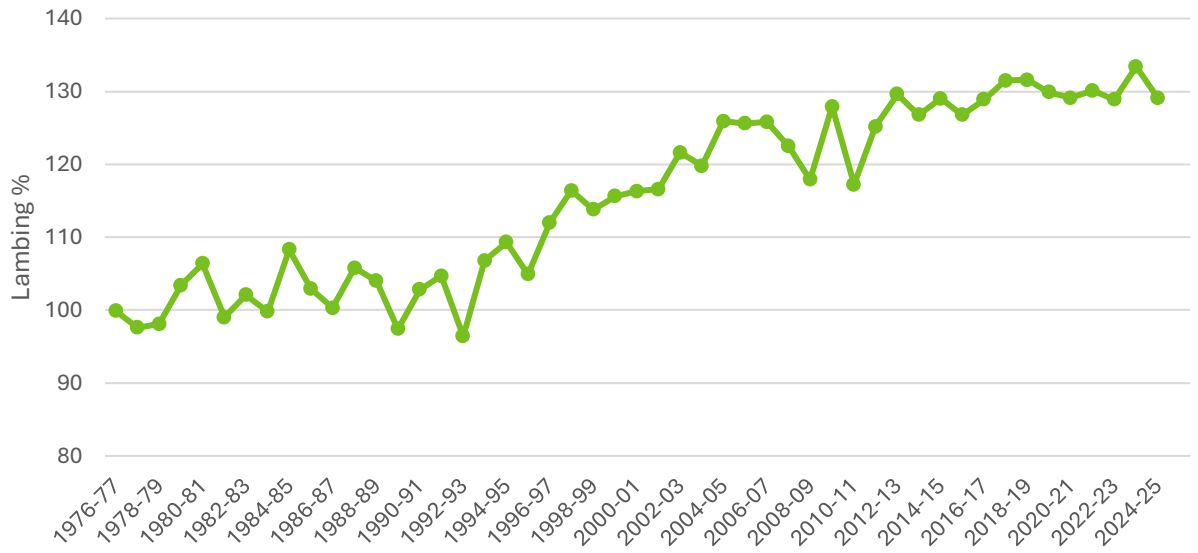


Figure 4. Lambing percentage data from Beef + Lamb New Zealand from 1976-77 to 2024-25 (provisional). Adapted from Beef + Lamb New Zealand (2026).

Initially sheep gave birth to singles and twins, but due to genetic advancement and artificial selection, along with the use of hormone treatments, this has increased triplet bearing ewes (Oldham, 1990). Once scanning percentage reaches 180% the expected proportion of triplets increases (Thompson et al., 2023).

In New Zealand, 68% of triplets survive on average across farms. The range is from 50% to 80% when looking at individual farms involved in a study by Kenyon et al. (2019). While Thompson et al. (2004) had survival rates of 76% for triplets at Poukawa farm, at the higher end of the stated range. Singles on the other hand have a survival rate of 90% and twins 86% (Kenyon et al., 2019). Ludemann & Tafford (2009) reported triplet lambs having a 20% lower survival rate then single and twin lambs. This raises the question, what can farmers do to raise the triplet survival rate to match lower birth rank survival? If a ewe spends resources growing lambs in her womb and they die before becoming a value product- this is a waste of feed and energy.

Lamb death can occur anywhere on a long timeframe from ovulation of the egg in the ewe, to being birthed, weaning through to becoming a hogget. Although lamb death is most likely in the first few days after birth, Watson (1972) reported that 80% of deaths occurred within the first three days of life. This is a considerable proportion and therefore it will be around this time that the study focuses.

It is worthy to note that ewe deaths post scanning also contribute to lamb deaths leading up to lambing, as lambs in utero cannot survive their mothers' death. Ewe mortality is most likely to occur between scanning and weaning (Flay et al., 2021).

5.3 - Factors affecting survivability of triplets

The reasons for the reduced survivability of triplets will be explored in the next section.

5.3.1 - Birth rank on lamb survivability

Birth rank and the number of lambs born from a ewe, influences the survivability of lambs. When just considering birth rank, 67.5% of triplets survive in comparison to 89.5% of singles and 85.5% of twins (Kenyon et al., 2019). Even when triplets are an appropriate weight, Paganoni et al. (2014) reported that it was still birth rank that influenced their survival (85%, 79% and 66% for single, twin and triplet lambs respectively). Holmøy et al. (2017) suggested that lambs born as twins or more, one lamb would die in 81% of the sets born.

Triplet lambs can be born as a light, medium and heavy lamb. Morel et al. (2008) found that their mortality rate was 56%, 40% and 28%, respectively. This can also be interpreted as the lightest lamb had

a 3.2 times higher mortality rate compared to the largest lamb. In studies on birth size of triplet lambs and their survival by Mathias-Davis et al. (2010) and Juengel et al. (2018) it was also reported that the smallest lamb within the triplet set was at the greatest risk of death.

5.3.2 - Ewes natural limitations

A ewe is limited in her ability to raise three lambs by her natural structure. Ewes have two functioning teats typically and cannot feed three lambs at once, although there has been work done on breeding ewes with four functioning teats (Davies, 1999). This can result in the weakest lamb being outcompeted for milk. The ewe's udder also has limited capacity for colostrum and milk production, which may not suffice to feed three lambs (Oldham, 1990).

A triplet bearing ewe cannot consume enough pasture (energy) to sustain herself and the growing lambs easily during late pregnancy (Kenyon et al., 2019). This feed intake reduction may result in smaller less energetic lambs and hence the importance of having triplet-bearing ewes with an appropriate boy condition score.

Ewe pelvis size can be a factor in the death of triplet lambs. If the lambs are birthed simultaneously, they may get stuck causing maternal dystocia from foetopelvic disproportion (Jacobson et al., 2020).

5.3.3 - Lamb survival limitations

A lamb is limited by their own stored energy and size at birth to survive. Birth weight of a lamb influences the reserves that it carries to survive the first few days (Oldham, 1990). A lamb born outside the optimal range of 3.5kg and 5.5kg has a lower chance of surviving (Dalton et al., 1980), as lambs are born with a limited supply of their own brown fat which first begins to be consumed during the birthing process. Energy must then be replenished from colostrum/milk. Lambs can stand within 30 minutes of birth and suckle in less than an hour (Oldham, 1990) but external factors, such as a difficult birth, being weak or becoming cold quickly can prevent this from happening. A difficult birth may use more energy and the trauma may result in the lamb being slower to stand and less able to keep up with the ewe to feed.

5.3.4 - Lamb and ewe bonding on survivability

A ewe and lamb must form a strong bond soon after birth and quickly learn to recognise one another to improve the chances of survival for the lamb. A ewe that cannot recognise her own lambs will not feed them. Ewes must lick birthing fluid from her lambs to clean them and as part of the bond forming process. The more lambs she has, the less time she is likely to spend cleaning each one before stopping to eat or other regular ewe behaviour. If a bond is weak between a ewe and her lamb, recognition ability is reduced and therefore survivability of her lamb decreases (Oldham, 1990).

Recognition by sound (bleating) is the most important way to recognise one another, then visual, and thirdly smell (Oldham, 1990). They must remain together as much as possible in the early stages to ensure a strong bond is created.

Better ewe temperament can improve the survivability of her lambs. The ability to be less reactive to unfamiliar experiences is influenced by her genetics and her environment. Quieter ewes spend more time at the birth site, which helps to form a better bond with her lambs (Oldham, 1990).

5.3.5 - The effect of Dystocia on lamb survivability

Jacobson et al. (2020) defined dystocia as "a difficult birth due to a long, unassisted parturition or prolonged delivery requiring assistance." This can affect all birth rank lambs and can be caused by the lamb or the ewe. Issues from the ewe include foetopelvic disproportion, poor ewe body condition or frame size. While foetal dystocia includes size of the lamb (small or big), disease, or lamb position. These situations all result in reduced survival chance of the lamb and increased mortality for the ewe (Jacobson et al., 2020). Dystocia is therefore not just a large lamb problem, but is also an issue for small lambs who have lower energy reserves (Kenyon et al., 2019). Increased duration of the birth was associated with a lower chance of survival for the lamb (Everett-Hincks et al., 2007). Of lambs that die within the first three days, approximately half of them, regardless of birth rank, died from dystocia (Kerslake et al., 2005).

5.3.6 - Effects of exposure on lamb survivability

It is difficult to determine the exact cause of death between exposure and starvation as one does not generally occur without the other (Mellor & Stafford, 2004). In a study by Kerslake et al. (2005), starvation/exposure was found to be the second most common cause of lamb death, killing 27% of triplet lambs, second only to dystocia. While Thompson et al. (2020) found that starvation/exposure was the biggest killer of triplet lambs with 28% dying of this cause, but with a similar percentage (27%) dying of this cause as Kerslake et al. (2005).

Lambs are endothermic and therefore require metabolism to occur in their bodies to maintain body temperature. Lambs are susceptible to heat loss via "conduction, convection, radiation, and evaporation" (Pollard, 2006). Triplets are even more susceptible due to frequently having a lighter birth weight and small body mass to surface area ratio speeding up heat loss potential (Kenyon et al., 2019). Extreme weather can occur and windchill can have disastrous repercussions. One report showed a 40% loss of lambs across a flock due to snowy weather (Johns et al., 2016).

Ewes tend to seek more shelter when they have lambs at foot (Pollard et al., 1999). However if they do not have access to shelter and lambs get wet, survival can greatly decrease. Arnold & Morgan (1975) reported 52% of all lambs born on rainy days died, even though 80% of them had consumed milk, demonstrating the impact of poor weather over good nutrition.

5.3.7 - Ewe nutrition on lamb survivability

Nutrition has three main influences on the ewe and lamb: the weight of her lamb at birth, her body condition score and her colostrum/milk production (Oldham, 1990). With increased fertility of a ewe comes increased energy requirements. Ewes that are triplet bearing require approximately 50% more feed than those single-bearing in the last 6 weeks of pregnancy (Beef + Lamb New Zealand, 2019; McCroad et al., 2020).

Ewes that can maintain their body condition score through pregnancy are likely to maintain more live lambs (Everett-Hincks et al., 2004). Ewes that are also adequately fed and less hungry spend more time at the birth site ensuring a good bond develops (Oldham, 1990). A lower level of nutrition for the ewe during pregnancy also correlated to a lower level of bonding with her lambs, demonstrated by reduced licking time. Lower bonding is well established to be associated with lower levels of survival for the lambs (Dwyer et al., 2003).

5.3.8 - Mother lamb bond on lamb survivability

Ewe mannerisms change after giving birth to begin building the bond between herself and her lambs. She licks, cleans, makes bleating noises, and allows her lambs to feed (Oldham, 1990). Dwyer et al. (2016) reports that the ewe is able to influence the lamb into standing, finding the udder and then beginning to consume colostrum. The earlier the bonding can occur, the higher the chance of survival for the lambs (Oldham, 1990). If the mother does not carry out activities to aid in this behaviour then the lambs are more likely to be mis-mothered and therefore not survive. Triplet lambs are more often slower to drink and bleat than single and twin lambs (Kenyon et al., 2019).

All triplet lambs within a set were found to be less likely to be reunited if separated than singles or twins and they had to often find their mother, rather than the ewe finding them. This is partly influenced by a mother of triplets bleating less than those with singles or twins and therefore having a weaker bond (Pollard, 1992).

5.3.9 - Ewe milk supply on lamb survivability

Ewe milk production is limited by ewe size, body condition, udder size, milk production efficiency, and her nutrition. Colostrum is initially produced by the ewe to improve the immunity, growth, and thermoregulation of her lambs. Lambs initially suckle colostrum, but triplet lambs are likely to receive less than twin or single lambs due to the production not proportionately increasing with more lambs. Triplet ability to suck is also not as strong, reducing intake (Shubber et al., 1979).

Triplet lambs have less milk available to them than their twin counterparts because as with colostrum, the ewes produce a similar amount whether they are raising two or three lambs (Peterson et al., 2006). Protein, fat, and lactose composition was similar between ewes with different lamb rearing numbers. To

balance the energy requirements of triplet raised lambs, triplets were found to be grazing more than twin raised lambs and grew slower (Peterson et al., 2006). Although decreased milk consumption may not affect the survivability of lambs, it is likely to be an issue for triplet lambs as they will have decreased growth rates from increased milk competition.

5.3.10 - Genetics on lamb survivability

The genetics of the ewe and lamb influence the survivability of the lamb. Generally it appears from the literature that survivability to weaning has a low heritability. Kerslake et al. (2005) reports a heritability of 0.02-0.13. Kelly et al. (2017) reports that Merino sheep survivability heritability for multiples is 0.15 and is lower for twins and singles, suggesting there is greater gain in selecting for survivability for triplets or more than lower birth ranks. Southey et al., (2002) on the other hand suggests that if traits that contribute towards survivability are further analysed individually there is more opportunity for heritable traits that can be selected for such as birth weight.

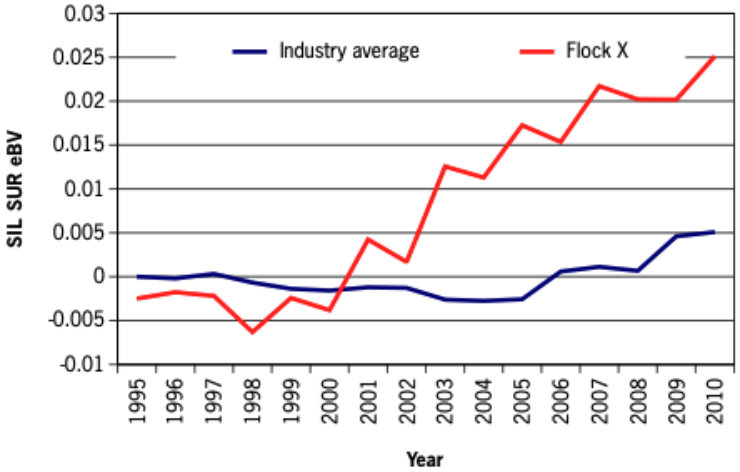


Figure 5. Genetic trend for survivability for Flock X that focused on improving the flocks Survivability eBV (estimated Breeding Value) versus the industry average (Young, 2012).

Figure 5 depicts Farm X in NZ that has had its survivability estimated Breeding Value (eBV) monitored across its flock. It had been able to make a 3% gain in lamb survivability over 10 years, whereas the industry average, from SIL-ACE (Sheep Improvement Limited - Advanced Central Evaluation) data, is under 1% over the same timeframe (Young, 2012). This shows it is possible to make genetic gain in survivability gain across a flock.

Kenyon et al. (2019) suggests that selection for survivability based on birth rank is likely to make more progress genetically than all birth ranks combined. Further research is required to determine the genetic gains that could be made if "triplet survivability" was the trait measured over time.

The online tool nProve allows farmers to filter rams and breeders based on Breeding Values (BV). Lamb survival is a trait that can be used to filter breeders and rams. The lamb survivability BV is measured as "lambs born that die before weaning" and has a heritability of less than 5% (Young, 2017). It is based on a mixture of genes that promote the ewes mothering ability and lamb vigour (Young, 2017).

Studies show that between breeds of sheep there are differences in their maternal ability. Some call out to their lambs more than others (Oldham, 1990) and spend more time at the birth site (Alexander et al., 1983) showing the genetic potential between breeds that could be selected for.

A maternal assistance score of 1-3 has been developed to aid in simple collection of data to determine heritability of mothering ability of ewes (Hay et al., 2024). Mothering ability had a heritability of 0.05. It is therefore possible to select for lamb survivability even though it has low heritability.

5.3.11 - Conclusion of factors affecting triplet survivability

Table 1. Summary of factors influencing lamb survival.

Maternal factors	Lamb factors	Environmental factors
Conception rate	Dystocia	Windy weather
Dystocia	Seeking Shelter	Wet weather
Seeking shelter	Size of the lamb	Cold weather
Licking the lamb clean from birth fluids	Ability to stand and find the udder	Human interference
Staying with lamb during initial bonding phase	Sucking ability	Shelter
Milk production ability	Illness	Terrain
Bleating ability	Milk consumption ability	Stocking rate
Health/Illness	Birth rank	
Vaccination status	Genetics	
Body condition score		
Nutrition		
Genetics		

Many factors that influence the survivability of lambs examined in this literature review in sections 5.3 and 5.4 are summarized in Table 1. The severity of these factors can all be reduced or limited by human intervention, although some are easier and quicker than others and take good planning management to mitigate. Strategies available to improve triplet lamb survival outcomes will be considered in the next section of the literature review to reduce the negative impact of the above factors.

5.4 - Strategies to improve triplet survivability:

The factors in Table 1 can be influenced and managed by human intervention to improve the survival outcomes for lambs. Oldham (1990) suggests two approaches for reducing lamb wastage, these are to improve the environment of the birthing ewe and improve the mothering ability of the ewe. Strategies to improve triplet lamb survival outcomes through these two factors will be discussed below along with others commonly identified in the literature.

5.4.1 - Stocking density and paddock size

In New Zealand and Australia, it has been shown that increased stocking rate and large mob sizes reduces lamb survival and growth potential (Lockwood et al., 2020 and 2023). The recommendation that came from the Lockwood et al. (2023) study was to lamb ewes in smaller mobs, this was shown to have no effect on ewe mortality but does improve lamb survival.

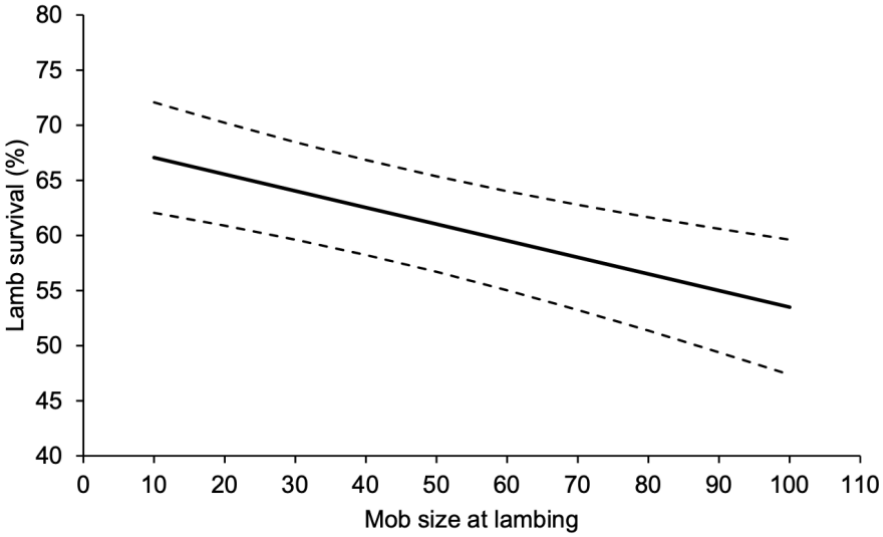


Figure 6. The effect of mob size of triplet-bearing ewes. Dashed lines represent +/-95% confidence interval. From Lockwood et al. (2023).

Interestingly, stocking rate in the Lockwood et al. (2023) study showed that up to 13 ewes per hectare did not influence the survivability of their triplet lambs, instead it was mob size and for every reduction of 10 ewes, another 1.5% of lambs survived for triplets. This significant trend is displayed in Figure 6.

A similar result was found in the Lockwood et al. (2020) study for single and twin-bearing ewes. The effect of stocking rate in some scenarios used improved the survivability of lambs. A 0.7% increase in lamb survivability per ewe removed per hectare of twin and single bearing ewes while in other scenarios it made no difference. Therefore mob size may be more important than stocking rate within practical limitations.

5.4.2 - Lambing beats/shepherding

There is limited research available suggesting whether lambing beats/shepherding are worthwhile or not. Some reasons for performing lambing beats include allowing a farmer to tip up cast ewes, fix bearings and assist lambing in the paddock, mother up separated lambs or adopt orphan lambs for artificial rearing. A risk to performing lambing beats is that ewes can startle and abandon their lambs if they are not able to keep up. An advantage is that ewes experiencing dystocia can be assisted, potentially saving the ewe and her lambs from death or abandoned lambs can be taken for fostering or artificial rearing. Fisher & Mellort (2002) reported there is no impact on lamb survival but suggests more investigation is required.

Dwyer (2008) suggests lambing beats may actually slow the genetic progress of low input sheep systems. Letting natural selection occur without human intervention may result in lower survivability of lambs before the maternal potential of the flock is expressed.

Lambing beats may also be done to reassure farmers their stock are safe and help them feel like they are doing something at lambing time which is important for some farmers mental health(Fisher & Mellort, 2002).

5.4.3 - Wind breaks and within paddock shelter

Ewes and lambs do not necessarily seek shelter when weather conditions deteriorate. A way to manage this is to create passive shelter for stock that will benefit them regardless of their attempt to use it or not. This can be through purposeful planting of shelter belts, natural bush barriers, manmade structures or natural terrain features.

Hedging for windbreaks combined with late pregnancy shearing have shown to increase survivability in all birth ranks, halving death potential of all lambs (Lynch et al., 1980). Wind speed is slowed, reducing the windchill experience for stock and therefore heat loss (Lynch et al., 1980). Purpose grown wind shelter using pinus radiata helped to improve survival of lambs by 10% in New Zealand (Pollard, 2006).

This is an opportunity that may initially require significant resources to implement but will eventually be a strategy that requires little input later supporting a lower input sheep system.

5.4.4 - Staggered lambing dates

Climate change is increasing the number of extreme weather events that New Zealand experiences (Ministry for the environment, 2025). These events pose a risk to the survival of lambs, particularly ones involving cold temperatures, wind, and precipitation. Staggering the start of lambing for different mobs is a strategy than can be used to ensure only a portion of potentially susceptible lambs could be experience detrimental conditions (Smart, n.d.). This strategy has potential for spreading feed demand, not having all ewes lamb at once in a paddock (reducing mis-mothering), and extending when lambs will be ready for sale. This strategy on a farm is talked about in brief and there appears to be a dearth of evidence on whether this is a worthwhile strategy.

5.4.5 - Ewe nutrition

Adjustment of ewe nutrition leading up to birth and post-birth has the potential to influence lamb survival and the ewe's body condition score. Ewes that are triplet bearing require approximately 50% more feed than those single-bearing in the last 6 weeks of pregnancy (McCroad et al., 2020). Triplet-bearing ewes with a body condition score of 3 have a higher chance of raising three live lambs than those with lower scores (Cranston et al., 2017; Kenyon et al., 2013). When taking into account feed intake prior to birth (from day 128 of pregnancy to day 142) triplet-bearing ewes could be restricted to pre- and post-grazing masses of 1100 and 800 kg dry matter/ha, respectively, and it would not affect the survivability of their lambs, assuming they were fed "ad libitum levels for the remainder of pregnancy and in lactation" (Kenyon et al., 2013). Therefore lamb survivability was not correlated to low nutritional regimen as long as feed intake maintains or improves their body condition score of the ewe.

5.4.6 - Adoption of a triplet lamb onto another ewe

In a survey examining lambing systems used in the United Kingdom, fostering of a lamb onto another ewe is common with 93.7% of respondents using the strategy. The most common reason was due to litter size and often the lamb was fostered onto a ewe who had a single (Whatford et al., 2023). Adoption success was considered "always successful" by 21.9% of the farms surveyed. No evidence could be sourced on the survival outcomes of lambs using this method. Presumably if they are not successfully fostered they would be artificially reared instead, which instead increases the long-term workload for farmers until the lambs can be weaned. Case study A will be presented later in the report of a New Zealand example of this strategy being used.

5.4.7 - Training ewes to be less emotive

There is potential for ewes to become more accustomed to human interaction. In a trial, weaned Merino lambs were grouped to experience human behaviour of differing intensities in an attempt to quieten them. However it was not successful in reducing their reactivity, they suggested weaned lambs were too young to be doing this with (Atkinson et al., 2022).

Ewes unaccustomed to humans may be more flighty and likely to abandon the birth site before fully bonding if disturbed (Dwyer, 2008). Putu (1990) showed that ewes that were more accustomed to

human interaction were better mothers to their lambs. They can be trained to be less reactive to unfamiliar events. Having someone be present among them weekly or fortnightly feeding by hand or walking amongst them was enough to achieve the desired result. Those least worried spent more time at the birth site, increasing their lamb bond.

Spending time with ewes is time intensive and would need to be considered whether the time required results in an adequate benefit based on management practices used, including lambing beats and tagging at birth.

5.4.8 - Artificial rearing

Artificial rearing of lambs is an opportunity similar to that frequently used in the dairy industry to raise calves. This strategy ensures lambs receive the appropriate amount of milk early on when it is most critical to their survival. In a study from the United Kingdom 42.6% of farms considered lamb artificial rearing to always be successful (Whatford et al., 2023).

Success of lambs reared artificially in New Zealand is mixed with reports of 10%-30% dying, mostly from disease and bloat (Bull & Binnie, 2006). It is not clear how this proportion fits within the flock as a whole.

Reilly & Crilly (2025) studied the impact of artificially reared lambs compared to naturally reared lambs across flocks in the United Kingdom. The lamb survival between the groups were similar with inter-quartile ranges of 90.4%-100% and 95.7%-100%, respectively. Naturally reared lambs in this study were likely lambed indoors as is standard practice in the United Kingdom, this has already been described, accounting for the high survival. This study which combines the two successful practices shows great potential to improve survival outcomes of triplet lambs.

Artificially reared triplet lambs have the same potential of naturally reared triplet lambs to reach similar weaning and carcass weights even if they had received ewe colostrum or a replacement colostrum (Belanche et al., 2019). Ewe lambs that were artificially reared could go back to the maternal flock as they have the same ability to rear their own lambs as their naturally reared counter parts (Posbergh et al., 2024).

5.4.9 - Supplementary feeding

Supplementary feeding of triplet-bearing ewes is an option to ensure ewes receive appropriate nutrition especially given their greater demand for energy later in pregnancy if pasture supply and demand is tight (McCroad et al., 2020).
Survival of lambs was found not to be influenced by feed and supplementation of concentrates to ewes in late pregnancy and during lactation, but ewe mortality could be reduced, which in turn effects lamb growth potential and overall flock efficiency (Haslin et al., 2024). Therefore supplementary feeding could be considered for ewe survival.

5.4.10 - Genetic selection for lamb survival

There is evidence to support that genetics of the lamb and ewe influences the survivability of lambs (Alexander *et al.,* 1983; Hay et al., 2024). For stud farmers it is common practice to tag lambs at birth so that pedigree can be matched and survival of lambs from a dam and sire can tracked and measured. However this is an intensive exercise and is not common for commercial sheep farmers. Commercial farmers rely on sheep stud farmers to collect lamb survival phenotypes along with genotyping to determine breeding values of traits. Rams can then have breeding values associated with them that commercial farmers are able to base their ram purchases from. Commercial farmers may require the knowledge of their breeders to assist them in choosing the appropriate rams that align with the breeding objective of their flock. Farmers are also now able to use nProve and nProve Tracker to make these decisions themselves and track their flock merit (Beef + Lamb Genetics, n.d.). Lamb survivability is a breeding value farmers can use to filter rams for sale by, however, a triplet specific lamb survival breeding value is currently unavailable to improve their flocks genetic potential. Given lamb survivability's low heritability it is important famers also focus their efforts on improving the environment for lamb survival.

5.4.11 - Indoor lambing

Indoor lambing, separate from artificial rearing, is an uncommon practice in New Zealand with 5% of farms reportedly using it (Erichsen et al., 2024), however it is more common in other parts of the world,

including the United Kingdom. Binns et al. (2002) reported in their study that 73% of farmers in the United Kingdom had all of their ewes inside for lambing and only 8% farmed only outdoors. Over the two years of the study the risk of mortality for lambs was 7% in 1996 and 10% in 1997. The average post-natal mortality risk was just 2.7% for lambs when lambed indoors in the United Kingdom.

Indoor lambing therefore has much better outcomes for lambs compared to the extensive system used in New Zealand which can result in 25% of lambs dying (Erichsen et al., 2024). Scanning percentage between United Kingdom, Ireland, and New Zealand farms are similar, but numbers of ewes in a flock are lower in the United Kingdom and Ireland (Erichsen et al., 2024). In the indoor lambing system, there was also a decrease in the risk of lambs being stillborn when ewes are housed, due to better observation and decreased risk of exposure. Another example in South Africa showed having ewes lamb indoors showed that survivability can be 92%, similar to that of the UK example (Ipsen, 2014). However, a noted risk of housing ewes and lambs is the increased risk of disease and parasite spread.

There is a possible benefit from using this strategy in New Zealand, however it is worth considering how it would work with large flock sizes and facilities not purposefully built for this. The average flock size in an Irish study was 131 ewes, whereas in the Binns et al. (2002) study the median flock size was 658 in the United Kingdom. The average New Zealand ewe flock (two-tooth and mixed age) size captured in this study was 2000 ewes.

5.4.12 - Benefit of increased survivability on profit

Beef + Lamb New Zealand (2026) forecasts the average lamb price at $10.28/kg carcass weight (CW) for 2025-26 and the average lamb carcass weight at 19.4kg. A price of $9.35kgCW was already 20% higher than the five-year average (Beef + Lamb New Zealand, 2025).

Table 2. Sensitivity analysis of number of lambs sold at 19.4 kilograms of carcass weight (kgCW) compared to the price of lamb ($/kgCW).

		Price of lamb ($/kgCW)								
		$ 5.00	$ 6.00	$ 7.00	$ 8.00	$ 9.00	$ 10.00	$ 11.00	$ 12.00	$ 13.00
Number of Lambs sold at 19.4 kgCW	25	$ 2,425	$ 2,910	$ 3,395	$ 3,880	$ 4,365	$ 4,850	$ 5,335	$ 5,820	$ 6,305
	50	$ 4,850	$ 5,820	$ 6,790	$ 7,760	$ 8,730	$ 9,700	$ 10,670	$ 11,640	$ 12,610
	100	$ 9,700	$ 11,640	$ 13,580	$ 15,520	$ 17,460	$ 19,400	$ 21,340	$ 23,280	$ 25,220
	150	$ 14,550	$ 17,460	$ 20,370	$ 23,280	$ 26,190	$ 29,100	$ 32,010	$ 34,920	$ 37,830
	200	$ 19,400	$ 23,280	$ 27,160	$ 31,040	$ 34,920	$ 38,800	$ 42,680	$ 46,560	$ 50,440
	250	$ 24,250	$ 29,100	$ 33,950	$ 38,800	$ 43,650	$ 48,500	$ 53,350	$ 58,200	$ 63,050
	300	$ 29,100	$ 34,920	$ 40,740	$ 46,560	$ 52,380	$ 58,200	$ 64,020	$ 69,840	$ 75,660
	350	$ 33,950	$ 40,740	$ 47,530	$ 54,320	$ 61,110	$ 67,900	$ 74,690	$ 81,480	$ 88,270
	400	$ 38,800	$ 46,560	$ 54,320	$ 62,080	$ 69,840	$ 77,600	$ 85,360	$ 93,120	$ 100,880
	450	$ 43,650	$ 52,380	$ 61,110	$ 69,840	$ 78,570	$ 87,300	$ 96,030	$ 104,760	$ 113,490
	500	$ 48,500	$ 58,200	$ 67,900	$ 77,600	$ 87,300	$ 97,000	$ 106,700	$ 116,400	$ 126,100

The sensitivity analysis in Table 2 presents the profit opportunity available to farmers if they improve survivability of their lambs and are able to get them to the average weight of 19.4kgCW. Table 2 does not account for the costs associated with maintaining more stock on-farm.

5.4.13 - Mental health of farmers on lamb survivability

General literature is available on the mental health of farmers in New Zealand, however it comes with mixed conclusions on whether the mental health of farmers, grouped collectively across sectors, had poorer mental health outcomes than the general population (Goffin, 2014; Scarlatti, 2017).

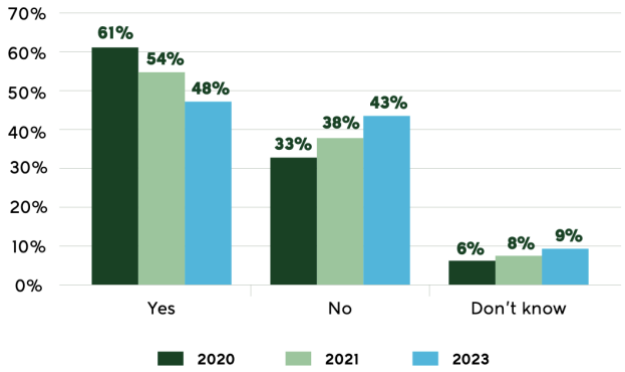


Figure 7. Survey from DairyNZ on whether you or someone on your farm experienced mental health issues over 2020-2023. Retrieved from DairyNZ (2023).

Figure 7 from DairyNZ (2023) suggests approximately 50% of farmers surveyed either had experienced mental health issues or someone on their farm had. There appears to be a paucity of research about sheep farmers and how their occupation specifically affects their mental health.

5.4.14 - Conclusion

The literature review portion of this report shows survivability of triplet lambs are lower than their single and twin counterparts in New Zealand. They face increased pressures due to being one of three competing for nutrition and attention from their mother. They are typically born smaller and therefore have increased vulnerability to weather conditions. New Zealand farmers typically farm extensively outdoors and lambs therefore are less likely to receive immediate intervention compared to those reared indoors.

There appears to be plenty of strategies available to farmers to improve the survivability of their triplets including genetics, low ewe numbers per paddock, shelter, nutrition, artificial rearing, and indoor lambing. It is not clear in New Zealand to what extent farmers are utilizing these strategies, and to what extent they are successful when used for triplet lamb survivability outcomes.

6. Method

6.1 - Survey

A Survey of 30 questions (See Appendix 2) was distributed to sheep farmers via email, social media platforms, and word of mouth. The survey could be accessed on Qualtrics via a link or with a QR code. It was anonymously filled in by participants, there is no way to identify respondents.

Data was gathered between 5th April 2026 and 5th May 2026. Four of the 51 respondents who began the survey used the QR code, 47 used the link.

38 surveys were completed in full ,and were carried out by a range of sheep farmers across Aotearoa New Zealand.

The results from the survey were analysed using the Qualtrics website and Microsoft Excel to generate qualitative and quantitative statistics. Likert scale charts and graphs were generated to display the results clearly. Where text answers could be given, they were summarized into themes.

6.2 - Interviews

Two interviews were conducted in a semi-structured interview style. See Appendix 4 for a sample of the questions asked and the themes covered. The aim of the interviews was to talk to farmers that are using alternative strategies (indoor lambing/fostering and artificial rearing) to improve survivability outcomes of triplet lambs and discuss their experiences using them. The themes from the interviews are included as case studies in the discussion.

7. Results

7.1 - Survey

The survey was completed by 38 participants, although some others did start it and provide some initial data, which in some cases was used. Of those that finished the survey, some did not provide answers for every question.

7.1.1 - Demographics of participants

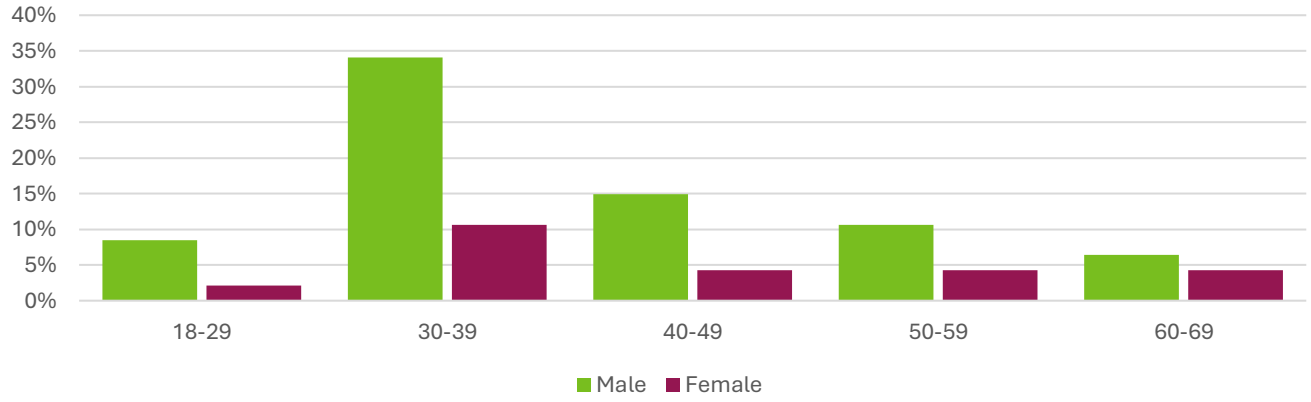


Figure 8. Age range and gender distribution of respondents in this survey.

Figure 8 shows the distribution of participants based on age and gender. The most common age bracket of respondents is those aged 30-39 and 79% of the respondents identified as being male.

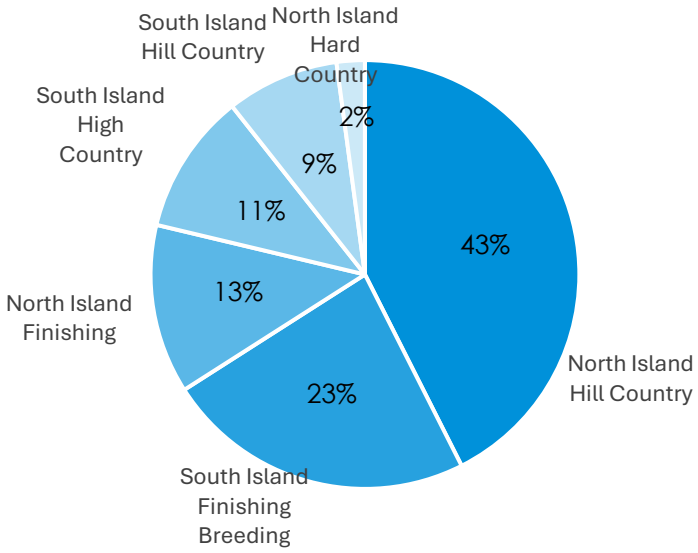


Figure 9. Distribution of Beef + Lamb NZ sheep and beef farm class included in this survey.

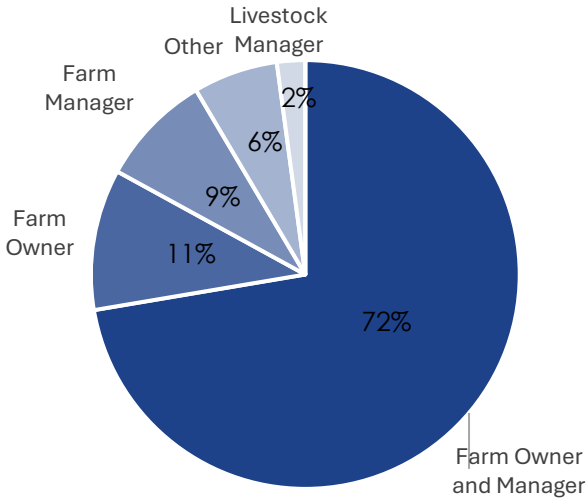


Figure 10. Distribution of respondents relationship to farm associated with for this survey.

Figure 9 shows the distribution of farms included in this survey by Beef + Lamb New Zealand land class, where 58% of the respondents were associated with a North Island farm. Compared with Beef + Lamb New Zealand farm economic survey distribution of farms 55% of their farms are from the North Island, of those 33% are North Island hill country farms, 20% South Island finishing breeding farms and 11% for both North Island and South Island finishing (Beef + Lamb New Zealand, n.d.). A similar distribution to what has been sampled here. There were no respondents from South Island Finishing or South Mixed Finishing farms for this survey.

Figure 10 shows the distribution of respondents affiliation with the farm they are considering when filling in this survey. The majority are farm owners and/or managers who are likely to have the information required for this survey and 97% of respondents have the responsibility of making the primary decisions on the farm. They will all be referred to as "farmers" for ease throughout this report.

92% of the farms are sheep and beef, the others ran sheep only or sheep, beef, deer and dairy. 86% are connected to commercial farms and the others were connected to combined stud and commercial farms.

7.1.2 - General lamb survival

The first section of the survey was to establish if there is an issue with lamb survivability from the view point of farmers. Farmers were first asked their opinion on whether there is a lamb survivability issue on farms, collectively, throughout New Zealand and whether the lambing wastage on their own farms negatively impacts their mental health. The results are displayed in Figure 11.

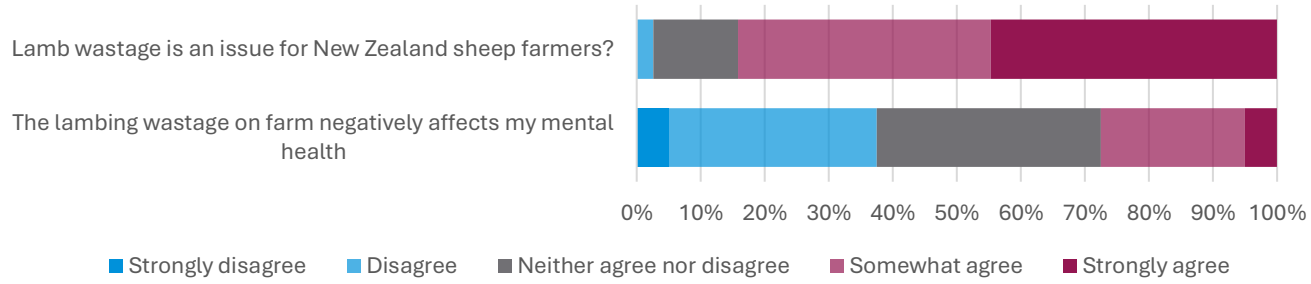


Figure 11. The opinion of farmers on lamb wastage as a farming collective and how it affects their mental health on their own farms.

84% of farmers agree that lamb wastage is an issue and 28% of them feel it negatively impacts their mental health. This clarifies that lamb survival is an issue in New Zealand that should be assessed to make improvements.

97% of farmers did pregnancy test their ewes (two tooths and mixed age ewes going to the ram). The average size of the ewe flock surveyed was 2003 ewes with a range of 200 to 5100 ewes. This is higher than reported in a 2014 study where a quarter did not pregnancy scan (Corner-Thomas et al., 2014).

The average total ewe flock scanning percentage recorded in this survey was 169% (18% of famers did not scan for multiples) and the average docking/tailing % was139% for the 2025 season. The average survivability was 82% for the ewe flock.

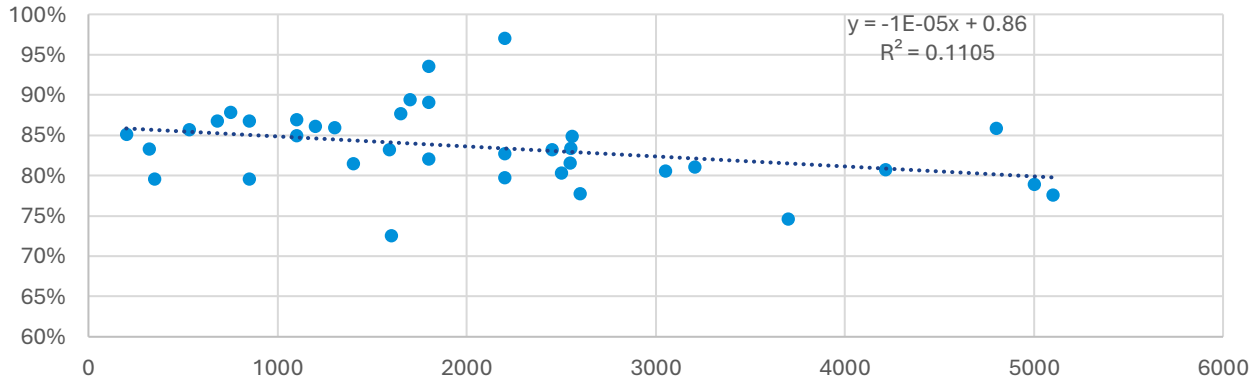


Figure 12. Ewe flock number versus lamb survivability at docking/tailing for the flock in 2025.

Figure 12 shows the survivability of lambs from scanning to docking/tailing for the 2025 season in relation to the number of ewes that went to the ram. There is a weak negative correlation (r=-0.33, p=0.0476) where when size of the flock increases lamb survivability decreases. 11% of the variation in survivability is explained by the ewe flock size. There are some outliers who appear to have particularly better and worse survival outcomes for their lambs.

7.1.3 - Triplet survival

As already described triplets have the lowest survival outcomes and thus the largest opportunity for improvement, hence the reason for being the focus of this report. Of those farms that do pregnancy scan their ewes, 82% of farmers also scan for triplets and above. The median scanning percentage was 179% for those that do scan for triplets and 156% for those that do not scan for multiples (Figure 13). Actual conception rate is likely to be a higher scanning percentage than presented for those that do not scan for triplets. Farmers were less likely to scan for triplets once their flock size was 1800 or over. 63% of farmers are scanning for triplet beyond this size (Figure 14).

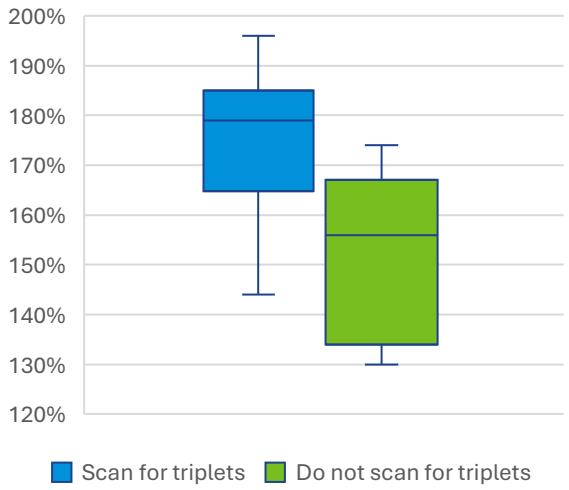


Figure 13. Comparison of respondents who do scan for triplets and those who do not and their scanning percentages.

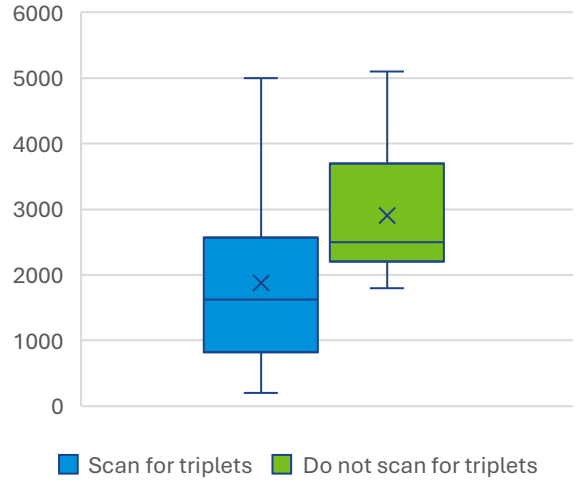


Figure 14. Comparison of respondents who do scan for triplets and those who do not compared to their ewe flock size.

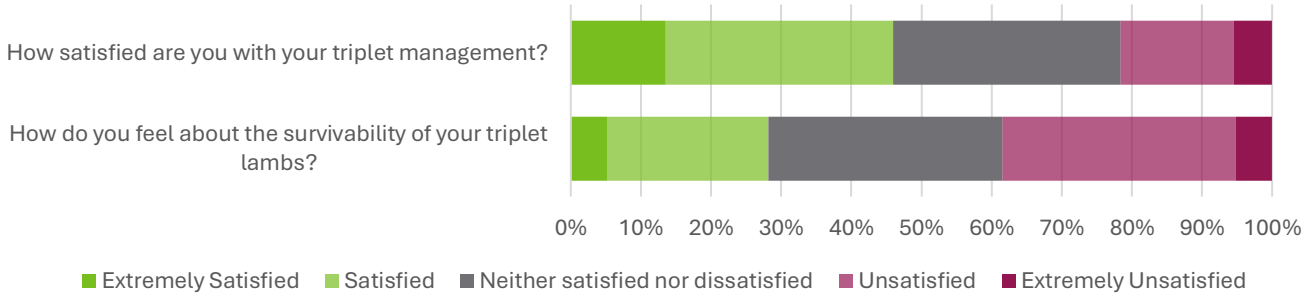


Figure 15. Respondent's opinion of the triplets management and survival on their farm.

Farmers were then asked about their own triplet management and survivability. 77% of farmers had strategies in place to manage triplets and those that did not, did not scan for multiples, except for 6% who did scan for multiples but then did not have separate strategies for them. Of those surveyed 46% are satisfied with their triplet management, but then just 28% are satisfied with survivability of triplets (Figure 15). 22% are satisfied with their management, but 38% are not satisfied with the survivability of triplets on their farm (Figure 15).

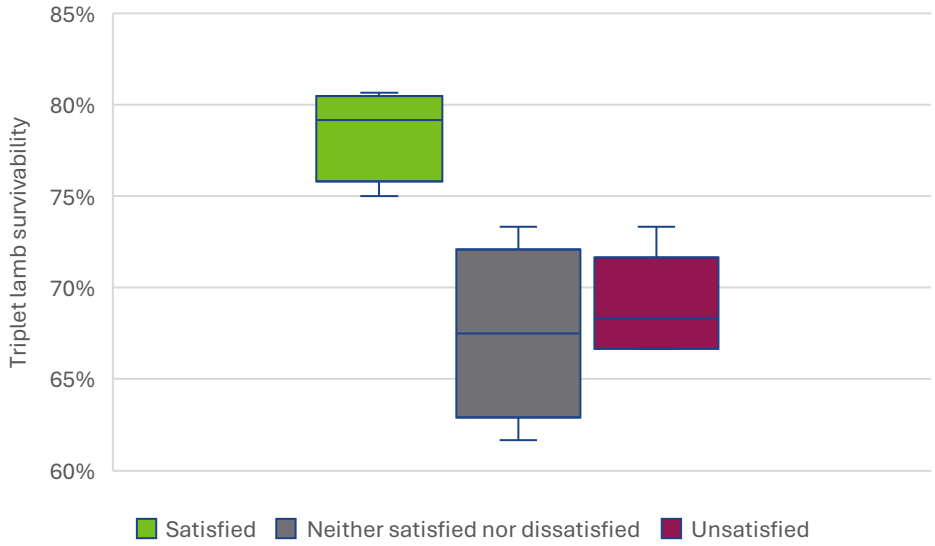


Figure 16. Satisfaction of respondents in relation to their triplet only survivability percentage.

34% (n=13) of farmers surveyed were able to report their triplet specific docking/tailing percentage along with the number of ewes that scanned as triplets. The survivability of these triplet lambs between scanning and docking/tailing could therefore be calculated and presented relative to triplet survivability satisfaction in Figure 16. A limitation of the data here is the low number of responses used to produce Figure 16, however it gives an idea of how farmers satisfaction and triplet survival percentage are related. The average triplet specific lamb survivability reported here was calculated to be 71% with a range of 62%-82%. All farmers surveyed that had triplet survivability over 75% were satisfied with their triplet survivability (Figure 16). Figure 16 therefore shows a probable distinction between farmers that are satisfied and the others in relation to lamb survivability.

7.1.4 - Strategies for survivability of triplet lambs

Strategies available to famers to achieve better triplet lamb outcomes are varied. Their use and the perception of how effective they are, is captured below.

Strategies used on New Zealand farms for management of triplet lambs

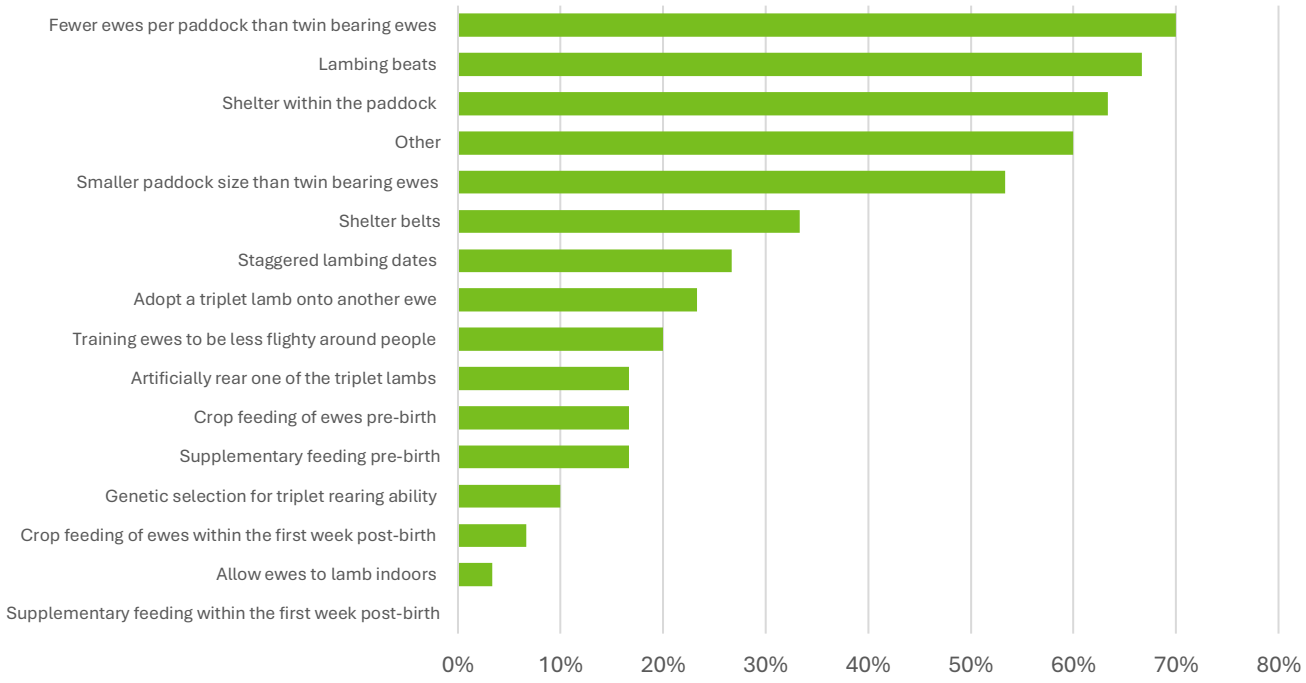


Figure 17. Percentage of farmers using the selected strategies to improve triplet management.

Figure 17 shows the strategies that farmers use to improve their triplet lamb survivability. The most common strategies used are fewer ewes per paddock than twin bearing ewes, doing lambing beats, and using paddocks that have within-paddock shelter. The respondents were able to note other strategies they use, these included the following variety of strategies:

Lambing triplets in "easy contouring paddocks"

Feed triplet bearing ewes "minimally (to avoid bearings)," "maintenance," "preferentially" or "ad libitum"

Triplet bearing ewes are pulled out at scanning

"Lamb triplet bearing ewes with single 2 tooths, they are more likely to adopt a lamb than MA ewes"

"Lamb triplets in with twins"

"Ram harnesses for targeted feeding of ewes" in relation to when they will lamb

"Clostridial vaccinations"

"Mineral supplements"

"Keep triplet bearing ewes fit prior to lambing"

"Subdividing large paddocks with temporary fences"

"Put woollen jackets on weak sets of triplets prior to poor weather"

"Pre-lamb shear with a cover comb"

For those farmers that were able to provide their triplet specific data, three had over 78% for triplet lamb survivability. The characteristics of these flocks included a flock size of 500-1100 ewes and scanning percentage of 173% - 196% and overall docking/tailing percentages of 152% - 168%.

Of the strategies listed in Figure 17, only 'having fewer ewes per paddock that twin bearing ewes' was used by all three of these higher achieving farms. Six other strategies were used by two of the three farms, in various pairs. These included use of:

-shelter belts
-shelter within a paddock
-smaller paddock size than twins
-training ewes to be less flighty around people
-artificially rear one of the triplet lambs
-lambing beats

One allowed ewes to lamb indoors and adopted a triplet lamb onto another ewe, while another farmer used supplementary feed pre-birth along with crops pre and post birth. Just one of these farmers genetically selected for triplet rearing ability.

Note. Triplet specific survival could only be calculated from those that provided the number of ewes scanned as triplets and the triplet specific docking/tailing percentage.

Perception of effectiveness of strategies used to improve triplet survivability

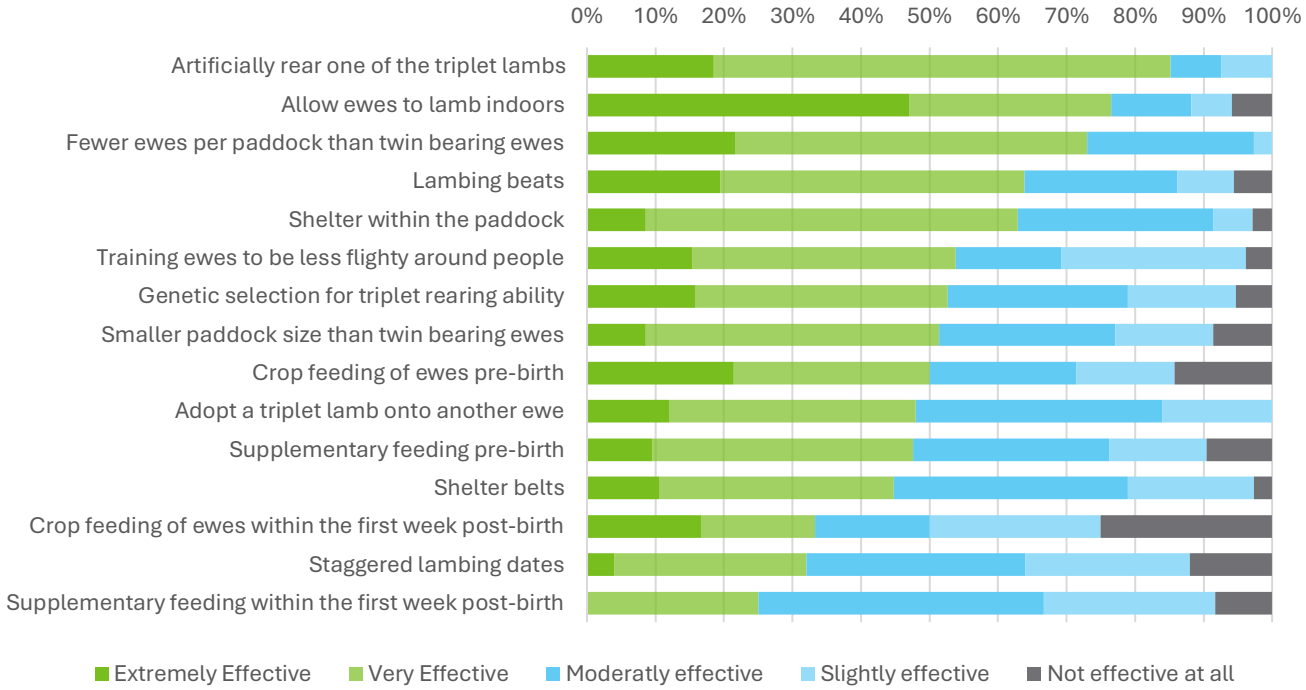


Figure 18. Farmers perception of effectiveness of triplet survival strategies. Unsure responses were removed for this Likert scale chart and are shown in Figure 19 instead.

After gathering data on which strategies farmers used, respondents were then asked about their perceived effectiveness of various triplet survival strategies, both ones they use themselves and ones they did not. The strategies' perceived effectiveness are displayed in Figure 18. Interestingly when ranked by extremely effective and very effective (combined), lambing indoors and artificially rearing come out as the top strategies perceived as being most effective to improve triplet survival.

Farmers were given the option to include other strategies and their perceived effectiveness. These are summarised in Table 3.

Table 3. Other strategies farmers noted and their perceived effectiveness.

Extremely effective	Very effective	Moderately effective
Ewes and lambs have access to a shed as shelter Good weather while lambing Body condition scoring Dilute triplet ewes by lambing with twin ewes Preferentially feeding pre- and post- lambing including lighter ewes Lamb jackets	Easy contour Ewe condition score of 3+ Second shear	Selecting paddocks where ewes are less likely to stray from lambs Lambing on rolling country not dead flat Cull ewes that do not rear all three lambs High quality feed pre and post lambing

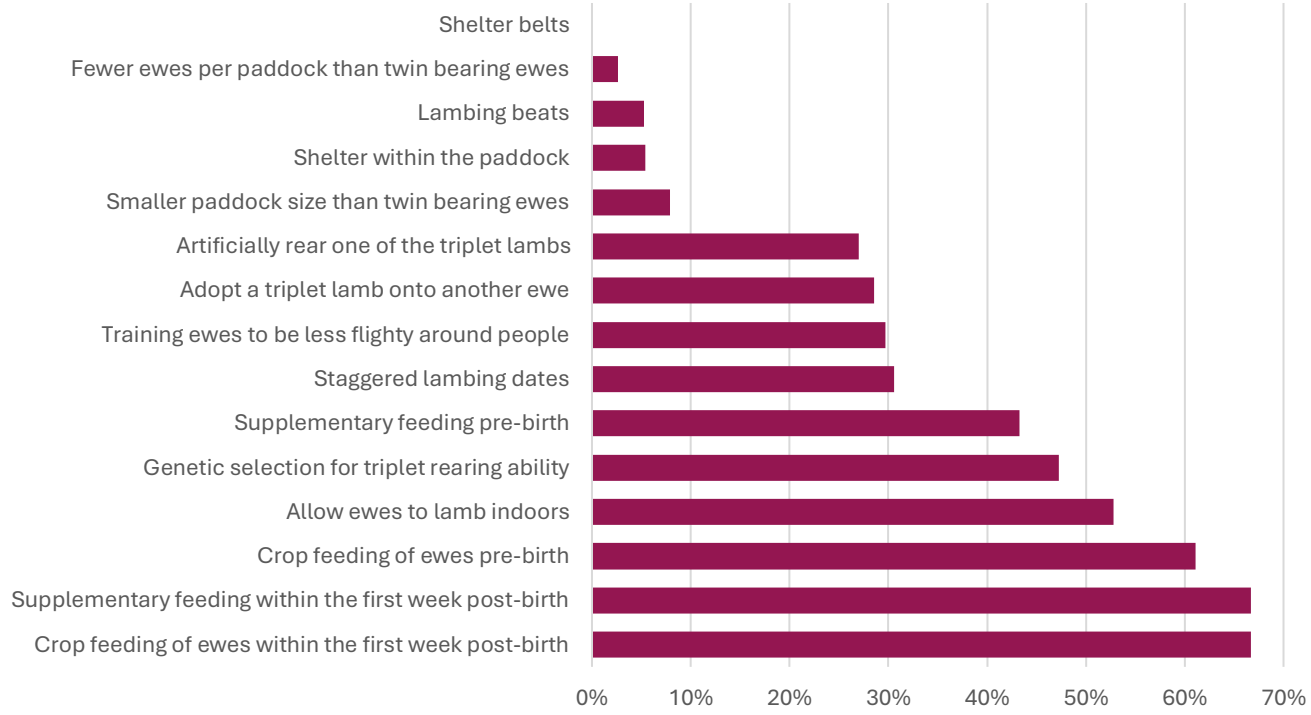


Figure 19. Percentage of farmers unsure about the effectiveness of a strategy.

Many farmers were unsure whether a strategy was beneficial or not in helping triplet lambs survive, displayed in Figure 19. Farmers were most unsure about the use of crop-feeding and supplementary feeding ewes post-birth. Although farmers perceived that indoor lambing would be most effective to improve triplet lamb survival of the strategies listed in Figure 18, 53% of famers were unsure whether the strategy would be effective or not.

95% of farmers were broadly interested in adopting more strategies to improve the survivability of their triplet lambs. Interest in adopting specific strategies to improve triplet lamb survivability will be explored in the next section.

7.1.5 - Alternative opportunities to improve survivability

Two strategies were chosen that have high potential for triplet lamb survival as potential opportunities for farmers to utilise. Farmers' opinions on whether they would be interested in adopting the strategy are analysed below. What information resources and physical resources farmers would like to know or have before adopting the strategy are also explored.

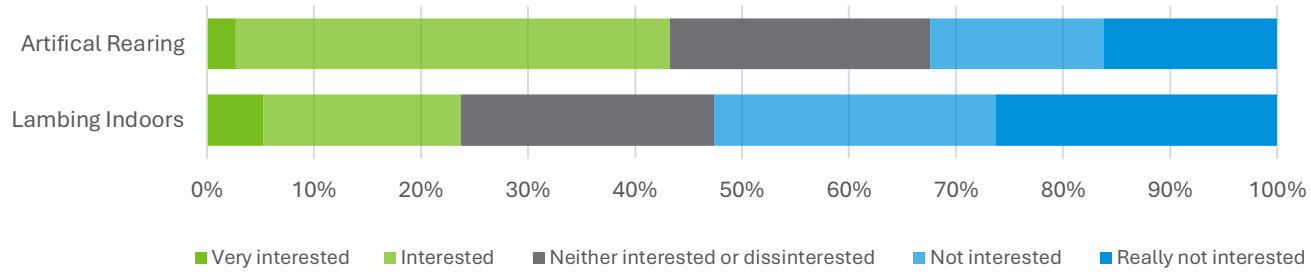


Figure 20. Farmers interest in implementing an indoor lambing or artificial rearing system to improve triplet survivability.

42% of farmers are interested in adopting an artificial rearing system, while 24% are interested in using an indoor lambing system to improve outcomes for triplets (Figure 20). 24% of farmers were neither interested nor disinterested in adopting either strategy.

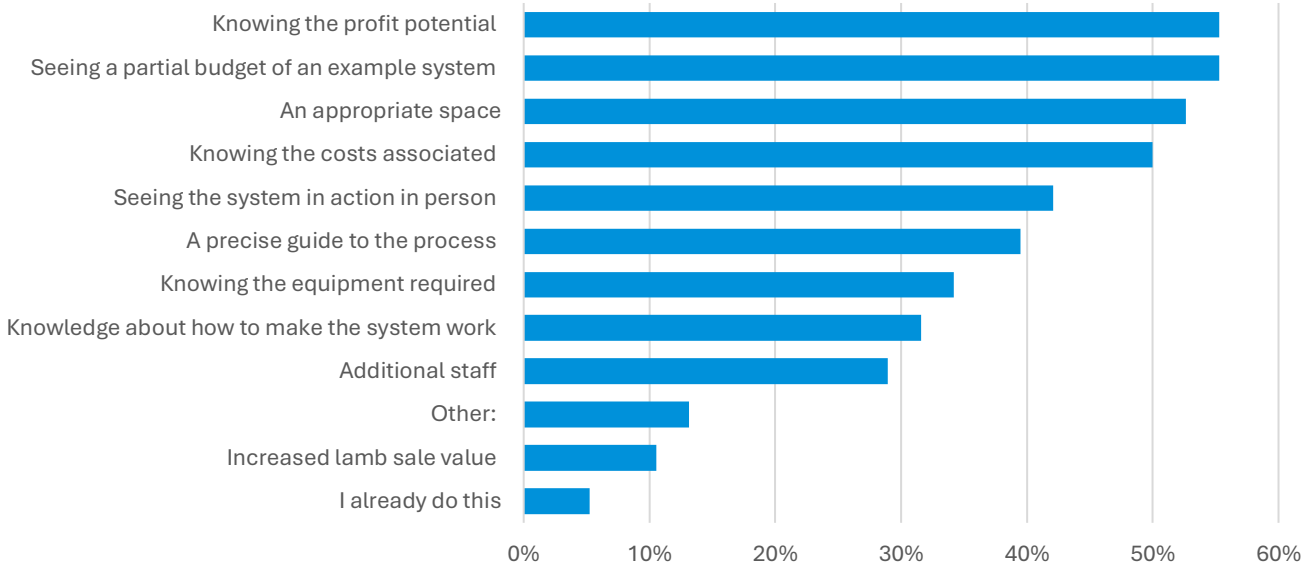


Figure 21. Gaps to implementation of lambing ewes indoors by percentage of respondents.

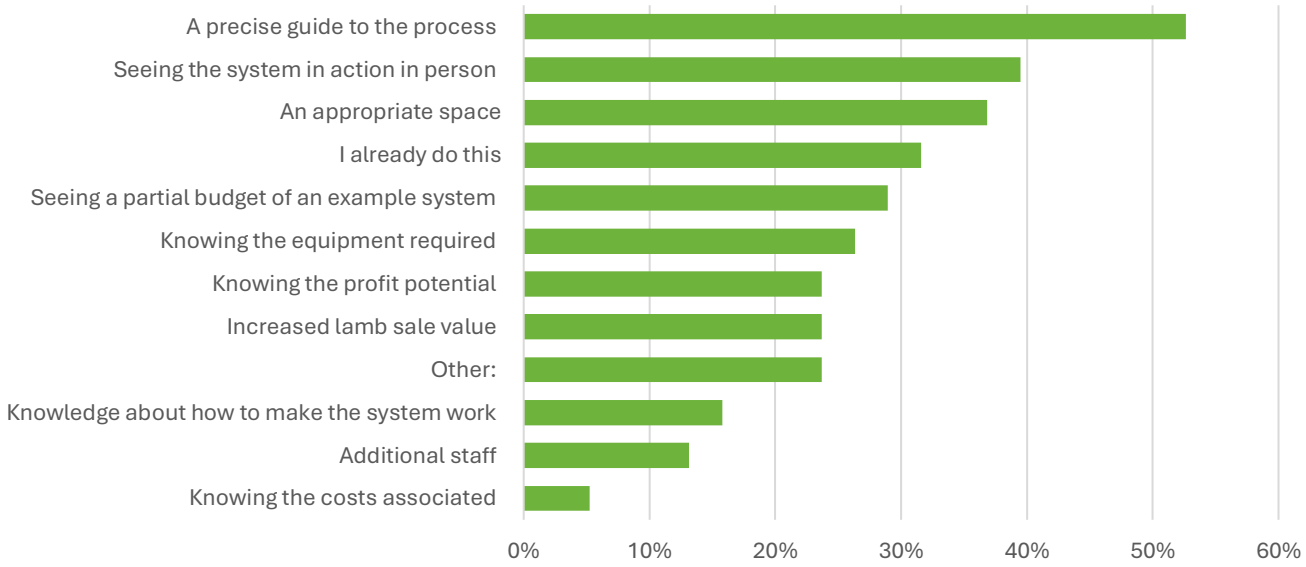


Figure 22. Gaps to implementation of artificially rearing lambs by percentage of respondents.

Figures 21 and 22 illustrate what farmers require to close the gap for adoption of either having ewes lamb indoors or artificially rearing triplet lambs to improve triplet survivability. For both strategies, farmers mostly want more information about the strategies and an appropriate space to house the ewes and lambs. It appears respondents are less confident with implementing an indoor lambing set up as more options were ticked overall. 30% more options were selected under indoor lambing.

Towards the latter end of the survey being open, an additional option was added to understand how many lambs famers already artificially reared. Some stated 30 or less lambs artificially reared and another respondent stated "doing over 60" and another reared 100-150.

7.1.6 - Targets and the future

Respondents were asked about their target scanning percentage and target tailing/docking percentage. Of those that were able to provide the number of ewes to the ram, scanning percentage, docking percentage and also their targets for these key production indicators (KPI), target survivability percentages could be calculated, given in Table 4.

Table 4. Comparison of 2025 actual results compared to target results. This calculation assumes ewe numbers remain the same as 2025 for the target calculation.

	2025 Percentages	Target Percentages
Scanning Percentage	169%	177%
Docking Tailing Percentage	139%	147%
Survival Percentage (Calculated)	82.0%	83.2%

There were some farmers that have targets lower than their 2025 actuals, the majority wanted to increase scanning and docking/tailing percentage. This resulted in a total lamb survivability increase of 1.2% (Table 4).

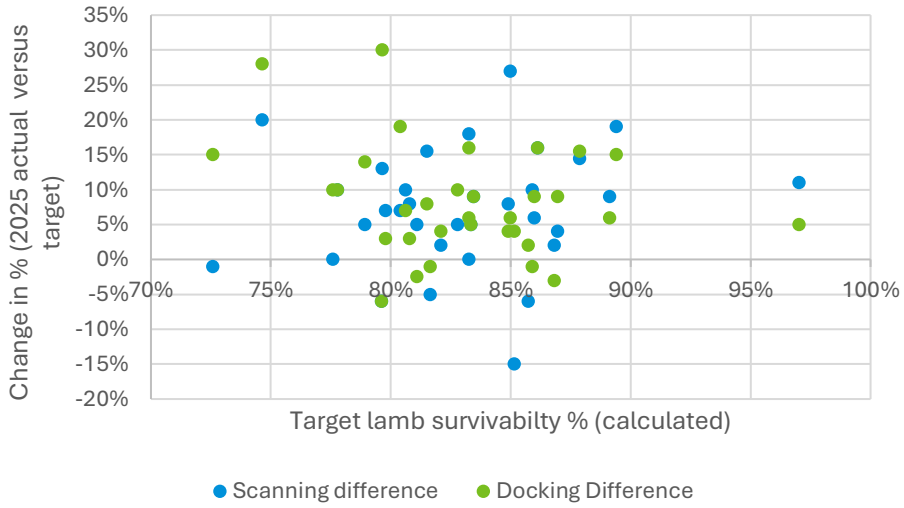


Figure 23. Comparison of 2025 lamb survivability against the change in scanning and docking/tailing percentage between 2025 and their target.

There was little relationship between lamb survivability percentage and change in scanning percentage (R^2=0.0194) and docking/tailing percentage (R^2=0.072) between the 2025 year and the farms target (Figure 23).

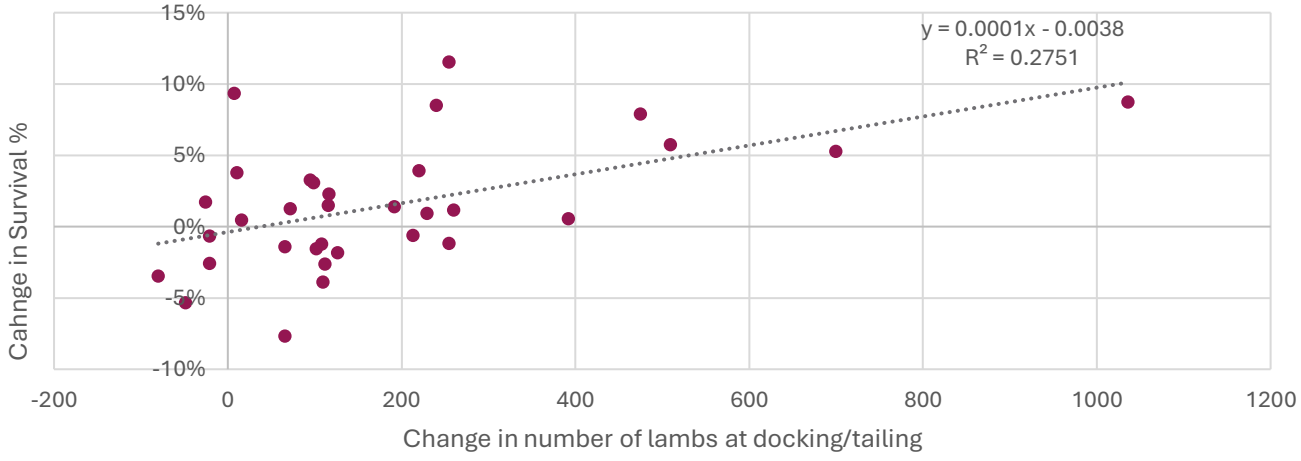


Figure 24. Using the target figures for scanning percentage and docking/tailing (assuming ewe number is the same) shows the change in lamb number and change in survival percentage.

Figure 24 shows some farmers scanning and docking/tailing percentage targets (assuming the same ewe flock number) resulting in some farms decreasing their overall lamb survival percentage. Although no survey data was collected to explain this unexpected result, it is likely this is an arithmetic error on the part of famers surveyed, as it is quite unlikely that any farmer would genuinely desire a lower survival rate for their flocks lambs. Most result in more lambs surviving to docking/tailing as expected.

8. Discussion

8.1 - Introduction

The government of New Zealand has an ambitious goal of doubling the value of New Zealand's export value by 2034 to $106 billion (Ministry for Primary Industries, 2025). The vision of New Zealand being "the world's most trusted provider of high-value food and fibre products", begins with the producers and growers who are supplying the products. Ministry for Primary Industries (MPI) has four outcomes to achieve this goal: prosperity, sustainability, protection and visible leadership (Ministry for Primary Industries, 2026). In pursuit of sustainability they support the agricultural sector to adopt more sustainable practices. One way sustainability can be implemented for businesses is improving their triple bottom line: people, planet and profit. This is an important concept for New Zealand sheep farmers as our product must be successfully marketed to be sold overseas, often aiming at a premium market opportunity to increase the value of product sold without increasing production volume.

Improving survival of triplets has potential for increasing profit for those farms with already high lambing percentages, although it has been established that it is most profitable to increase lamb growth rates of those surviving (Ludemann & Tafford, 2009). Increasing lamb growth rates pre-weaning had a bigger impact on increasing profit than did increasing scanning percentage, particularly those with a lambing percentage of 140% and above already (Moloney, 2022; Moloney et al., 2023). However in saying this, farmers in this survey are targeting scanning and lambing percentages higher than their 2025 actuals.

Focussing only on growth rates or targeting a higher scanning percentage does not improve the overall welfare of all lambs conceived or the wellbeing of the people taking care of the stock. The people and stock need to be considered in the framework for improving triple bottom line and not just profit. As stated by both interviewees from the case studies below, it just makes you feel better knowing you are doing your best for the sheep.

Improving lamb survivability has the ability to improve triple bottom line by increasing:

- **People**
  - Improves farmer wellbeing.
  - Consumers are satisfied knowing stock welfare is excellent.

- **Planet**
  - Improves flock efficiency.
  - Strategies to improve triplet management may benefit the natural environment.

- **Profit**
  - Increase in number of lambs that survive to processing from conception.
  - Public perception of high animal welfare standards means a premium price can be asked.

If farmers have selected for ewes and rams to be more fertile and target higher lambing percentages, then it is the farmers' responsibility to manage the resulting number of lambs including triplet sets and adopt strategies that work for them.

8.2 - Is lamb wastage an issue?

The first question addressed by this report is whether lamb wastage is an issue from the farmer's perspective. The consensus is that it clearly is, with 84% agreeing with the statement and that these losses negatively impacts 28% of farmers mental health. Taking into account there are approximately 22,000 sheep and beef farms (Beef + Lamb New Zealand, 2023), this could be affecting numerous farmers. Recording lamb losses can result in "recording fatigue" that has been shown to negatively affect mental health (Gascoigne et al., 2023.).

Triplets are the focus of this study as they present the greatest potential opportunity from a triple bottom line point of view. 38% of farmers were not satisfied with their farms' triplet survivability and another similar portion were neither satisfied nor dissatisfied suggesting there is potential to make improvements to management practices. All farmers surveyed who had specific triplet survivability over 75% were satisfied with the survival rate. Farmers in this survey reported a 71% average triplet survival this is higher

than the New Zealand triplet survival average of 68% reported by Kenyon et al. (2019) but lower than the New Zealand flock average which is 75% across all lambs Dwyer et al., 2016). These statistics are all below the world flock average lamb survivability of 85% (Erichsen et al., 2024).

Triplet survivability over 75% resulted in farmers feeling satisfied with their triplet survival in this study. Although this is above the average triplet survivability of 68% reported by Kenyon et al. (2019) it is below the world flock average lamb survivability of 85%. To remain competitive with the global sheep industry, there is an opportunity to improve triplet survival to meet the global average. Understandably, triplet lambs are more difficult to maintain the survival of for reasons discussed in the literature review portion of this report, but there are numerous strategies available to increase their survival outcomes, as also reviewed.

8.3 - Key performance indicators as a solution to lamb wastage

In the United Kingdom the Agriculture and Horticulture Development Board has provided farmers with lambs reared key performance indicator (KPI) targets determined by the number of lambs finished as a percentage of the ewes to put to the ram, displayed in Table 5. The targets are adjusted for indoor and outdoor lambing and age of the ewes (Agriculture and Horticulture Development Board n.d.).

Table 5. Key performance indicator (KPI) targets supplied by the Agriculture and Horticulture Development Board for sheep farmers in the United Kingdom. Table adapted from the Agriculture and Horticulture Development Board (n.d.).

Key performance indicators		Performing well	Room to improve	Review performance
Lambs reared	Outdoor lambing ewes and shearlings only	170-155%	155-135%	135-125%
	Outdoor lambing ewes, shearlings and ewe lambs	160-145%	145-125%	125-115%
	Indoor lambing ewes and shearlings only	175-160%	160-140%	140-130%
	Indoor lambing ewes, shearlings and ewe lambs	165-150%	150-130%	130-120%
Lamb losses from scanning to reared		10-12%	12-20%	20-50%

In this report's survey lambs reared was captured to docking/tailing and not to finished as described in Table 5. However, overall lamb docking/tailing percentage from this survey was 139%, and given this is likely to still decrease slightly to a finished date, this puts New Zealand farmers on average in the lower end of the "room to improve" category of "outdoor lambing ewes and shearlings only". Lamb losses percentage (18% average for total ewe flock in this study) also fell into the bottom end of the "room to improve" range, although again a slightly narrower window of time was captured, and likely to be lower by the finished date. This international comparison shows New Zealand farmers are not keeping pace with global metrics on lamb survivability.

At present, there appears to be limited guidance on what constitutes an acceptable level of lamb loss in New Zealand. Developing lamb survival benchmarks, similar to those presented in Table 5 but tailored to New Zealand farming systems and breeds, could provide farmers with a useful point of reference for evaluating their own flock performance. A benchmark would allow farmers to compare their results against a national standard rather than relying on personal expectations. National standard lambing survival targets would need to be determined taking into account New Zealand farming characteristics and produced with input from expert knowledge from industry bodies, universities and farmers.

Lamb survival may also become an increasingly important component of farm certification standards as consumer and supply chain expectations continue to evolve. Consumers are demanding via their suppliers to know more about where their food comes from and that stock are raised with the best welfare practices (New Zealand Farm Assured, n.d.).

8.4 - Strategies being used to improve triplet lamb survivability and their perceived effectiveness

The second objective of this report was to understand the strategies that are currently being used in New Zealand sheep farming systems to improve triplet survivability outcomes and their perceived effectiveness.

Perceived effectiveness was addressed as it identifies which strategies farmers believe are effective for improving triplet lamb survivability regardless of whether they have personal experience with them.

Famers claimed to use a range of strategies to support the likelihood of their triplet lambs surviving. It was interesting to note when comparing the top three triplet lamb survivability farms in this study that they all used different combinations of strategies. This emphasises how different farms have different challenges and that there are different methods to manage triplet survivability. Farmers need to understand their farm and what they are capable of implementing lest their investments outweigh the benefits.

Interestingly, farmers perceived artificial rearing and allowing ewes to lamb indoors as the most effective strategies when combining the "extremely" and "very effective" ratings. However, these strategies were not predominately used by farmers. Lambing indoors was one of the least used strategies and artificially rearing one of the triplets was used only by 17% of famers surveyed.

It appears there is room for more education for farmers in this space around what strategies are actually effective and practical to implement. There would also be scope for investigation into what combination of strategies produce better survivability together.

8.5 - Are farmers interested in using other strategies to improve triplet survival?

Question three explored whether farmers were interested in using more intensive strategies to improve the survivability of their triplet lambs. This study has already determined 95% of farmers are interested in adopting more strategies to improve triplet survivability. Most lamb deaths occur within the first three days post-partum (Holmøy et al., 2017) largely from either dystocia or starvation/exposure (Kerslake et al., 2005). This window provides a time-critical opportunity for human intervention or strategy to occur to impact the largest number of lambs at their most vulnerable.

Farmers were specifically surveyed on their interest in adopting the strategies of artificial rearing of lambs and having ewes lamb indoors. Approximately half of farmers are interested in adopting artificial rearing. 32% are already artificially rearing some lambs, although information about scale and targeted lambs was not collected. 24% of farmers reported being interested in lambing ewes indoors as a strategy. 5% of farmers in this survey stated they are already lambing indoors, which is comparable to research on New Zealand farming practices at large (Erichsen et al., 2024).

A stud farmer noted in this survey they were not interested in adopting artificial rearing or lambing ewes indoors for their stud flocks due to wanting to market their flocks as able to tolerate extensive farming systems. Using either of these systems does not expose their flocks appropriately to determine phenotypes.

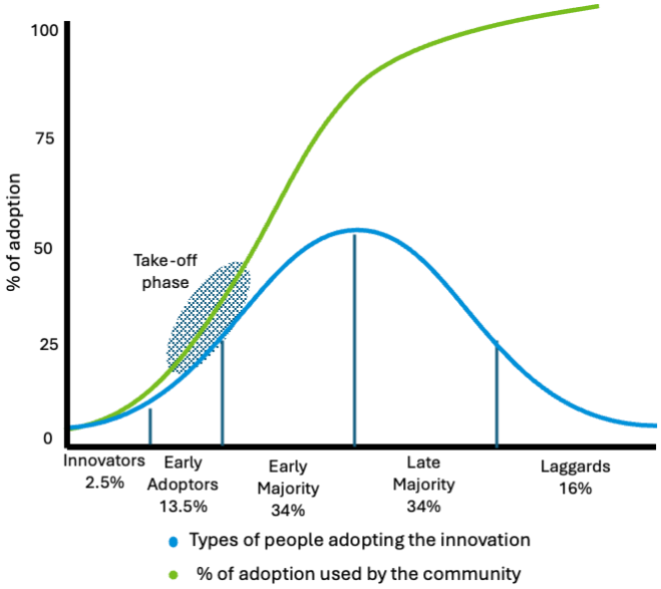


Figure 25. Diffusion of Innovation Model. Adapted from Rogers (1983).

Based on the diffusion of innovation model (Rogers, 1983) illustrated in Figure 25, lambing ewes indoors is currently practiced by innovators in New Zealand and some early adopters.

If the 24% of farmers interested in lambing indoors can be convinced to utilise the strategy on their farms it would account for the rest of the early adopters and some of the early majority. This would put the strategy well into the take-off phase, creating a cultural shift to convince the rest of farmers in New Zealand to implement this strategy.

Case study A presents a famer who recognised they had an unacceptable number of ewe deaths in their triplet bearing ewes and decided to implement an indoor lambing strategy to mitigate this. Later this developed into including lambing single-bearing ewes indoors, partly to prevent them from a birth related death and to be available to foster triplet lambs. Although this was implemented for ewe survivability, it also measurably improved triplet survivability outcomes.

Case study A: Summary of an interview describing ewes lambing indoors in New Zealand (Anonymous Farmer A, personal communication, March 25, 2026).

Farmer A has a flock of sheep that normally has 15-30% of ewes lambing triplets and was concerned about the approximately 10% ewe death rate at lambing each year.

The farmer implemented a style of indoor lambing, taking inspiration from the United Kingdom systems. Initially described as "doom and gloom" but now the system is "cruisy". Farmer A did initially artificially rear 50 triplet lambs, but then expanded their system to bring singles in to birth due to their own birthing issues and additionally providing the opportunity to foster a triplet onto them if necessary.

Key aspects of the system:

- Rams are fitted with a harness and raddle changed every 6 days to determine ewe lambing date.
- Ewes are scanned and drafted into their birth rank mobs.
- Use covered yards with sides and mobile yards, cover dirt floor with straw.
- Most triplet and single-bearing ewes come inside in their birthing window, therefore rotated through.
- Ewes spend approximately 5 days under the covered yards, where they lamb.
- Fed peas and lucerne while in the shed.
- Someone available to assist ewes and lambs 16 hours per day.
- Half to a third of triplet-bearing ewes keep all three lambs to rear themselves, but a struggling triplet can be fostered onto a single, by covering it in recent birth fluids.
- Do usually employ another staff member for the lambing season, but can do it on their own.
- Put triplet ewes and her lambs out to ryegrass pasture of 2500kgDM/ha post-lambing and bonding.

Other important notes from Farmer A:

- Do it first for welfare, then profit (ewes survival alone covers the cost of the system).
- Can utilise the infrastructure you already have.
- Opportunity to match lambs and ewes via EID ear tag easily.
- Opportunity to do tailing and marking as they leave the shed.

A Beef + Lamb New Zealand (2025) report suggested there is a profit opportunity to "add a potential $14,000 for a North Island Hill Country farm or $20,000 for a South Island Finishing-Breeding farm" by lifting lambing percent from 120% to 125%. For a farm with 3000 ewes this is the equivalent of keeping just another 150 lambs alive. Simply put, if 228 triplet bearing ewes lamb outdoors in New Zealand 68% will survive on average producing 465 lambs of 684 potential lambs (Kenyon et al., 2019). However if 228 triplet bearing ewes lamb indoors and 90% (lower end of survival range from Binns et al. (2002)), of the lambs survive there will be an additional 150 lambs surviving. This would result in increasing lambing percentage by 5% as suggested to increase profit by the Beef + Lamb New Zealand (2025) report. This could be as few as 38 ewes per week lambing indoors over 6 weeks. This does not take into account additional costs associated with indoor lambing which would be farm dependent.

Artificial rearing on the other hand has been adopted by 30% of farmers surveyed suggesting implementation by those in the early majority section and therefore the practice is in the take-off phase already.

Case study B presents a farmer who had an issue with a highly fecund flock resulting in so many multiples including quintuplets, that the anticipated number of lamb deaths was overwhelming. They decided it was better not to scan for multiples and not identify their actual scanning percentage because it was "too scary" prior to implementing artificial rearing policies and removing the Inverdale gene.

The farmer decided to implement an artificial lamb rearing strategy to improve lamb survivability alongside breeding out the Inverdale gene to reduce the high fecundity of the flock. This dual

approach reduced the number of lambs conceived and improved the welfare of the lambs born. Which allowed them to feel they had "made the most of what you can do".

Case study B: Summary of an interview describing use of an artificial lamb rearing system in New Zealand (Anonymous Farmer B, personal communication, May 1, 2026).

Farmer B had a ewe flock that had many sets of multiples including quintuplets due to the Inverdale gene, enough that scanning for multiples felt overwhelming.

- 8000 Ewes
- Perendales with high fecundity
- Naturally poor mothers

Farmer B recognised that their survival of lambs was below their own acceptable level and wanted to do something about it because they "loved lambs and animals". They were able to consider changing their lamb management system because they were spending more time at home due to the age of their children.

Farmer B decided on implementing an artificial lamb rearing system, rearing approximately 600 lambs. The lambs targeted for artificial rearing changes each season depending on the weather and the pasture availability. The usual rule is to just take what looks like it is struggling or anticipated to struggle. This often results in ewes being left with two and taking away the extras.

They have been now doing this for 8-10 years and believe it **works well for them because:**

- It is low input (no need for "fancy auto-feeder", use buckets, drums, pipe, valves).
- Have the resources set up and rear them out of the large machinery shed with mobile yards.
- Have years of experience on how to run their system efficiently, and have learned along the way.
- One of them is very handy with tools and "kiwi ingenuity".
- More lambs survive in the shed and they feel the ones left on mum thrive with less competition.
- Makes them feel better that they are doing their best for their stock.

Key aspects of the system:

- Pick up approximately 50 lambs per day during the lambing period.
- All lambs get tube fed colostrum (from dairy cows) on arrival to the lamb shed regardless of initial health.
- Three-pen system: drop pen, transition pen, settled-in pen.
- Lambs are fed via an ad libitum system.
- Spray paint colour to mark lambs to track arrival date.
- Rubber bands on legs to keep track of which lambs have fed and are capable of feeding themselves before moving to the settled-in pen.

Other important notes from Farmer B:

- It is a time commitment.
- You must love lambs.
- Cost is $80-$90 per head, not including time.

This survey shows New Zealand sheep farmers have sufficient interest in uptake of artificial rearing or lambing ewes indoors to justify exploring what would be required to increase uptake. The case study examples show these strategies can both be successfully incorporated into New Zealand sheep farming systems and show benefits for lamb and ewe survivability as well as making farmers feel better about their stock welfare.

8.6 - What do farmers need to adopt other strategies?

Question four was about learning what it would take to encourage more farmers to adopt artificial rearing or lambing ewes indoors for the benefit of improving triplet lamb welfare.

Dwyer et al., (2016) investigated why uptake of strategies have not occurred to improve lamb survivability, despite many studies showing better outcome scenarios with certain strategies. They reflected on how studies are very specific to a particular survivability factor (e.g. ewes per paddock, nutrition intake) and often only able to analyse one factor at a time in small trial groups. Many studies lack specifics on how to implement the better outcome scenario at scale or within a full farm system and do not provide financial benefits and drawbacks of implementation.

As determined in this survey, farmers believe both artificial rearing and indoor lambing are effective for triplet lamb survivability improvement. To drive potential implementation among potential adopters it is standard practice to determine what information they specifically require before uptake (Rogers, 1983).

Figures 21 and 22 show what resources farmers need to bridge the adoption gap. Of the resources farmers identified as implementation gaps, most highly ranked was informational resources. There are many resources online for artificial rearing, but none specifically for commercial sheep and beef farmers in New Zealand. Industry education groups should create resources for New Zealand farmers using information already available but tailored for the New Zealand commercial farm system. The same can be said for lambing ewes indoors, a practice which is very successful outside of New Zealand, but sees little uptake here.

An informational resource commonly requested by farmers in discussion of these two strategies is specific financial viability information. Both case studies examined here have chosen to take a well-rounded approach to their triple bottom line, people, planet, and profit.

Both case studies identified the welfare of their stock was compromised prior to implementation of the new to them strategies and that the farmers did not feel they were making the best management decisions for themselves or their stock. They both implemented a new practice to support survivability of ewes and lambs which in turn also benefited their farm business profit. Both case studies emphasised that these implementations additionally benefitted the planet and people component of their triple bottom line. The planet is benefited through increased farming efficiency by reducing stock wastage, while the farmers involved felt better about their farming practices which addresses the people component.

Both case studies noted that even if profit did not increase due to the uptake of the strategy, it was worthwhile regardless, due to the benefits of lamb welfare and the feeling of doing their best. These often underappreciated factors show how farming systems can positively influence famer mental health and use of either of these methods could help alleviate negative emotions that farmers are feeling around their lamb survivability.

Outside of information requirements, farmers felt they still required a dedicated space to carry out artificial rearing or indoor lambing, 37% and 53% respectively. Conversely, both case studies emphasised that investment in new dedicated structures was not required and that they were able to make use of the infrastructure that they already had to implement these strategies, using mobile yards to divide the existing spaces into smaller pens.

Both case studies emphasised that there were growing pains with their chosen strategy, but they were glad they were early adopters in New Zealand, that they could see the benefit to their farm, and would continue to implement these strategies for the foreseeable future.

8.7 - Further barriers to uptake

Dodunski (2014) attributes the marginal profitability of many New Zealand sheep farms to a "continued failure of a large percentage of sheep farmers to apply accepted best-practice management within the farmgate." Although there is much published information around lowering lamb wastage, farmers may find this information difficult to parse without specific instructions.

Dodunski (2014) also notes that farmers like experiencing things in-person when pursuing new ideas. Industry-led farmer education field days would meet this requirement. However, attendance at these events can be unexceptional, as a Beef + Lamb New Zealand survey found 66% of farmers only occasionally attend field days and another 16% never attend (Dodunski, 2014).

Botha et al., (2015) found that farmers most preferred education style included person to person learning. This suggests farm advisors can help famers learn in the way they prefer. When farmers work with advisors they are more likely to make a plan and act on it, which can help famers adopt permanent changes to their farm system (Dwyer et al., 2016). Beef + Lamb New Zealand's focus groups may also fill this gap in providing space for farmers to learn from one another in small group environments.

8.8 - Implementing change

The issue of triplet survivability is not going anywhere because triplets are not going away. Farmers are still targeting higher scanning and lambing percentages with little improvement to lamb survivability. Increasing scanning percentage typically increases the number of triplet bearing ewes if genetic rate is not also targeted through breeding objectives (Amer & Bodin, 2006).

Although farmers report they are concerned about their triplet survivability and are implementing strategies to improve the survivability outcomes, these strategies are not effective enough when comparing survivability outcomes of lambs globally. Based on the literature, artificial rearing and indoor lambing are effective for improving lamb survival but are not well applied in New Zealand. This study has demonstrated there is significant interest to increase industry body education in these areas.

Working within the bounds of social licence is a nebulous limitation farmers must navigate. A time may come when farmers must report their lamb survivability as part of certifications to receive a premium for their product. In the meantime, industry guidance on acceptable loss rates would be helpful to ensure farmers are on the right track. Famers with suboptimal lamb survivability may face increasing pressure to improve performance as market expectations, industry initiatives and regulatory requirements continue to evolve.

In the survey, although most farmers did scan for triplets, they did not provide a triplet docking percentage. Given they have already scanned for triplets this could be a manageable number to record. Recording triplet survivability year to year will demonstrate whether strategies are working on farm, although it should be emphasized that any small change in a direction to improve lamb survival is beneficial to the farm's triple bottom line.

A study by Greer et al. (2015) found that New Zealand farmers want more research on the topic of lamb survival, however after completing this literature review it appears there is sufficient information available to improve New Zealand lamb survivability to match top performers globally. Rather than a total research deficit, it is the ability of farmer implementation that is limiting progress through lack of actionable information targeted at New Zealand sheep farmers.

9. Conclusions

In order for New Zealand to remain globally competitive with a premium product, farmers need to do better than just maintain their social licence to farm, they need to stay ahead of certification requirements and anticipate what consumers want. A way to pre-empt these demands is ensuring the welfare of the lambs being born and that they are able to survive to become a product of value. Lamb wastage is an issue for New Zealand farmers and affects their mental health negatively. Triplet lambs offer the greatest opportunity for improving overall lamb survival given farmers are still chasing higher scanning percentages and triplets are at a greater risk of dying compared to their single and twin counterparts.

It is important to highlight that raising weaning weights is still more profitable than lifting scanning percentage when lambing percentage is 140% or above however, this does not improve the welfare of lambs which die.

This study has shown that there is a proportion of famers that are not satisfied with their management of triplets on farm and their resulting survivability. There appears to be a range of strategies used by famers to improve the survivability of their lambs, but there is little correlation between strategies used and their perceived effectiveness. The top three farms for triplet survivability in this study all used different sets of strategies in combination, leaving a lack of a clear pattern for success.

From the literature, triplet lambs are most susceptible to death by dystocia or exposure/starvation within the first few days post-partum. Human intervention at this stage would therefore be a logical place to input a strategy. This assumes the ewe has been adequately maintained up to this point. Otherwise there are likely interventions for the ewe prior to pregnancy or birth that should be first prioritised.

Both strategies, allowing ewes to lamb indoors and artificially rearing at least one triplet lamb are more intensive than lambing out in paddocks without human intervention, but have been shown as reliable strategies to improve triplet survivability outcomes globally. Indoor lambing in particular is well used in the United Kingdom, where survivability is better on average than in New Zealand, likely due to the ability of farmers to step in if the ewe is having birthing difficulties as well as ewes and lambs being kept close during the bonding phase. Indoor lambing allows the impact of dystocia to be controlled, removes the weather effect that can cause a lamb to die of exposure, and farmers can ensure lambs are adequately fed.

Artificial rearing shows great promise as a method to improve survival outcomes for triplets. Lambs are typically removed from the inclement weather and guaranteed to be fed suitably. This method removes only some the exposure/starvation factor as lambs are still born outside, but helps lambs that would have otherwise died from the delayed effects of dystocia. This method is similar to calf rearing already well used in the dairy industry and calf rearing expertise could be adapted for a lamb rearing system.

Almost half of farmers were interested in adopting artificial rearing, while a quarter were interested in lambing ewes indoors. This suggests industry body investment in resources to help farmers implement these strategies could be of value. Industry bodies can start with what famers have suggested they need including: budgets, ideas on infrastructure alternatives, seeing these strategies in action, and being able to talk to farmers already implementing these strategies. The diffusion of innovation has started for both indoor lambing and artificial rearing, but it will take continued investment, education and a cultural shift to keep increasing the proportion of use.

It is clear that famers acknowledge there is a lamb survivability issue in New Zealand, and that farmers want to improve the survival of their triplet lambs. The information gathered for this report was used to form recommendations for industry organisations to support farmers which can be found below.

If sheep farming in New Zealand wishes to remain sustainably competitive in a global market with increasingly granular consumer standards then improving lamb survivability is not just an option but a requirement.

10. Recommendations

⇒ **Lamb survivability benchmarks and KPIs**

- Industry organisations along with universities, industry professionals, and farmer representatives need to create lamb survivability targets within the next year for total lambs and each birth rank to encourage improvement of a farm's triple bottom line. Uptake and lamb survival of different birth ranks must be measured by farmers each year to determine lamb survivability trends. This would give farmers an evidence based benchmark against which to measure their own farm systems.

⇒ **Farmer resources**

- Industry organisations need to modify and create informational resources with the input of those already implementing artificial rearing and lambing indoor strategies within the next two years. These resources should give farmers actionable, relevant and easily understood information on how to incorporate these methods into their sheep farming systems. Industry organisations should measure the uptake and success of these strategies each year.

⇒ **Genetic improvement**

- The nProve Tracker online tool from Beef + Lamb Genetics provides famers with the information to make decisions to improve the genetic merit of their flock survival. The impact of individual ram genetics on flock survivability can now be measured and tracked. To allow time for genetic progress, in one, five, and ten years Beef + Lamb Genetics should investigate whether nProve Tracker has aided in the improved survivability of lambs on commercial farms.

11. Limitations of this study

There are limitations to this study.

For the literature review section, there is limited information on triplet survivability specifically, many write about the flock as a whole or focus on single or twin lambs. Triplets have become more common only in the last 30 years and they are harder to keep track of in a paddock for studies.
At the same time as being limited there were other areas that were abundant with information and with a tight time-frame in which to complete this study, not everything could be read.

The results analysed from the survey are limited by the number of surveys completed. There is a bias towards those that can access the internet and use it. There may have been more responses if paper versions had also been sent out. There is likely a bias towards those that are already thoughtful about triplets because the word "triplet" was used in the title and summary. There may also be bias around the answers that were given as the survey was carried out by people willing to do a survey for a stranger and they may collectively think in a similar way. However, there appears to be an appropriate spread of responses from the various land classes and are similar proportions to the Beef + Lamb New Zealand Economic Survey data.

12. References

Agriculture and Horticulture Development Board. (n.d.). *Key performance indicators (KPIs) for lamb sector*. Retrieved June 5, 2026, from https://ahdb.org.uk/key-performance-indicators-kpis-for-lamb-sector

Alexander, G., Stevens, D., Kilgour, R., de Langen, H., Mottershead, B. E., & Lynch, J. J. (1983). Separation of ewes from twin lambs: Incidence in several sheep breeds. *Applied Animal Ethology*, *10*(4), 301–317. https://doi.org/10.1016/0304-3762(83)90181-5

Amer, P. R., & Bodin, L. (2006). *Quantitative genetic selection for twinning rate in ewes*. 66.

Amer, P. R., McEwan, J. C., Dodds, K. G., & Davis, G. H. (1999). Economic values for ewe prolificacy and lamb survival in New Zealand sheep. *Livestock Production Science*, *58*(1), 75–90. https://doi.org/10.1016/S0301-6226(98)00192-4

Arnold, G. W., & Morgan, P. D. (1975). Behaviour of the ewe and lamb at lambing and its relationship to lamb mortality. *Applied Animal Ethology*, *2*, 25–46.

Atkinson, L., Doyle, R. E., Woodward, A., & Jongman, E. C. (2022). Exposure to humans after weaning does not reduce the behavioural reactivity of extensively reared Merino lambs. *Behavioural Processes*, *201*, 104709. https://doi.org/10.1016/j.beproc.2022.104709

Beef + Lamb Genetics. (n.d.-a). *nProve*. Retrieved May 29, 2026, from https://nprove.nz/#/home

Beef + Lamb Genetics. (n.d.-b). *nProve Tracker*. Retrieved May 29, 2026, from https://tracker.nprove.nz

Beef + Lamb New Zealand. (n.d.-a). *Farm classes*. Retrieved May 30, 2026, from https://beeflambnz.com/industry-data/farm-data-and-industry-production/farm-classes

Beef + Lamb New Zealand. (n.d.-b). *Lambing Calculator*. Beef + Lamb New Zealand. Retrieved February 24, 2026, from https://tools.beeflambnz.com/lambing-calculator

Beef + Lamb New Zealand. (n.d.-c). *Trade Policy*. Retrieved April 23, 2026, from https://beeflambnz.com/markets/trade/trade-policy

Beef + Lamb New Zealand. (2007, February). *Fact sheet: Abortion in ewes*. https://beeflambnz.com/sites/default/files/factsheets/pdfs/fact-sheet-88-abortion-in-ewes.pdf

Beef + Lamb New Zealand. (2013). *Making every mating count*. https://beeflambnz.com/knowledge-hub/PDF/making-every-mating-count.pdf

Beef + Lamb New Zealand. (2019, September). *Fact sheet: Feedsmart feed table-pregnant ewes*. Beef + Lamb New Zealand. https://beeflambnz.com/sites/default/files/factsheets/pdfs/fact-sheet-83-feedsmart-feed-table_0.pdf

Beef + Lamb New Zealand. (2023). *Compendium of New Zealand farm facts 2023*. https://beeflambnz.com/knowledge-hub/PDF/farm-facts-2023.pdf

Beef + Lamb New Zealand. (2025a, August 25). *Indoor lambing system continues to deliver*. Beef + Lamb New Zealand. https://beeflambnz.com/news/indoor-lambing-system-continues-deliver

Beef + Lamb New Zealand. (2025b, September). *New Season Outlook 2025-26*. https://beeflambnz.com/knowledge-hub/PDF/new-season-outlook-2025-26.pdf

Beef + Lamb New Zealand. (2025c, December). *Lamb crop report 2025*. https://beeflambnz.com/sites/default/files/2025-12/Lamb%20Crop%20Report%202025%20%281%29.pdf

Beef + Lamb New Zealand. (2026a, March). *Mid-Season Update 2025-26*. Beef + Lamb New Zealand. https://beeflambnz.com/sites/default/files/2026-03/MSU-2025-26-report.pdf

Beef + Lamb New Zealand. (2026b, May 19). *Beef + Lamb New Zealand launches tool to help sheep farmers unlock flock value | Beef + Lamb New Zealand*. https://beeflambnz.com/news/genetics-tool-helps-sheep-farmers-unlock-flock-value

Beef + Lamb New Zealand. (2026c). Beef + Lamb New Zealand Economic Service: Sheep and Beef Farm Survey Analysis

Belanche, A., Cooke, J., Jones, E., Worgan, H. J., & Newbold, C. J. (2019). Short and long term effects of conventional and artificial rearing strategies on the health and performance of growing lambs. *Animal*, *13*(4), 740–749. https://doi.org/10.1017/S1751731118002100

Binns, S. H., Cox, I. J., Rizvi, S., & Green, L. E. (2002). Risk factors for lamb mortality on UK sheep farms. *Preventive Veterinary Medicine*, *52*(3–4), 287–303. https://doi.org/10.1016/S0167-5877(01)00255-0

Bioeconomy Science Institute. (2000, July 3). Genetic discovery leads to more lambs. AgResearch. https://www.agresearch.co.nz/news/genetic-discovery-leads-to-more-lambs/

Botha, N., Atkins, K., & Roth, H. (2015). How New Zealand Farmers Prefer To Learn. *1st Australian Farming Systems Conference*. https://doi.org/10.13140/RG.2.1.4861.8721

Bull, C., & Binnie, B. (2006). Artificial rearing of lambs – avoiding abomasal bloat. *New Zealand Society of Animal Production*, *66*, 386–389.

Corner-Thomas, R. A., Kenyon, P. R., Morris, S. T., Ridler, A. L., Hickson, R. E., Greer, A. W., & Logan, C. M. (2014). Brief Communication: Ewe ultra-sound pregnancy diagnosis and its use by New Zealand farmers. *Proceedings of the New Zealand Society of Animal Production*, *74*, 65–67.

Cranston, L. M., Kenyon, P. R., Corner-Thomas, R. A., & Morris, S. T. (2017). The potential interaction between ewe body condition score and nutrition during very late pregnancy and lactation on the performance of twin-bearing ewes and their lambs. *Asian-Australasian Journal of Animal Sciences*, *30*(9), 1270–1277. https://doi.org/10.5713/ajas.16.0641

DairyNZ. (2023). *View from the cowshed 2023*. https://www.dairynz.co.nz/media/lmhntgck/view-from-the-cowshed-2023-oct2023.pdf

Dalton, D. C., Knight, T. W., & Johnson, D. L. (1980). Lamb survival in sheep breeds on New Zealand hill country. *New Zealand Journal of Agricultural Research*, *23*(2), 167–173. https://doi.org/10.1080/00288233.1980.10430783

Davies, D. A. R. (1999). Performance of ewes selected to have four functional teats. *Proceedings of the British Society of Animal Science*, 117–117. https://doi.org/10.1017/S1752756200002726

Dodunski, G. (2014). Knowledge transfer to farmers. *Small Ruminant Research*, *118*(1–3), 103–105. https://doi.org/10.1016/j.smallrumres.2013.12.010

Dwyer, C. M. (2008). Genetic and physiological determinants of maternal behavior and lamb survival: Implications for low-input sheep management. *Journal of Animal Science*, *86*, E246–E258. https://doi.org/10.2527/jas.2007-0404

Dwyer, C. M., Conington, J., Corbiere, F., Holmøy, I. H., Muri, K., Nowak, R., Rooke, J., Vipond, J., & Gautier, J.-M. (2016). Invited review: Improving neonatal survival in small ruminants: science into practice. *Animal*, *10*(3), 449–459. https://doi.org/10.1017/S1751731115001974

Dwyer, C. M., Lawrence, A. B., Bishop, S. C., & Lewis, M. (2003). Ewe-lamb bonding behaviours at birth are affected by maternal undernutrition in pregnancy. *The British Journal of Nutrition*, *89*(1), 123–136. https://doi.org/10.1079/BJN2002743

Elliott, J., Sneddon, J., Lee, J. A., & Blache, D. (2011). Producers have a positive attitude toward improving lamb survival rates but may be influenced by enterprise factors and perceptions of control. *Livestock Science*, *140*(1–3), 103–110. https://doi.org/10.1016/j.livsci.2011.02.015

Erichsen, C., Coombs, T., Sargison, N., McCoard, S., Keady, T. W. J., & Dwyer, C. M. (2024). Improving triplet lamb survival: Management practices used by commercial farmers. *Frontiers in Veterinary Science*, *11*, 1394484. https://doi.org/10.3389/fvets.2024.1394484

Everett-Hincks, J. M., Blair, H. T., Stafford, K. J., & Lopez-Villalobos, N. (2004). *The effect of ewe nutrition on maternal behaviour score and litter survival*.

Everett-Hincks, J. M., Dodds, K. G., & Kerslake, J. I. (2007). Parturition duration and birthing difficulty in twin and triplet lambs. *Proceedings of the New Zealand Society of Animal Production*, *67*, 55–60.

Ferguson, D. M., Schreurs, N. M., Kenyon, P. R., & Jacob, R. H. (2014). Balancing consumer and societal requirements for sheep meat production: An Australasian perspective. *Meat Science, Meat Science, Sustainability & Innovation: '60th International Congress of Meat Science and Technology 17-22 August 2014, Punta Del Este, Uruguay,'* *98*(3), 477–483. https://doi.org/10.1016/j.meatsci.2014.06.020

Fisher, M. W., & Mellort, D. J. (2002). The Welfare Implications of Shepherding During Lambing in Extensive New Zealand Farming Systems. *ResearchGate*, *11*(2), 157–170. https://doi.org/10.1017/S0962728600028128

Flay, K. J., Ridler, A. L., Compton, C. W. R., & Kenyon, P. R. (2021). Ewe Wastage in New Zealand Commercial Flocks: Extent, Timing, Association with Hogget Reproductive Outcomes and BCS. *Animals*, *11*(3), 779. https://doi.org/10.3390/ani11030779

Gascoigne, E., Corbishley, A., & Davies, P. (2023, January). *Targeting lamb survival in commercial flocks: Inspiring and effecting change*. https://doi.org/10.1002/inpr.238

Goffin, A. (2014). *Farmer Mental Health Review*. Accident Compensation Corporation. https://www.acc.co.nz/assets/research/dcaf5b4e0d/farmer-mental-health-review.pdf

Greer, A. W., Corner-Thomas, R. A., Logan, C. M., Kenyon, P. R., Morris, S. T., Ridler, A., Hickson, R., & Blair, H. (2015). Perceived importance of areas of future research: Results from a survey of sheep farmers. *New Zealand Journal of Agricultural Research*, *58*(4), 359–370. https://doi.org/10.1080/00288233.2015.1037461

Haslin, E., Blumer, S. E., Gordon, D., Kearney, G. A., Kenyon, P. R., Kubeil, L. J., Refshauge, G., Trompf, J. P., & Thompson, A. N. (2024). High Concentrate Supplementation during Late Pregnancy and Lambing Reduced Mortality of Triplet-Bearing Maternal Ewes. *Animals : An Open Access Journal from MDPI*, *14*(16), 2302. https://doi.org/10.3390/ani14162302

Hay, K., Lambe, N., Roden, J., Jarvis, S., & Dwyer, C. M. (2024). Genetic analysis of a maternal assistance score in sheep. *Animal*, *18*(9), 101265. https://doi.org/10.1016/j.animal.2024.101265

Holmøy, I. H., Waage, S., Granquist, E. G., L'Abée-Lund, T. M., Ersdal, C., Hektoen, L., & Sørby, R. (2017). Early neonatal lamb mortality: Postmortem findings. *Animal*, *11*(2), 295–305. https://doi.org/10.1017/S175173111600152X

Jacobson, C., Bruce, M., Kenyon, P. R., Lockwood, A., Miller, D., Refshauge, G., & Masters, D. G. (2020). A review of dystocia in sheep. *Small Ruminant Research*, *192*, 106209. https://doi.org/10.1016/j.smallrumres.2020.106209

Johns, C., Johns, & Stevens, D. R. (2016). *Increasing lamb survival and lamb weaning weight through feeding high fecundity crossbred sheep*.

Kelly, O. A., Hebart, M. L., Brien, F. D., & Pitchford, W. S. (2017). Genetic correlations between lamb survival, birth weight and gestation length differ between birth types. *Conference: Association for the Advancement of Animal Breeding and Genetics*, *22*.

Kenyon, P. R., Morris, S. T., Hickson, R. E., Back, P. J., Ridler, A. L., Stafford, K. J., & West, D. M. (2013). The effects of body condition score and nutrition of triplet-bearing ewes in late pregnancy. *Small Ruminant Research*, *113*(1), 154–161. https://doi.org/10.1016/j.smallrumres.2013.02.005

Kenyon, P. R., Roca Fraga, F. J., Blumer, S., & Thompson, A. N. (2019). Triplet lambs and their dams – a review of current knowledge and management systems. *New Zealand Journal of Agricultural Research*, *62*(4), 399–437. https://doi.org/10.1080/00288233.2019.1616568

Kerslake, J. I., Everett-Hincks, J. M., & Campbell, A. W. (2005). *Lamb survival: A new examination of an old problem*. *65*, 13–18.

Lockwood, A., Allington, T., Blumer, S. E., Boshoff, J., Clarke, B. E., Hancock, S. N., Kearney, G. A., Kenyon, P. R., Krog, J., Kubeil, L. J., Refshauge, G., Trompf, J. P., & Thompson, A. N. (2023). Decreasing Mob Size at Lambing Increases the Survival of Triplet Lambs Born on Farms across Southern Australia. *Animals*, *13*(12), 1936. https://doi.org/10.3390/ani13121936

Lockwood, A. L., Hancock, S. N., Trompf, J. P., Kubeil, L. J., Ferguson, M. B., Kearney, G. A., & Thompson, A. N. (2020). Data from commercial sheep producers shows that lambing ewes in larger mobs and at higher stocking rates reduces the survival of their lambs. *New Zealand Journal of Agricultural Research*, *63*(2), 246–259. https://doi.org/10.1080/00288233.2019.1570945

Ludemann, C., & Trafford, G. (2009). *The profitability of improving lambing percentages*. *13*. https://researcharchive.lincoln.ac.nz/server/api/core/bitstreams/d7e83083-d077-4f09-89c6-094b5198c03a/content

Lynch, J. J., Mottershead, B. E., & Alexander, G. (1980). Sheltering behaviour and lamb mortality amongst shorn Merino ewes lambing in paddocks with a restricted area of shelter or no shelter. *Applied Animal Ethology*, *6*(2), 163–174. https://doi.org/10.1016/0304-3762(80)90067-X

McCroad, S. A., Knol, F. W., & Stevens, D. R. (2020, June). *Lamb Rearing Technical Manual*. AgResearch.

Mellor, D. J., & Stafford, K. J. (2004). Animal welfare implications of neonatal mortality and morbidity in farm animals. *Veterinary Journal*, *168*(2), 118–133. https://doi.org/10.1016/j.tvjl.2003.08.004

Ministry for Primary Industries. (2025, December). *Situation and Outlook for Primary Industries December 2025*. MPI.

Ministry for Primary Industries. (2026, February 2). *MPI's action plan and strategy*. Ministry for Primary Industries. https://www.mpi.govt.nz/about-mpi/strategy

Ministry for the environment. (2025, April 8). *Atmosphere and climate*. Ministry for the Environment. https://environment.govt.nz/publications/our-environment-2025/atmosphere-and-climate/

Moloney, A. J. (2022). Utilising bioeconomic modelling to examine the impact of lambing percentages and pre-weaning lamb growth rates on farm profitability. Massey University.

Moloney, A. J., Tozer, P. R., Morris, S. T., & Kenyon, P. R. (2023). Bigger lambs or more lambs: The conundrum for New Zealand lamb producers. Livestock Science, 270, 105204. https://doi.org/10.1016/j.livsci.2023.105204

New Zealand Farm Assured. (n.d.). Why get NZAP and NZFAP *Plus certified?* Retrieved June 1, 2026, from https://www.nzfap.com/farmers/

Oldham, C. M. (Ed.). (1990). *Reproductive physiology of Merino sheep: Concepts and consequences*. School of Agriculture, Univ. of Western Australia.

Ospina, C. G. (2021). *Investigation of ewe and lamb mortality on a commercial farm in New Zealand*. Massey University.

Paganoni, B. L., Ferguson, M. B., Kearney, G. A., & Thompson, A. N. (2014). Increasing weight gain during pregnancy results in similar increases in lamb birthweights and weaning weights in Merino and non-Merino ewes regardless of sire type. *Animal Production Science*, *54*(6), 727–735. https://doi.org/10.1071/AN13263

Peterson, S. W., Kenyon, P. R., & Morris, S. T. (2006). *Do ewes with twin and triplet lambs produce different yields of milk and does the grazing behaviour of their lambs differ?* 444–449.

Pollard, J. C. (1992). Effects of litter size on the vocal behaviour of ewes. *Applied Animal Behaviour Science*, *34*(1), 75–84. https://doi.org/10.1016/S0168-1591(05)80058-9

Pollard, J. C. (2006). Shelter for lambing sheep in New Zealand: A review. *New Zealand Journal of Agricultural Research*, *49*(4), 395–404. https://doi.org/10.1080/00288233.2006.9513730

Pollard, J. C., Shaw, K. J., & Littlejohn, R. P. (1999). A note on sheltering behaviour by ewes before and after lambing. *Applied Animal Behaviour Science*, *61*(4), 313–318. https://doi.org/10.1016/S0168-1591(98)00200-7

Posbergh, C. J., Miles, A. M., Pettifor, N. L., & Thonney, M. L. (2024). Artificially reared ewes cannot be distinguished from natural reared ewes based on observed maternal behavior or lamb weaning weights. *Journal of Animal Science*, *102*, skae283. https://doi.org/10.1093/jas/skae283

Putu, I. G. (1990). *Maternal behaviour in Merino ewes during the first two days after parturition and lamb survival*. University of Western Australia.

Reilly, B., & Crilly, J. (2025). Orphan Lambs: How are they being reared in the UK? *Conference: Annual European College of Small Ruminant Health Management Conference*. https://www.researchgate.net/publication/392521216_Orphan_Lambs_how_are_they_being_reared_in_the_UK

Rogers, E. M. (1983). *Diffusion of innovations* (3rd ed). Free Press ; Collier Macmillan.

Scarlatti. (2017, August). *Health and Wellness of New Zealand Farmers—Initial findings from research into the wellness of and wellness behaviour patterns of New Zealand farmers*. https://foodandfibrecove.nz/wp-content/uploads/2023/01/Health_and_Wellness_of_New_Zealand_Farmers_-

_Initial_findings_from_research_into_the_wellness_of_and_wellness_behaviour_patterns_of_New_Zealand_farmers.pdf

Shubber, A. H., Doxey, D. L., Black, W. J. M., & FitzSimons, J. (1979). Colostrum production by ewes and the amounts ingested by lambs. *Research in Veterinary Science*, *27*(3), 280–282. https://doi.org/10.1016/S0034-5288(18)32792-9

Small, B., Murphy-McIntosh, A., Waters, W., Tarbotton, I., & Botha, N. (2005). *Pastoral farmer goals and intensification strategies*.

Smart, J. (n.d.). *Lamb Survival Coping with adverse spring weather: Preparation is key*. New Zealand Veterinary Association. Retrieved May 29, 2026, from https://nzva.org.nz/assets/Policies-Guidelines-Resources/Lamb_Survival_Coping_with_ad.pdf

StatsNZ. (2025, November 21). *Meat exports reach $10 billion in the year ended October 2025*. StatsNZ. https://secure.livechatinc.com/customer/action/open_chat?license_id=6093951&group=0&embedded=1&widget_version=3&unique_groups=0&organization_id=5ab41134-d743-41a7-a32a-5057096f4195&use_parent_storage=1&x-region=us-south1

Thompson, A. N., Allington, T., Blumer, S., Cameron, J., Kearney, G., Kubeil, L., Lockwood, A., Trompf, J., Winslow, E., & Kenyon, P. (2023). Reproductive Performance of Triplet-Bearing Ewes on Commercial Farms and Research Priorities Identified by Sheep Producers to Improve the Survival of Triplet-Bearing Ewes and Their Lambs. *Animals*, *13*(7), 1258. https://doi.org/10.3390/ani13071258

Thompson, B. C., Smith, N. B., Ward, K. R., & Muir, P. D. (2020). Brief Communication: Influence of birth rank on cause of lamb deaths prior to weaning. *New Zealand Journal of Animal Science and Production*, *80*, 21–23.

Watson, R. H. (1972). Observed levels of mortality in relation to lambing and early stages of growth of sheep in Australia. *World Review of Animal Production*, *8*(2), 104–113.

Whatford, L., Chivers, B. D., Rowe, M., & Blackie, N. (2023). A Survey of the Current Farming Practices and Perceptions on Adopting Orphan Lambs in the United Kingdom: How Do "Ewe" Do It? *Ruminants*, *3*(4), 468–482. https://doi.org/10.3390/ruminants3040038

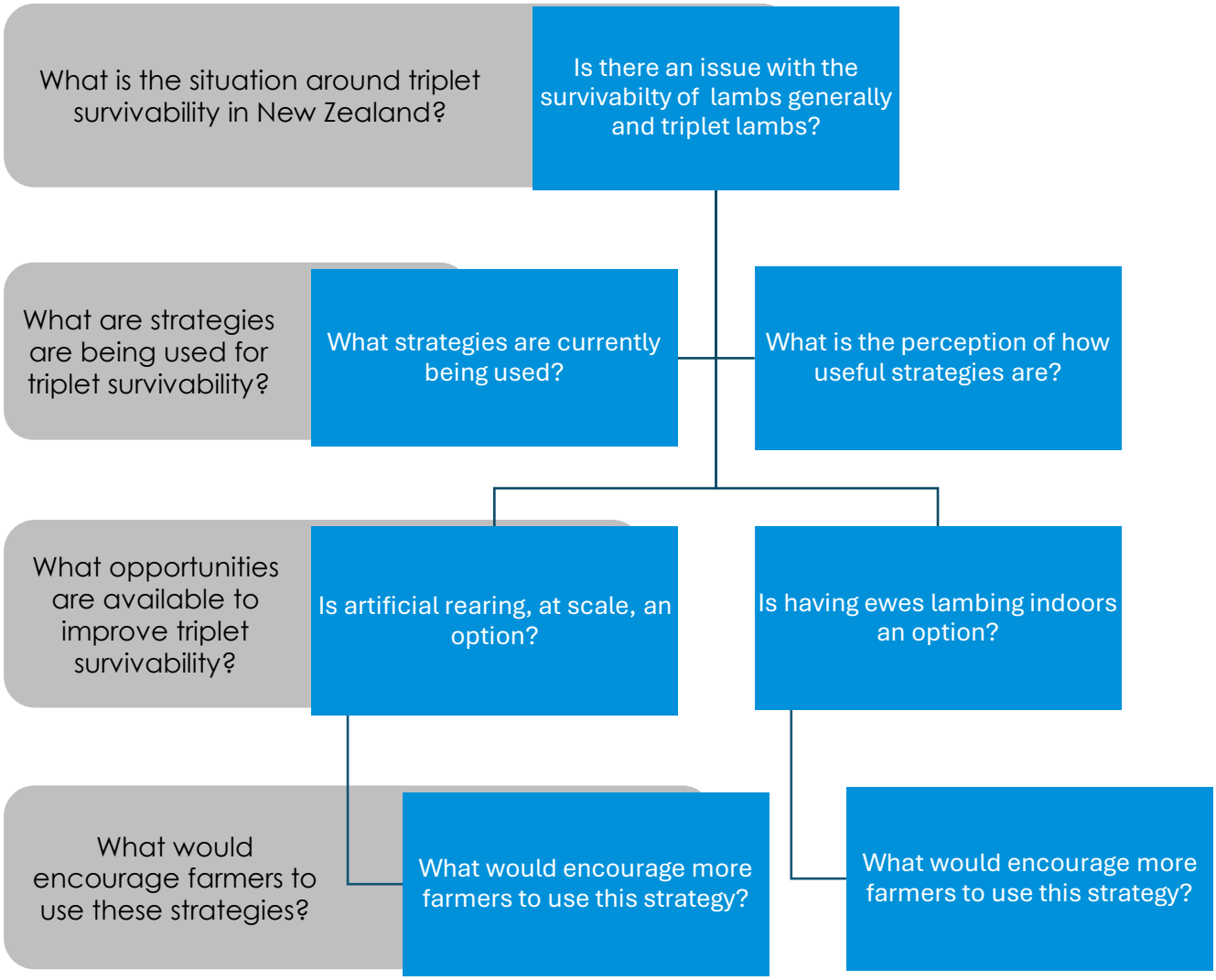
Willingham, T., Shelton, M., & Thompson, P. (1986). An assessment of reproductive wastage in sheep. *Theriogenology*, *26*(2), 179–188. https://doi.org/10.1016/0093-691X(86)90022-1

Young, M. (2012, January). *Focus on lamb survival*. BLNZ Genetics. https://www.blnzgenetics.com/files/1457580943210.pdf

Young, M. (2017, May). *Lamb survival*. https://www.sil.co.nz/files/1500253563561.pdf

13. Appendices

Appendix 1: Question tree



Appendix 2: Survey questions

1. I would like to invite you to participate in my Kellogg project which has an aim to explore triplet management strategies for sheep used in New Zealand. Along with NZ farmers appetite to use more or alternative strategies to improve triplet survivability. There will be general questions asking you about the farm you are associated with, general production indicators and questions around triplet survivability strategies.

   You need to be farming sheep in New Zealand and be over the age of 18. Participation in this study requires the completion of a survey that will take approximately 6-10 minutes. You are not required to participate. Participation in this study is completely voluntary, and you have the right to opt not to complete or submit the survey.
   The results of the project will be published on the Kellogg Rural Leaders website and may be published in an academic journal or presented at a conference. However, the survey is completely anonymous. To ensure confidentiality, your data will only be seen by me and will be stored in an electronic form with password protection. Only aggregated data will be presented in any publications. This study has been reviewed and approved by the Lincoln University Human Ethics Committee (HEC2026-10).

   If you have any questions about participating in the project, please contact me or my Course Examiner; we would be happy to discuss any concerns you have.

   Thank you for agreeing to participate in this project!

   Julia Hardwick-Smith
   Email: Juliah-s@hotmail.com

   Course Examiner: Dr Craig Trotter, Faculty of Agribusiness and Commerce

   Email: craig.trotter@lincoln.ac.nz Phone 03 423 0254

   1. I have read and understood the description of the project above.
   2. I have been given enough time to consider whether or not to participate in the project and to ask questions.
   3. I understand that I am not required to complete the survey, but after it has been submitted, I cannot withdraw as the surveys are anonymous.
   - I consent to participate in the project and the publication of the results (which may include my anonymised information)
   - No - Thank you for reading this far, you do not need to go any further

2. Which statement matches your **main farming operation** the best?
   - I farm only Sheep in New Zealand
   - I farm Sheep and Beef in New Zealand
   - I do not farm sheep
   - I do not farm in New Zealand
   - Other, Please Specify:

3. Which statement best describes your **sheep flock**?
   - Commercial and Stud
   - Commercial
   - Stud

4. Which land class type best fits your main sheep farming operation?
- South Island High Country
- South Island Hill Country
- North Island Hard Country
- North Island Hill Country

- North Island Finishing
- South Island Finishing Breeding
- South Island Finishing
- South Island Mixed Finishing

5. Which statement best describes your **role** in relation to the sheep farming business you are connected to?
- Farm Owner and Manager
- Farm Owner
- Farm Manager
- Livestock Manager
- Shepherd
- Other, Please Specify

6. Are you responsible for making the **primary decisions** on the farm?
- Yes
- No

7. What is your **gender**?
- Male
- Female
- Non-binary / third gender
- Prefer not to say

8. Which **age range** are you in?
- 18-29
- 30-39
- 40-49
- 50-59
- 60-69
- 70+

9. Combined, how many mixed age and two-tooth **ewes went to the ram in 2025**?

10. Are your ewes **pregnancy tested**?
- Yes
- No

11. What was your mixed age and two-tooth ewes (combined) **scanning % in 2025**? (number of fetuses scanned per number of ewes put to the ram x 100)

12. What is your **target** mixed age and two-tooth **ewe** (combined) **scanning %**?

13. Do you **scan for triplets**?
- Yes
- No

14. **How many** of your mixed age and two-tooth ewes (combined) were **scanned as triplet bearing in 2025**? (Write the total number)

15. What was your **tailing/docking %** for the mixed age and two-tooth ewes (combined) in **2025**? (number of lambs present at docking/tailing per number of ewes put to the ram x 100)

16. What is your **target** mixed age and two-tooth ewe (combined) **tailing/docking %**?

17. What was your **triplet tailing/docking % in 2025**? (Number of triplet lambs at docking over the number of ewes scanned as triplets x 100)

18. How do you feel about the **survivability** of your **triplet lambs**?

- Extremely satisfied
- Somewhat satisfied
- Neither satisfied nor dissatisfied
- Somewhat dissatisfied
- Extremely dissatisfied
- × Not Applicable

19. What is your opinion of the following statement?
"**The lambing wastage on farm negatively affects my mental health**"

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

20. Do you currently have any **strategies** in place to **improve triplet lamb survivability**? (Deaths of lambs between scanning and tailing/docking)

- Yes
- No
- × Not Applicable

21. Which of the following **strategies** do you use to **improve triplet survivability**?

- Shelter belts
- Shelter within the paddock
- Fewer ewes per paddock than twin bearing ewes
- Smaller paddock size than twin bearing ewes
- Supplementary feeding pre-birth (Feed taken to the ewes)
- Supplementary feeding within the first week post-birth (Feed taken to the ewes)
- Crop feeding of ewes pre-birth
- Crop feeding of ewes within the first week post-birth
- Training ewes to be less flighty around people
- Allow ewes to lamb indoors
- Artificially rear one of the triplet lambs
- Adopt a triplet lamb onto another ewe
- Genetic selection for triplet rearing ability
- Lambing beats
- Staggered lambing dates
- Other, Please tell me about the strategy/strategies you use:

22. How **satisfied** are you with your **triplet management**?

- Extremely satisfied
- Somewhat satisfied
- Neither satisfied nor dissatisfied
- Somewhat dissatisfied

- Extremely dissatisfied
- × Not Applicable

23. How **effective do you believe** each of the following **strategies to improve triplet survivability** to be? (Not effective at all, Slightly effective, Moderately effective, Very effective, Extremely effective, Unsure)

- Shelter belts
- Shelter within the paddock
- Fewer ewes per paddock than twin bearing ewes
- Smaller paddock size than twin bearing ewes
- Supplementary feeding pre-birth (Feed taken to the ewes)
- Supplementary feeding within the first week post-birth (Feed taken to the ewes)
- Supplementary feeding within the first week post-birth (Feed taken to the ewes)
- Crop feeding of ewes pre-birth
- Crop feeding of ewes within the first week post-birth
- Training ewes to be less flighty around people
- Allow ewes to lamb indoors
- Artificially rear one of the triplet lambs
- Adopt a triplet lamb onto another ewe
- Genetic selection for triplet rearing ability
- Lambing beats
- Staggered lambing dates
- Other, please specify

24. Would you be interested in **adopting more strategies** around **reducing triplet wastage**?

25. **Are you interested** in having **ewes lambing indoors** as a strategy to improve triplet survivability?

- Very interested
- Interested
- Neither interested or not interested
- Not interested
- Really not interested

26. **What would it take** for you to introduce having **ewes lambing indoors** to your farming operation? (Please choose up to 5 of the most important to you)

- I already lamb ewes indoors
- An indoor space to put the ewes
- Knowledge about how to make the system work
- Seeing the system in action in person
- Seeing a partial budget of an example system
- Knowing the equipment required
- Additional staff
- A precise guide to the process
- Knowing the costs associated
- Knowing the profit potential
- Increased lamb sale value
- Other:

27. Are you interested in an artificial lamb rearing system as a strategy to improve triplet survivability?

- Very interested
- Interested
- Neither interested or not interested
- Not interested
- Really not interested

28. **What would it take** for you to introduce an **artificial lamb rearing** system to your farming operation? (Please choose up to 5 of the most important to you)

- I already artificially rear lambs
- A space to keep the lambs
- Knowledge about how to make the system work
- Seeing the system in action in person
- Seeing a partial budget of an example system
- Knowing the equipment required
- Additional staff
- A precise guide to the process
- Knowing the costs associated
- Knowing the profit potential
- Increased lamb sale value
- Other:

29. What is your opinion of the following statement?
"**Lamb wastage is an issue for New Zealand sheep farmers?**"

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

30. What **other thoughts** do you have about **triplet survivability** that have not been covered in this survey?

Appendix 3: Interview consent form

MGMT 631 and the Kellogg Rural Leadership Programme

Research Information & Consent Form for Interviews

I would like to invite you to participate in a project entitled: **Analysing Triplet Lamb Survivability in New Zealand Sheep Systems**

This research explores *what farmers are currently doing for triplet survivability and what the appetite is for other strategies*.

If people want to be part of the project, they need to be working a sheep breeding operation in New Zealand and be over the age of 18.

If you wish to be part of this project, I will invite you to have an interview with me (Julia) that will last about 30 – 45 minutes, at your place of business, other neutral location that you are comfortable in or online. The interview will be more like a conversation, and the questions will be about your perspectives and experiences. With your permission, I will record the interview and transcribe for analysis and use in the project.

Your participation in this research is voluntary, and you don't have to answer any question if you don't want to. You can withdraw from the project, including withdrawing any information you have provided, up to 7th May 2026 by contacting me or my Course Examiner (Craig Trotter) via the emails below.

The results of the project will be published on the Kellogg Rural Leaders website, and may be published in an academic journal or presented at a conference. However, you may be assured of your anonymity: your identity will not be made public, or made known to any person other than the Human Ethics Committee in the event of an audit. To ensure confidentiality, your interview data will only be seen by me and will be stored in an electronic form with password protection. Only aggregated data will be presented in any publications, and no information will be reported in a way that might identify you as an individual.

This study has been reviewed and approved by the Lincoln University Human Ethics Committee (HEC2026-10). If you have any questions about participating in the project, please contact me or my Course Examiner; we would be happy to discuss any concerns you have.

Thank you for agreeing to participate in this project!

Julia Hardwick-Smith
JuliaH-S@hotmail.com

Course Examiner: Dr Craig Trotter, Faculty of Agribusiness and Commerce
Email craig.trotter@lincoln.ac.nz
Phone 03 423 0254

Consent

1. I have read and understood the description of the project above.

2. I have been given enough time to consider whether or not to participate in the project and to ask questions.

3. I have been given a copy of this Research Information and Consent Form to keep.

4. I understand that I may withdraw from the project, including withdrawal of any information I have provided, up to 7th May 2026 by contacting Julia Hardwick-Smith or her Course Examiner.

   Please tick or highlight:

   - ○ **I consent to participate in the project.**

   - ○ **I consent to publication of the results (which may include my anonymised information).**

   - ○ **I consent to having an audio recording made of my interview.**

     or

   - ○ **I do not consent to having an audio recording made of my interview, but agree to notes being made.**

Name:

Signed: Date: _____

Please return this form to Julia Hardwick-Smith (JuliaH-S@hotmail.com) before your interview.

March 2026

Appendix 4: Semi-structured interview questions

The aim of the study is to determine what farmers are currently doing to reduce triplet wastage and what it would take to get them to implement other strategies to lower lamb wastage further.

1. Tell me about how you reduce triplet lamb wastage on your farm.
    a. Can you elaborate on the exact processes involved?
    b. How many ewes?
    c. What specific knowledge do you need?
2. How do you manage getting water and feed to your ewes with this system?
3. Why did you decide to implement this strategy?
4. How long have you been doing it?
5. What did you learn along the way?
6. How much has your triplet lamb survival improved?
7. Do you think other farmers are currently doing this?
    a. Why or why not?
8. What barriers did you face in setting this system up?
    a. Cost
    b. Labour
    c. Facilities
    d. Knowledge
9. How can other farmers set up a similar system? What would it take?
10. What down sides are there to your system?
11. Has it been worth it? What benefits have you seen from reducing triplet wastage?
12. Anything else that could be helpful?