



# THE COST OF CLIMATE RESILIENCE:

FUTURE PROOFING UK DAIRY

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*Kite*

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## EXECUTIVE SUMMARY

- The cost of improving climate resilience on UK dairy farms over the next ten years stands at over £3.9 billion, based on Kite research.
- The estimated average cost of capital infrastructure investments and additional land required to ensure environmental resilience is £472,539 per farm, or an additional 2.4 ppl a year for ten years.
- Kite's analysis is based on data from over 850 UK dairy farms. Estimated costs per farm are based on an average herd size of 236, housed for an average of 30 weeks.
- An additional 1,350 tonnes of silage storage per farm is needed to increase capacity to 1.5 years for cover in case of drought or late grazing turn outs.
- An estimated 85% of dairy farms have less than 8 months slurry storage. This remains the case even when exit plans for the next 5-10 years are taken into account.
- This investment is required to ensure the long term production of milk in the UK and needs to be supported throughout the supply chain.

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## INTRODUCTION

**The changing climate poses many risks to UK dairy farms, as highlighted in Kite's TCFD report released in November 2023. An additional 1,350 tonnes of silage storage per farm is needed to increase capacity to 1.5 years for cover in case of drought or late grazing turn outs.**

Whilst there are many climate risks which could have a significant economic impact on dairy farms, in this report we consider the costs and investment required to ensure UK dairy farms have the infrastructure and land required to maintain production and eliminate pollution risks in periods of extreme weather.

In recent years, many weather and climate records have been broken and further extreme weather patterns are inevitable. An additional 1,350 tonnes of silage storage per farm is needed to increase capacity to 1.5 years for cover in case of drought or late grazing turn outs.

To mitigate these risks, considerable investment is required on farms in the form of additional silage and slurry storage facilities.

## THE DATASET

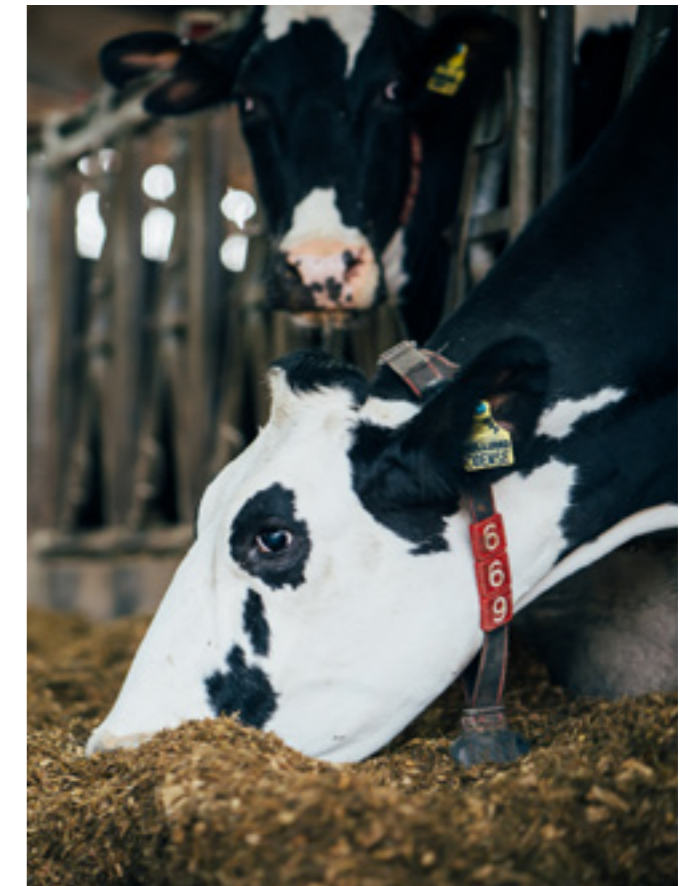
Kite has analysed data from over 850 dairy producers to provide an insight into the true cost of environmental resilience on UK dairy farms. Industry knowledge and estimates have been used where data is not available.

The data is representative of the wide spectrum of UK dairy farm sizes and systems. Herd sizes within the dataset ranged from less than 100 to over 1,500 cows. Milk production ranged from 6,500 to 10,000 litres. The dataset had a mixture of systems including all year round calving, spring block and autumn block calving systems. The farms in the dataset had:

- An average herd size of 236 cows, with a housing period of 30 weeks.
- An average dairy farm area of 165 ha.
- Average milk yield of 8,455 litres.

5% of the farmers in the dataset are planning on exiting farming within the next 5-10 years. Where relevant, this has been factored into the analysis.

Overall, the results show the level of investment that dairy farmers will need to make to fulfill current and future environmental commitments.





## FORAGE STORAGE

Ensuring sufficient forage stocks is becoming increasingly important to dairy farms as we experience an increased drought risk over summers along with the risk of high rainfall events increasing the winter housing periods.

To ensure that milk production can be maintained in these periods, farms need to be prepared with additional forage reserves.

Based on AHDB's forage calculator, a herd of 236 cows, with an average housing period of 30 weeks, requires storage for 2,725 tonnes of forage per year.

To prepare for the changing climate, we recommend farms have capacity to store an additional 50% of their yearly forage requirement. Based on the average farm, this means there is a requirement to have enough storage for 4,087 tonnes of forage.

### SSAFO REGULATIONS

In order to reduce pollution incidents caused by silage effluent, the Silage, Slurry and Agricultural Fuel Oil (SSAFO) regulations require silage clamps to have an impermeable base extending beyond any walls, and watertight drainage collection channels around the outside, flowing into an effluent tank of a suitable capacity.

Stores built before 1991 are exempt from the SSAFO regulations, unless substantial changes have been made. However, the Environment Agency can also serve notice at any point, if it believes there is a significant pollution risk, and this would require stores to be upgraded so that they meet the current regulations.

With the exempt stores now being over 30 years old, the requirement for improvement to these stores is increasing and this comes at a significant cost.

### SILAGE STORAGE REQUIRED

Kite has estimated that farms currently have sufficient forage capacity for one winter. Where farms have additional forage capacity, this is often in need of significant investment to meet the SSAFO regulations.

Therefore, on average, an additional 1,350 tonnes of compliant silage storage is required per farm to increase forage stocks to the 1.5 year requirement.

Without this investment, we are likely to see years where UK milk production is compromised because of the impact of climate change.





# SLURRY STORAGE

Having sufficient slurry storage for a farm system is a legal requirement under several regulations and is crucial for minimising the pollution risk from dairy farms. The regulations differ between devolved governments, but their primary purpose is to protect human health and the environment.

In England, Scotland and Wales the SSAFO Regulations require a minimum of four months of slurry storage. However, with the 18 months to March 2024 being the wettest since records began<sup>1</sup>, it is unsurprising that 4 months storage was insufficient for most dairy farmers. To ensure that not only regulations are met, but to guarantee that there is sufficient storage for extreme weather conditions and for slurry to be applied at the most suitable time (agronomically and environmentally), we suggest dairy farms should be targeting 8 months slurry storage.

## NVZs

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. They include about 55% of land in England<sup>2</sup>. Farmers with land in an NVZ must follow certain rules when applying nitrogen fertiliser and storing organic manure.

To comply, farmers must have a minimum of 22 weeks (5 months) storage for cattle slurry and meet various

limits on the amount of nitrogen they apply to fields, from organic and inorganic sources. In Wales, the Water Resources Control of Agricultural Pollution Regulations 2021 have been introduced and have similar regulations as to those under NVZs.

## FARMING RULES FOR WATER

'Farming Rules for Water' regulation was introduced in England in 2018 to reduce and prevent diffuse water pollution from agricultural sources.

These rules do not set a minimum capacity for slurry stores, but do require farmers to plan applications of manures and fertilisers so that they only spread slurries to meet crop needs, rather than spread because of a lack of storage. Meeting these rules will require most farmers to go beyond the minimum of four months' storage required by SSAFO regulations and increase their storage capacity to 6 months.

To reduce and prevent the risk of water pollution further, 8 months storage should be targeted.

## SLURRY CAPACITY ON UK DAIRY FARMS

Overall, based on Kite data, 64% of farmers have less than 6 months of slurry storage and it is estimated that only 15% of UK dairy farms have 8 or more months slurry storage available.

The regulations in place have positively impacted the

<sup>1</sup> Met Office

<sup>2</sup> Defra Guidance; Gov.uk

amount of slurry storage on farm, with 42% of farms in NVZ areas having more than 6 months slurry storage compared to just 30% of farms outside of NVZs.

There is no correlation between the number of farms planning on exiting farming and slurry storage capacity. If these farms are removed from the data, the overall percentage of farms with less than 6 months slurry storage remains at 64%.

Storage requirements for farms also increase with any herd expansion plans. Kite data from 162 dairy producers revealed that 48% of these farms are planning on increasing milk output over the next 2-3 years. This is planned to be achieved through a combination of increasing milk output per cow along with some herd expansions. Further continuous investment in infrastructure will be required as herd expansion takes place, which is outside the scope of this report.

## COVERED SLURRY STORES

The Clean Air Strategy 2019 proposed the requirement for all slurry and digestate stores to be covered by 2027. Whilst there has been no formal consultation on this yet, and although it is not expected that there will be rules requiring the covering of existing stores by 2027, it is still likely that the industry will face increasing regulatory requirements in this area over the coming years.

Currently, only 8% of dairy farmers in the sample had covered slurry storage facilities. Therefore, if new regulations are introduced, 92% of farmers will need to invest in this area.

We have estimated that 65% of slurry produced on UK dairy farms is contained in lagoon structures and 30% in towers, with the remaining 5% being stored under buildings.

To allow for sufficient storage in years of extreme weather, 85% of UK dairy farms need to invest in slurry storage to reach 8 months storage.

## PLANNED CHANGE IN MILK OUTPUT IN NEXT 2-3 YEARS

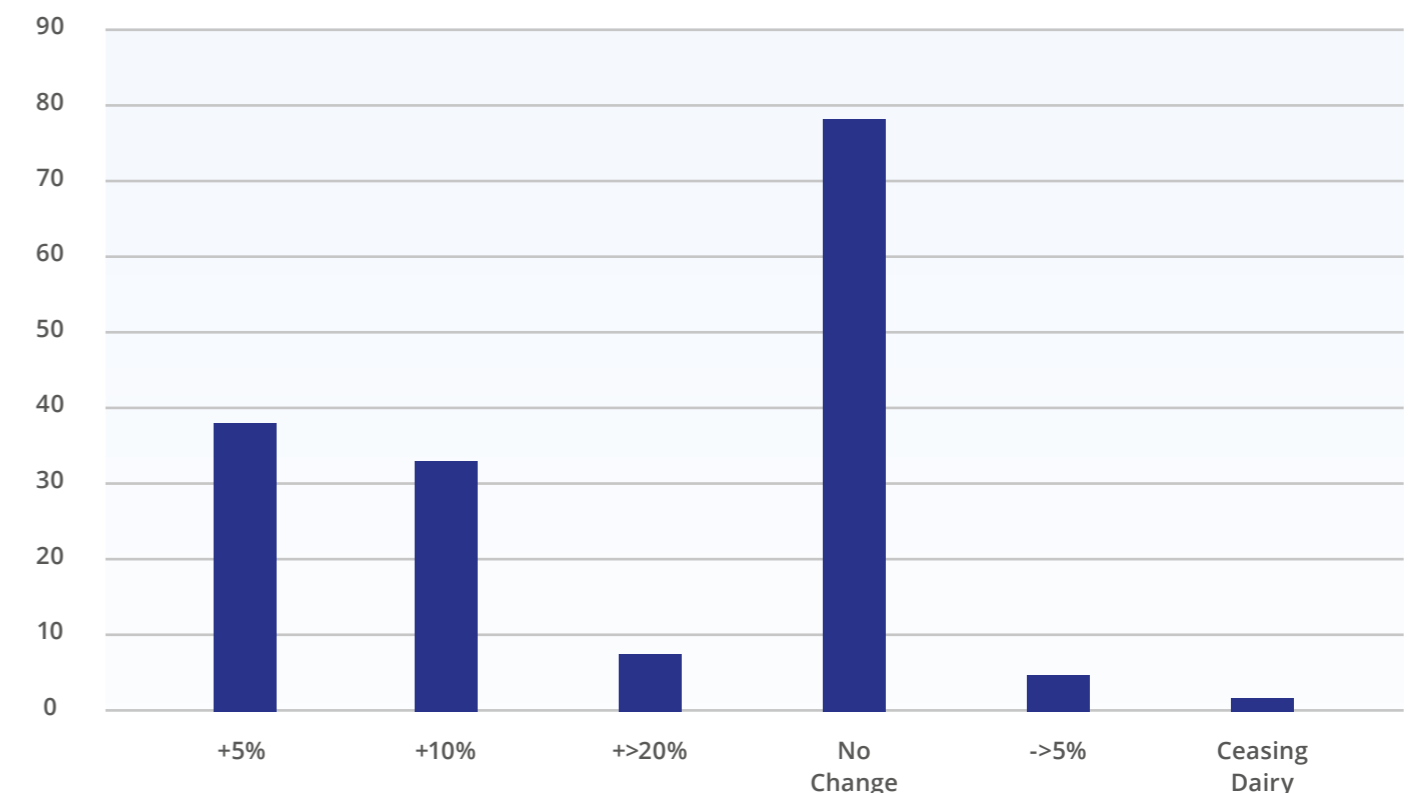


Figure 2: Production intentions (Kite independent survey, 2022)

# SILAGE AND SLURRY CAPITAL INVESTMENT COSTS

The estimated total cost of these capital investments is provided in table below.

Investment type	Average cost per farm
Increased slurry storage to 8 months with covers (based on the increase needed from current storage capacity)	£92,296
Silage clamps	£204,450
Total capital costs	£296,746
Interest on 10 year loan at 6.5% interest rate	£107,592.90
Total investment cost over 10 years	£404,338.90
Annual Payments (10 yrs)	£40,433.89
Payments per month	£3,369.49
£/cow/year	£171.33
£/litre/year	£0.020
ppl/year (across 10 years)	2.0 ppl

At a projected interest rate of 6.5% over 10 years, the cost to an average dairy farmer (236 cows, c.8,500 litres), of meeting the £296,746 cost of environmental infrastructure for climate resilience equates to an additional 2.0 ppl a year for ten years.

## LAND REQUIREMENTS

Whilst silage clamps and slurry stores are deemed two of the largest capital investments required for climate resilience and environmental protection, having sufficient land area is another key area.

Additional land may be required to help build forage stocks to provide additional cover in drought periods, and from an environmental perspective, enough land is needed to ensure manure applications can be targeted to where there is a soil and crop requirement, which is being driven through environmental regulations.

### NVZs

Farms located in NVZ areas in England and Scotland, along with all farms in Wales, are subject to livestock manure nitrogen farm loading limits, whereby there is a limit of an average of 170 kg N/ha from livestock manure in each calendar year.

Based on the average herd size in the dataset of 236 cows and a replacement rate of 30%, a farm would produce 29,855 kg N/year and would therefore require at least 176 ha to comply with the regulations – or have land available to export manures.

The average farm size in the dataset was 165ha and therefore on average, we have estimated that farms require an additional 11ha of land to meet the 170 kg N/ha limit.

Some farms may be able to apply for a derogation to increase the farm loading limit to 250 kg N/year/ha, which would reduce the land requirement to 120 ha. However, to minimise the risk of diffuse pollution, and to ensure other current and future regulations can be met, farms should aim to meet the 170kg N/ha farm loading limit from livestock manures.

### Farming Rules for Water

Along with the N farm limits, the Farming Rules for Water state that organic manure applications should be planned based on soil and crop nutrient requirements and should therefore, where possible, avoid organic manure applications which will raise the soil phosphorus index above target levels.

NRM's most recent annual soil summary highlights that 40% of grassland soils are above the target index of 2 for phosphorous along with 36% of arable soils .

A small amount of phosphorous may still be required for some silage or maize crops at a soil index of 3. However, this requirement could be provided from a relatively small amount of slurry.



For many dairy farms, this regulation could mean that large areas of their farms are not available for spreading organic manures. Therefore, additional land is required to ensure that phosphorous levels are not continually increased on their holding.

### Land cost

The additional land requirement has contributed to increased competitiveness of land in certain parts of the UK. Farms in livestock dense areas are finding that they must travel further afield to find suitable areas for exporting slurry, to ensure that both NVZ regulations and the Farming Rules for Water can be met.

This has not only increased rental values in some of these areas but also has increased transportation costs. To take this into account, we have estimated an average rental value of £620/ha.

Based on the additional NVZ land requirement of 11ha, at a rental value of £620/ha, this would cost farms an additional £6,820 and would equate to £68,200 over the next 10 years.

Additional land may be required to help build forage stocks and to provide additional cover in drought periods



## SUPPORT AND GRANTS

Two rounds of the Slurry Infrastructure Grant have already been released with a third round expected in 2024. These grants are intended to help livestock farmers to upgrade their slurry storage to reach six months' capacity. This is the first time Defra has run a national slurry storage grant for many years.

The minimum grant farmers have been able to apply for is £25,000. The maximum grant is £250,000 for each business. Grants can cover up to a maximum rate of 50% of the eligible costs of a project.

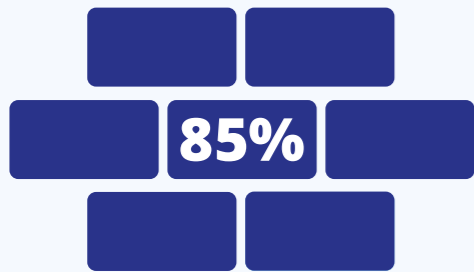
Therefore, even if government funds 50%, the industry is still faced with a minimum investment cost of £3.9 bn to have the infrastructure and land required to ensure environmental protection in a changing climate.

Grants can cover up to a maximum rate of 50% of the eligible costs of a project.

## THE STATISTICS

# £472,539

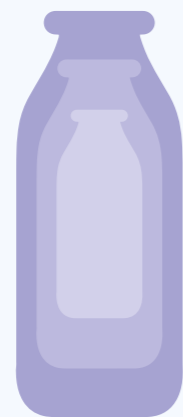
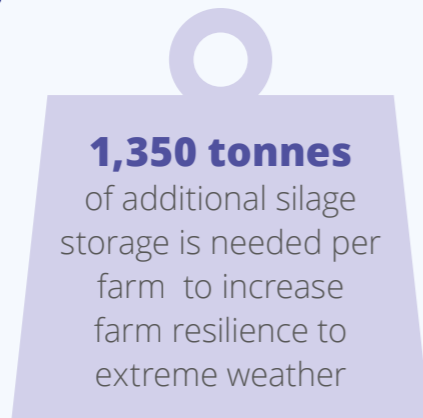
The estimated total cost of land and infrastructure investments for environmental compliance per farm is £472,539



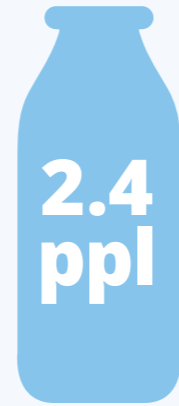
85% of dairy farms have less than 8 months slurry storage



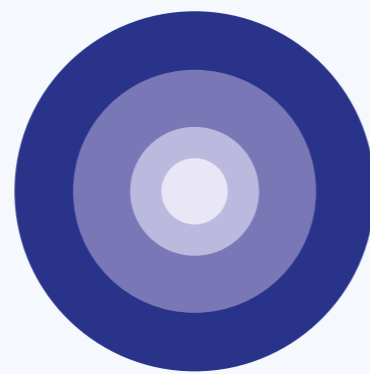
92% of dairy farmers do not have covered slurry storage facilities



48% of farms are planning to increase milk output over the next 2-3 years



OR AN ADDITIONAL 2.4PPL A YEAR FOR TEN YEARS



**40% of grassland soils are above the target index of 2 for phosphorous**

# £3.9 BILLION

Total cost to British dairy farmers of climate resilience over the next 10 years

## THE TOTAL COST OF ENVIRONMENTAL COMPLIANCE TO THE FARM

Investment type	Average cost per farm
Total silage and slurry capital investment costs (10 yrs)	£404,339
Total land payments (10 yrs)	£68,200
<b>Total cost of resilience (10 yrs)</b>	<b>£472,539</b>
<b>Total payments per year</b>	<b>£47,254</b>
<b>£/cow/year</b>	<b>£200.23</b>
<b>£/litre/year</b>	<b>0.024 (2.4 ppl)</b>

## CONCLUSION

UK dairy farms require a total investment of over £3.9 billion to help mitigate against climate change and to protect the environment through meeting current and future regulations. This requires an additional 2.4 ppl over the next 10 years, on top of the cost of production for dairy farms.

Without this investment, the industry will be unprepared for extreme weather events. This is likely to jeopardise the future of some of these farms and put milk production at risk.

Investment from the industry is therefore critical to ensuring the secure supply of milk.

## THE TOTAL COST TO INDUSTRY

Investment type	Average cost per farm	Total cost (and @50% funded by gov)
Silage clamps	£204,450	£2,208,060,000
Slurry storage capacity	£74,496	£804,556,800 (@50% funding = £402,278,400)
Slurry store covers	£17,800	£192,240,000 (@50% funding = £96,120,000)
Additional land for N loading (for 10 yrs)	£68,200	£736,560,000
<b>TOTAL</b>		<b>£3,941,416,800</b> (or £3,443,018,400 if eligible investments are up to 50% funded)

Kite