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No Budget, No Cuts

Budget and Methane Reduction Impact Analysis for Achieving 78% Low-Methane Feed Supply Target

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Solutions for Our Climate (SFOC) is an independent nonprofit organization that works to accelerate global greenhouse gas emissions reduction and energy transition. SFOC leverages research, litigation, community organizing, and strategic communications to deliver practical climate solutions and build movements for change.

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1. Ambitious Targets, Insufficient Means: The Limitations of Mitigation Goals Without Fiscal Support

Budget allocation is one of the clearest indicators of a government's policy priorities and commitment to implementation. The success of greenhouse gas (GHG) reduction policies likewise depends largely on the level of public financing. Reducing GHGs is a process of transforming existing systems by mobilizing people, technology, and time—an undertaking that is impossible without sustained financial support from the government. In this regard, the extent to which the government allocates funding to reduction initiatives can be seen as a direct reflection of its willingness to act on climate goals.

Building on this critical awareness, this study analyzes the budget scale required to achieve the low-methane feed supply target announced by the Ministry of Agriculture, Food and Rural Affairs (MAFRA) in January 2024 (MAFRA, 2024c). The Ministry has set a goal of expanding the supply rate of low-methane feed to 78% by 2030. However, the annual low-methane feed supply rates and budget sizes required to implement this goal cannot be confirmed. Questions arise regarding whether the low-methane feed supply targets established directly by the Ministry are achievable.

Why then did MAFRA set a target for low-methane feed supply to reduce GHG emissions in the agricultural sector? Approximately 30% of GHG emissions from agriculture stem from enteric fermentation. Ruminants like cattle regurgitate and chew their feed, during which microorganisms in the stomach break down the feed and release methane (CH_4). CH_4 is a potent GHG with a heat-trapping effect more than 80 times stronger than that of carbon dioxide. With livestock numbers projected to increase in the future (MAFRA, 2021), methane emissions from enteric fermentation are also expected to rise. **Therefore, to achieve the 2030 GHG reduction targets for agriculture and livestock, reducing methane emissions through the supply of low-methane feed is essential.**

The objective of this study is to identify the conditions necessary for MAFRA's low-methane feed supply to be realized in practice. To achieve the low-methane feed supply rate (78% by 2030) proposed by MAFRA, we estimate the annual rate of supply and the corresponding budget scale. This analysis aims to transform the government's climate policy from merely setting targets and toward a policy framework underpinned by practical implementation capacity and fiscal feasibility.

The budget scale presented in this study is calculated based on a specific scenario and the actual level of government spending will depend on the government's commitment. **Nonetheless, this analysis provides a benchmark for the minimum level of public investment required to achieve meaningful progress in low-methane feed supply. The National Assembly and the government should take this into account when adjusting increasing the relevant budget allocations and effectively achieve GHG reduction targets in the agriculture and livestock sectors.**

2. Current Status and Targets for Low-Methane Feed

2.1 Definition of Low-Methane Feed

The key difference between low-methane feed and conventional feed lies in the inclusion of methane-reducing additives. Low-methane feed is formulated by supplementing standard feed with such additives to reduce methane emissions generated during the enteric fermentation in ruminant animals.

According to the Standards and Specifications for Feed and Feed Ingredients under the *Control of Livestock and Fish Act*, MAFRA (2024a) defined methane-reducing additives as those that demonstrate a "significant methane reduction effect of at least 10% compared to conventional feed (control group)." Furthermore, it stipulates that "The use of additive must not cause any significant deterioration in livestock health or productivity (e.g., weight gain or milk yield), nor affect the safety of the final livestock products". The criteria specified by MAFRA for methane-reducing additives are summarized in Table 2-1.

[Table 2-1] Legal Standards for Methane-Reducing Feed Additives

Category	Legal Standard
Methane Reduction Effect	Based on domestic livestock feeding trials, the additive must demonstrate **a significant methane reduction effect of at least 10% compared to conventional feed (control group).**
Measurement Method	The reduction effect must be verified using internationally recognized measurement systems, such as the Respiration Chamber or GreenFeed system. Results from overseas trials or other measurement methods that are not approved in Korea are not applicable.
Testing Institutions	Experiments must be conducted only in institutions, such as universities, research institutes, or equivalent facilities equipped with the measurement systems described above, and must be certified by institutions that have been recognized and officially announced by the Director of the National Institute of Animal Science or equivalent authorities.
Livestock Productivity	The use of the additive must not cause any significant deterioration in livestock health or productivity (e.g., weight gain or milk yield), nor affect the safety of the final livestock products.
Quality of Additives	The additive must clearly identify its ingredients and be manufactured through a controlled process. If the ingredient is derived from natural extracts or plants and its quality cannot be guaranteed, the Food Safety Evaluation Committee may review whether its use is acceptable.
Possibility of Reevaluation	Certification may be revoked through reevaluation if scientific evidence shows that the additive's efficacy cannot be reproduced or if safety or quality concerns arise.
Labeling Principle	The additive must be labeled by product name, not by ingredient name.

A key methane-reducing additive that meets MAFRA's criteria is 3-Nitrooxypropanol (3-NOP), developed by the global feed additive company, Bovaer. It has been officially approved as a methane-reducing additive in multiple jurisdictions, including the European Union, the United Kingdom, the United States, Canada, Brazil, Chile, and South Korea. Currently, the South Korean government imports 3-NOP for use in producing low-methane feed.

The methane reduction effect of 3-NOP varies depending on the feed additive dosage per kilogram of feed, feeding system, and environmental conditions. Field trials across various countries indicate it can reduce methane emissions from enteric fermentation by at least 10% and in some cases over 30%. The South Korean government requires that feed supplemented with 3-NOP achieve a minimum 10% reduction in methane emissions relative to conventional feed.

2.2 Current Status of Low-Carbon Feed: Focusing on Low-Carbon Agriculture Pilot Project (Livestock Sector)

Low-methane feed containing 3-NOP is currently being distributed through *MAFRA's Low-Carbon Agriculture Pilot Project,* which was initiated in 2024 and continuing to date. The program consists of two subcomponents, crop and livestock, with low-methane feed falling under the latter. The objective of the livestock sector pilot project is to "support the supply of low-methane and nitrogen-reducing feed and improving manure management practices to realize low-carbon livestock production" (MAFRA, 2024b).

Under this program, livestock farmers feeding low-methane feed receive direct payments of $17.16 per Hanwoo (Korean beef cattle) and $34.32 per dairy cow annually.[1]

However, data submitted by MAFRA (2025) to the National Assembly office indicate that as of October 2024, which was the end of the payment period, none of the allocated budget of $3.39 million for the livestock component of the 2024 pilot project had been spent on low-methane feed supply. In other words, government-funded low-methane feed supply was virtually non-existent.

MAFRA (2025) plans to distribute low-methane feed to a total of 60,463 cattle in 2025, including 49,981 Hanwoo, 1,973 beef cattle, and 8,509 dairy cattle. **The estimated direct payment amount for**

1 The amount is calculated based on an exchange rate of 1,458 KRW to 1 USD, and all budget amounts presented in this report are uniformly based on this exchange rate.

this is approximately $1.17 million, corresponding to supply rates[2] of 1.8% for Hanwoo, 1.9% for beef cattle, and 2.8% for dairy cattle.

The total budget for the Low-Carbon Agriculture Pilot Project (Livestock Sector) in 2025 stands at $6.90 million. As MAFRA is currently still in the process of recruiting participating farms, the exact amount of direct payments to be allocated for the 2025 low-methane feed supply remains undetermined at this stage.

However, it is clear that with a low-methane feed supply rate of less than 3% in 2025, achieving the 2030 target of 78% is virtually impossible. Only five years remain, from 2026 to 2030, for the government to raise the supply rate from below 3% to 78%, a daunting task for the government. Now is the critical juncture for the central government and MAFRA to put concrete budgets and policies into action.

2.3 MAFRA's Target: 78% Low-Methane Feed Supply Rate by 2030

In January 2024, MAFRA unveiled the Livestock Sector's GHG Reduction Roadmap through the "2030 GHG Reduction and Green Growth Strategy for the Livestock Sector towards Carbon Neutrality by 2050." According to this roadmap, the projected GHG emissions from the livestock sector in 2030 are approximately 11 Mt CO_2eq. Of this, 3.27 Mt CO_2eq, equivalent to about 30%, must be reduced.

Key mitigation measures include:

1. Manure treatment,
2. Reduction of enteric fermentation, and
3. Productivity improvement.

Among these, manure treatment accounts for the largest share of reduction potential, representing 81% (2.64 Mt CO_2eq) of the 2030 livestock reduction target, followed by enteric fermentation (0.31 Mt CO_2eq) and productivity improvement (0.24 Mt CO_2eq) (see Figure 2-1).

2 The low-methane feed supply rate is calculated based on the number of cattle (beef cattle aged 6 months or older and dairy cattle aged 12 months or older) relative to the animals that applied for low-methane feed in 2025. (Low-methane feed supply rate for beef cattle (%) = number of 2025 applicants / total cattle aged less than six months; for dairy cattle (%) = number of 2025 applicants / total cattle aged 12 months or older)

[Figure 2-1] MAFRA's Livestock Sector 2030 GHG Reduction Roadmap

Category		Livestock Manure Treatment			Enteric Fermentation
2018 Baseline Emissions	9.41 Mt CO_2eq	4.94 Mt CO_2eq(52.5%)			4.47 Mt CO_2eq(47.5%)
2030 Projected Emissions (A)	11 Mt CO_2eq	6.24 Mt CO_2eq			4.76 Mt CO_2eq
Reduction Measures Reduction Amount (B)		Improvement for manure treatment Reduced by 2.2Mt CO_2eq		Nitrogen in manure reduced by 0.44 Mt	Reduction of Enteric Methane Emissions by 0.31 Mt CO_2eq
		Process Optimization	Process Diversification	Low-protein Feed	Low-methane Feed
		• Improvement of Liquid Fertilizer Production (50%→56%)	• Expansion of Purification Treatment (13%→25%) • Energy Conversion (1.3%→15%)	• Pigs and Poultry (0%→48%)	• **Hanwoo, Beef and Dairy cattle (0%→78%)**
		Enhanced Productivity Reduced 0.24 Mt of Emissions	• Enhancing productivity through shortened rearing periods and improved carcass weights in Hanwoo and beef cattle • Improvement of milk yield per cow • Improvement of MSY (Marketed Pigs per Sow per Year)		
2030 Emissions Target (A-B)	7.73 Mt CO_2eq	3.43 Mt CO_2eq			4.3 Mt CO_2eq

Source: MAFRA (2024c)

Despite similar GHG emissions from both enteric fermentation and manure treatment, reduction targets are more heavily focused on manure treatment. When examining GHG emissions in 2022 based on the 1996 IPCC guidelines, enteric fermentation accounted for approximately 5 Mt CO_2eq, while manure treatment accounted for approximately 5.57 Mt CO_2eq, indicating similar emission scales.

Nevertheless, the reason livestock manure reduction targets were set higher is relatively straightforward. Manure treatment already has various established technologies and methods, and it has been steadily pursued in the past as part of water pollution control and odor reduction projects.

Since there is well-established infrastructure and project experience for manure management, it is relatively easier to approach it from a policy perspective.

By contrast, policy efforts targeting methane reduction from enteric fermentation have been limited. Currently, the only viable option to mitigate methane emissions from enteric fermentation is the supply of low-methane feed. Consequently, MAFRA's target of reducing 0.31 Mt CO_2eq from enteric fermentation depends entirely on the success of low-methane feed supply.

However, MAFRA's low-methane feed supply target only presents a single-year target for 2030 at 78% supply rate, without presenting year-by-year implementation plans, required budget, and policy framework. In other words, the target exists without a concrete roadmap. To ensure that the 78% supply target is more than just a declaration, it must be backed by feasible financial resources and a detailed implementation plan.

2.4 Regional Targets for Low-Methane Feed

Jeju Special Self-Governing Province is the first region in Korea to launch a pilot project for supplying low-methane feed. Since 2023, Jeju has been providing low-methane feed to Hanwoo cattle and dairy cows across the province through the *"Eco-friendly Methane Reduction Livestock Farming Pilot Project."*

In 2024, Jeju supplied low-methane feed to approximately 3,000 cattle equivalent to about 7.5% of the province's Hanwoo and beef cattle population on the island. Jeju aims to increase the supply of low-methane feed by 30% to 12,000 cattle (30% of the province's cattle population) by 2030.

During the initial phase of the pilot project, a subsidy of $0.02 per kilogram of feed was provided to offset the price difference between conventional feed and low-methane feed. However, starting in 2025, direct payments through MAFRA's *"Low-Carbon Agriculture Pilot Project (Livestock Sector)"* were introduced, leading to an adjustment of the subsidy in Jeju to $0.01 per kilogram.

Additionally, Jeju has explicitly outlined its low-methane feed supply targets, GHG reduction goals, and investment plans in its *First Jeju Special Self-Governing Province Carbon Neutrality and Green Growth Basic Plan (2024-2033)*. **Similarly, four other metropolitan governments—Jeonbuk Special Self-Governing Province, Jeonnam Province, Ulsan Metropolitan City, and Daegu Metropolitan City—have incorporated comparable targets and budgetary commitments in their respective *Basic Plans for Carbon Neutrality and Green Growth* (see Table 2-2).**

[Table 2-2] Summary of Low-Methane Feed Supply Plans in Regional Governments' "*Basic Plans for Carbon Neutral Green Growth*"

Metropolitan/ Provincial Government	Supply Target	GHG Reduction Target	Invest-ment Plan	Key Details on Low-Methane Feed and Methane Reduction Measures
Jeju Special Self-Governing Province	○	○	○	• Supply Target: low-methane, low-protein feed supply target of 36,000 head (2024–2033 cumulative) • GHG Reduction Target: cumulative 16,956 tCO_2eq by 2033 • Investment Plan (2024–2033 cumulative): $55,000
Jeonbuk Special Self-Governing Province	○	○	○	• Supply Target: 120,000 heads by 2033 • GHG Reduction Target: 18,840 tCO_2eq by 2033 • Investment Plan: cumulative $3,360 by 2033
Jeonnam Province	○	○	○	• Supply Target: 109,375 head (2024–2033 cumulative, equivalent to 15% of the province's total livestock) • GHG Reduction Target: 51,516 tCO_2eq (2024–2033 cumulative) • Investment Plan: cumulative national and local government funding of $1.87 million each (2024–2033 cumulative)
Ulsan Metropolitan City	○	○	○	• Supply Target: 50% of livestock by 2030 • GHG Reduction Target: 9,144 tCO_2eq (2031–2033, through low-methane, low-protein feed supply) • Investment Plan: cumulative $7,990 by 2030
Daegu Metropolitan City	○	○	○	• Supply Target: 2,000 tCO_2eq reduction through feed research and supply (2025–2033 cumulative) • GHG Reduction Target: 942 tCO_2eq by 2033 • Investment Plan: cumulative $308.68K (2026–2028, $102.89K allocated annually from local government funds)
Incheon Metropolitan City	○	X	○	*Supply Standards for Eco-Friendly Microbial Compound Feed* • Supply Targets: 3,000 (2025–2026) → 4,000 (2027) → 5,000 (2028) → 7,000 (2029–2030) → 8,000 head/year (2031–2033) • Investment Plan: cumulative $1.03 million ($205.90K/year from 2024–2028)
Gyeonggi Province	○	X	X	• Supply Target: cumulative 1,960 head (70 head/year in 2024 → 210 head/year from 2025–2033)
Gyeongbuk Province	X	○	X	• GHG Reduction Target: Based on the Supply of Forage and Low-Methane Feed • 0.141 Mt CO_2eq by 2030, 1.412 Mt CO_2eq by 2050
Gwangju Metropolitan City	X	○	X	• GHG Reduction Target: 741 tCO_2eq by 2045 (including low-methane feed supply measures)

Metropolitan/ Provincial Government	Supply Target	GHG Reduction Target	Invest-ment Plan	Key Details on Low-Methane Feed and Methane Reduction Measures
Gyeongnam Province	X	X	X	• The strategy "Reducing GHG emissions and Strengthening Carbon Storage Capacity" includes the task "Improving the Supply Rate of Low-Methane Feed." • No specific plan for supplying low-methane feed
Chungbuk Province	X	X	X	• The strategy "Strengthening the Green Foundation through Low-Methane AI Livestock Carbon Sinks" includes the initiative "Promoting Methane Reduction through Smart Ai-Based Livestock Farming." • No specific plan for supplying low-methane feed
Chungnam Province	X	X	X	• Under the initiative "Transitioning to a Sustainable Agriculture, Livestock and Fisheries Sector", low-methane feed supply is included as a mitigation measure within the strategy "Reducing GHG Emissions and Enhancing Carbon Storage Functions." • No specific plan for supplying low-methane feed
Daejeon Metropolitan City	X	X	X	• Livestock sector mitigation measures include development of methane-reducing feed technologies. • No specific plan for supplying low-methane feed
Sejong Special Self-Governing City	X	X	X	• As part of strategy for "Transitioning to a Low-Carbon Agricultural Structure and Promoting Eco-Friendly Agriculture", the plan includes "Expanding the Use of Low-Methane Feed and High-Quality Roughage, and Low-Carbon Livestock Management." • No specific plan for supplying low-methane feed

Note: Seoul Metropolitan City, Busan Metropolitan City, and Gangwon Special Self-Governing Province are excluded from Table 2-2 because their respective "*Basic Plans for Carbon Neutral Green Growth*" do not mention "low-methane" or "low-methane feed."

3. Comparative Scenarios for Low-Methane Feed Supply: Baseline vs. Enhanced

All GHG emission data used in this study were calculated in accordance with the 1996 IPCC Guidelines. In January 2025, the government published national GHG inventories using the updated 2006 IPCC Guidelines, which generally produce higher emission estimates due to revised methodologies. However, the *"2030 GHG Reduction and Green Growth Strategy for the Livestock Sector to Achieve Carbon Neutrality by 2050"* released by MAFRA in 2024 applied the 1996 IPCC Guidelines. To ensure methodological consistency and enable direct comparison between MAFRA's policy targets and the reduction potential analyzed in the report, this study likewise employed the 1996 IPCC Guidelines. This allows for alignment between policy goals and expected mitigation outcomes under the same calculation standard.

This study aims to estimate the annual low-methane feed supply rate and required budgets necessary to achieve MAFRA's target of 78% supply of low-methane feed by 2030. As this analysis predicts the trajectory over the next five years, it involves several assumptions and preconditions, which are summarized in Table 3-1.

[Table 3-1] Assumptions for Annual Budget Estimation to Achieve a 78% Low-Methane Feed Supply by 2030

Category	Description	Assumption
Time Frame	Start Year and Initial Feed Supply Rate	10% by 2026
	End Year and Initial Feed Supply Rate	78% by 2030
Methane Reduction Effect of Low-Methane Feed		10%
Annual Supply Growth Rate		Geometric increase: Previous year's supply rate × 1.665
Target Livestock		Beef cattle (Hanwoo and beef), dairy cattle
Livestock Population Estimate		Average annual growth rate applied over the past decade (2014–2024)
Scenario	Baseline Scenario: Current government policy (Applying the Revised Guidelines for the Low-Carbon Agriculture Pilot Project (Livestock))	Hanwoo and beef cattle aged six months or older; Dairy cattle aged 12 months or older
	Enhanced Scenario	All Hanwoo cattle, beef cattle, and dairy cattle
Subsidy	Baseline Scenario: Budget Floor (Applying the Revised Guidelines for the Low-Carbon Agriculture Pilot Project (Livestock Sector))	Beef cattle: $17.16/head/year Dairy cattle: $34.32/head/year
	Enhanced Scenario: Budget Ceiling	$0.02 per kilogram of feed

Table 3-1 Among these assumptions, it is noteworthy to review three key points. **First, the study adopts a geometric increase method** to project the annual growth of low-methane feed supply through 2030. This means that the supply rate increases by a constant ratio each year, rather than by a fixed amount (arithmetic increase). Under geometric growth, the rate of growth is gradual in the early years but accelerates toward the later years. Such an approach can ease the government's initial fiscal burden while allowing farmers to gradually adapt to new feeding practices, thereby increasing farmer's acceptance and the practical feasibility of implementation.

Second, the methane reduction effect of low-methane feed was set at 10%. While the methane reduction effect may vary depending on the amount of methane-reducing additive in the feed, it was set at 10% to reflect the "significant methane reduction effect of 10% or more" mentioned in MAFRA's Standards and Specifications for Feed and Feed Ingredients.

Finally, to estimate the upper and lower bounds of the potential budget requirements, we used two references: **1) The current budget supported by MAFRA**, and **2) The Jeju Special Self-Governing Province's model, which initially subsidized $0.02 per kilogram of feed to offset the price difference between conventional and low-methane feed.**

Based on these assumptions, the study formulated four low-methane feed supply scenarios, as summarized in Table 3-2. **Among them, two cases were selected for detailed analysis: the Baseline Scenario (Scenario 1) and the Enhanced Scenario (Scenario 4). The Baseline Scenario directly reflects the government's current policy framework, incorporating MAFRA's existing program and subsidy levels. In contrast, the Enhanced Scenario allows for the estimation of the maximum level of budgetary resources that would be required to achieve the 78% supply target through an expanded policy effort.** The government could then determine the actual budget within the range of the maximum and minimum budgets, based on political will.

[Table 3-2] Budget Analysis Scenarios for Low-Methane Feed Supply

Scenario	Eligible Population	Subsidy	Description
Baseline Scenario: Maintaining the current policy by supplying low-methane feed to eligible species and providing subsidies according to existing policy	Hanwoo and beef cattle (≥6 months), Dairy cattle (≥12 months)	Beef cattle: $17.16/per head/year Dairy cattle: $34.32/per head/year	Maintaining current government policy (Eligible population and subsidy unchanged)
Maintaining the current policy on the supply targets for low-methane feed while increasing the subsidy	Hanwoo and beef cattle (≥6 months), Dairy cattle (≥12 months)	$0.02 per kilogram of feed	Maintaining current eligible population & increasing subsidies
Expanding the scope of low-methane feed supply while maintaining subsidies at current levels	All Hanwoo, beef cattle, and dairy cattle	Beef cattle: $17.16/per head/year Dairy cattle: $34.32 per head/year	Expanding the scope of eligible population & maintaining current subsidies
Enhanced Scenario: Estimating the maximum required budget by expanding both the eligible species of low-methane feed and the subsidy	All Hanwoo, beef cattle, and dairy cattle	$0.02 per kilogram of feed	Fully expanded supply and feed-based subsidy structure; represents maximum budget estimate

Note: The scope of the eligible population of low-methane feed, specifically beef cattle (≥6 months) and dairy cattle (≥12 months),' is a criterion defined solely within the guidelines for the Low-Carbon Agriculture (Livestock) Pilot Project. These criteria were established by MAFRA after gathering opinions from various stakeholders such as farmers, and the feed industry.

4. Estimated Budget for Achieving 78% Low-Methane Feed Supply by 2030

4.1 Baseline Scenario: Cumulative Budget Requirement of $118 million

According to MAFRA's current guidelines, achieving a 78% supply rate of low-methane feed by 2030 would require a cumulative budget of $121.64 million over the next five years. Breaking this down by year, the required annual budget rises from $6.38 million in 2026, to $51.96 million in 2030 (see Table 4-1). By livestock type, total budget requirement by 2030 amounts to $100.49 million for beef cattle (Hanwoo and beef) and $17.71 million for dairy cattle.

This scenario represents a conservative estimate of the fiscal scale achievable within the current policy framework and can serve as a baseline for budget calculations prior to policy expansion.

As explained in Section 2-2, assuming MAFRA budget (direct payments) for low-methane feed supply in 2025 is $1.17 million, budget shortfall compared with the required budget for 2026 ($6.41 million) would be $5.24 million. Therefore, the findings suggest that the government must increase the low-methane feed budget for 2026 by at least $5.24 million to reach a minimum of 10% supply rate in 2026.

[Table 4-1] Baseline Scenario: Annual Low-Methane Feed Supply and Required Budget (2026–2030)

Year	Supply Rate (%)	Livestock Type	Head	Annual Required Budget (USD million)
2026	10	Hanwoo & beef cattle	313,728	5.35
		Dairy cattle	30,110	1.03
2027	16.7	Hanwoo & beef cattle	531,429	9.12
		Dairy cattle	49,554	1.72
2028	27.9	Hanwoo & beef cattle	900,441	15.43
		Dairy cattle	81,575	2.81
2029	46.7	Hanwoo & beef cattle	1,525,241	26.13
		Dairy cattle	134,248	4.60
2030	78	Hanwoo & beef cattle	2,584,117	44.31
		Dairy cattle	220,978	7.61
Cumulative Total				118.09

Note: Budget estimates are based on the assumption that identical annual subsidies are provided each year to low-methane feed. The supply rate was applied to the livestock population, assuming the eligible animals are newly designated each year. Annual budget figures are rounded to the nearest second decimal point.

4.2 Enhanced Scenario: Cumulative Budget Requirement of $378 million

To determine how much the government could expand its low-methane feed policy in the future, it is crucial to assess the maximum fiscal expenditure under an expanded policy framework. This study developed an Enhanced Scenario assuming a comprehensive scale-up of the government's low-methane feed program.

According to this scenario, the cumulative budget required between 2026 and 2030 amounts to approximately $378 million. This reflects expanding the subsidy target to include all age groups of beef cattle and dairy cows, coupled with a shift in the subsidy structure, from a per-head direct payment system to a feed-weight-based system, providing $0.02 per kilogram of feed.

The annual total feed consumption was calculated using the number of animals and the average daily feed intake per species (6.7 kg/day for beef cattle, 10.1 kg/day for dairy cattle). These values were multiplied by $0.02 per kg to determine the annual budget requirement. As the supply rate grows proportionally from 10% in 2026 to 78% in 2030, annual expenditure increases steeply, meaning approximately $166.25 million would be needed for 2030 alone (see Table 4-2).

It should be noted that the total of $378 million may not be directly comparable with the budget figures under the current policy framework (direct payments), as both the eligible population and the subsidy criteria differ fundamentally. **Nonetheless, the results of the Enhanced Scenario provide a useful benchmark for the maximum budget that would be required if the policy were to be fully scaled up.**

[Table 4-2] Enhanced Scenario: Annual Low-Methane Feed Supply Rate and Required Budget (2026–2030)

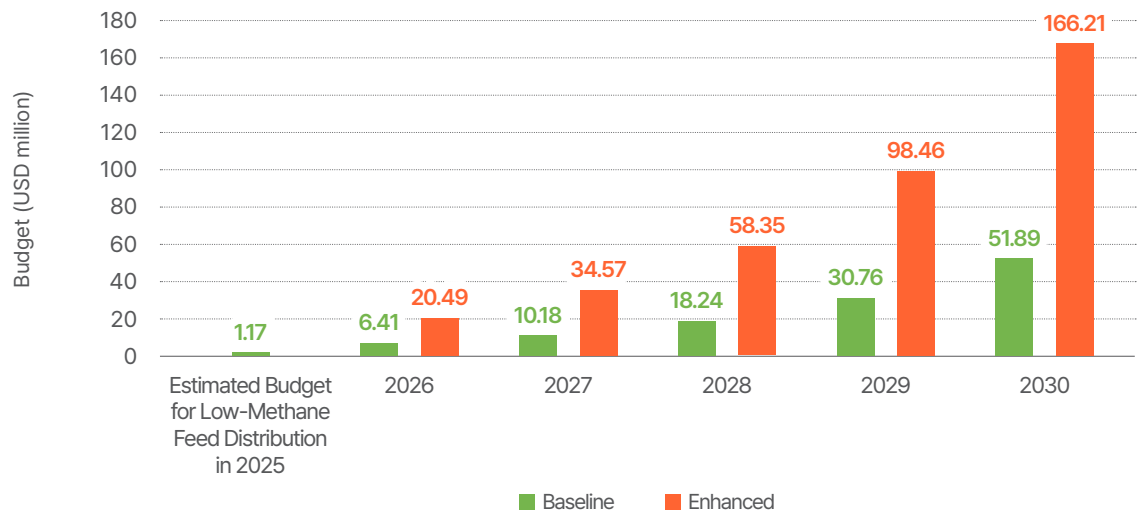
Year	Supply Rate (%)	Livestock Type	Head	Annual Required Budget (USD million)
2026	10	Hanwoo & beef cattle	351,546	17.70
		Dairy cattle	36,880	2.81
2027	16.7	Hanwoo & beef cattle	595,461	29.97
		Dairy cattle	60,696	4.60
2028	27.9	Hanwoo & beef cattle	1,008,892	50.76
		Dairy cattle	99,919	7.61
2029	46.7	Hanwoo & beef cattle	1,708,876	85.97
		Dairy cattle	164,440	12.47
2030	78	Hanwoo & beef cattle	2,895,138	145.73
		Dairy cattle	270,680	20.52
Cumulative Total				378.04

Note: Budget estimates are based on the assumption that identical annual subsidies are provided each year to low-methane feed. The supply rate was applied to the livestock population, assuming the eligible animals are newly designated each year. Annual budget figures are rounded to the nearest second decimal point.

Figure 4-1 illustrates the annual budget required under both scenarios. Even under the conservative Baseline Scenario, the government would need to allocate $6.41 million in 2026 to achieve the 10% feed supply rate.

As discussed in Section 2-2, assuming MAFRA invests $1.17 million in low-methane feed supply in 2025, the funding gap relative to the amount required in 2026 ($6.41 million) is $5.24 million. This amount indicates that the government will need to set the low-methane feed supply rate at a minimum of 10% in 2026 and increase the corresponding budget by at least $5.24 million compared with the 2025 figures.

[Figure 4-1] Annual Budget Requirements by Scenario for Expanding Low-Methane Feed Supply (Baseline vs. Enhanced) (2026–2030)



5. Cumulative Methane Reductions: >0.71 Mt CO_2eq by 2030 through 78% Low-Methane Feed

This study confirmed the potential methane reduction achievable when the low-methane feed supply rate is 78%. The analysis compared two budget scenarios—the baseline scenario and the Enhanced Scenario—under the same assumptions used in the budget analysis.

One key factor in estimating methane reduction is the emission factor as total reduction potential varies even with the same livestock depending on the emission factor applied. To directly compare with the reduction estimates published by MAFRA (2024c), this study applied the 1996 IPCC guidelines and used Tier 1 values for both Hanwoo cattle and dairy cows (Hanwoo: 47 kg CH_4/head/year; Dairy cows: 118 kg CH_4/head/year).

Additionally, the Global Warming Potential (GWP)[3] for methane in the national GHG inventory has been revised upward to 28 in 2025 (based on the 2006 IPCC guidelines, 100-year horizon). This study applied a GWP value of 21 to ensure comparability with MAFRA's estimates. **This means the methane reduction figures represent minimum estimates. If the revised 2006 IPCC guidelines (GWP = 28) were applied, the total methane reduction would increase by approximately 30%.**

Under MAFRA's existing guidelines, if low-methane feed is supplied to beef cattle aged 6 months or older and dairy cows aged 12 months or older, the cumulative methane reduction over five years (2026-2030) would be approximately 0.71 Mt CO_2eq. Under the Enhanced Scenario (targeting all beef cattle and dairy cows), the cumulative reduction over five years would be approximately 0.8 Mt CO_2eq (see Table 5-1, Figure 4-2).

Meanwhile, MAFRA projects that achieving a 78% target would reduce methane emissions by 0.31 Mt CO_2eq. However, this study confirmed that reduction potential is substantially greater, by 0.4 Mt CO_2eq under the baseline scenario and 0.5 Mt CO_2eq under the Enhanced Scenario (see Figure 4-3).

3 GWP (Global Warming Potential) is a relative indicator comparing the impact of a greenhouse gas on global warming over a given period to that of carbon dioxide (CO_2), typically using 20-year and 100-year reference values. Methane's GWP20 value is 84, meaning methane has approximately 8 times the warming effect of carbon dioxide over a 20-year period (based on IPCC AR5).

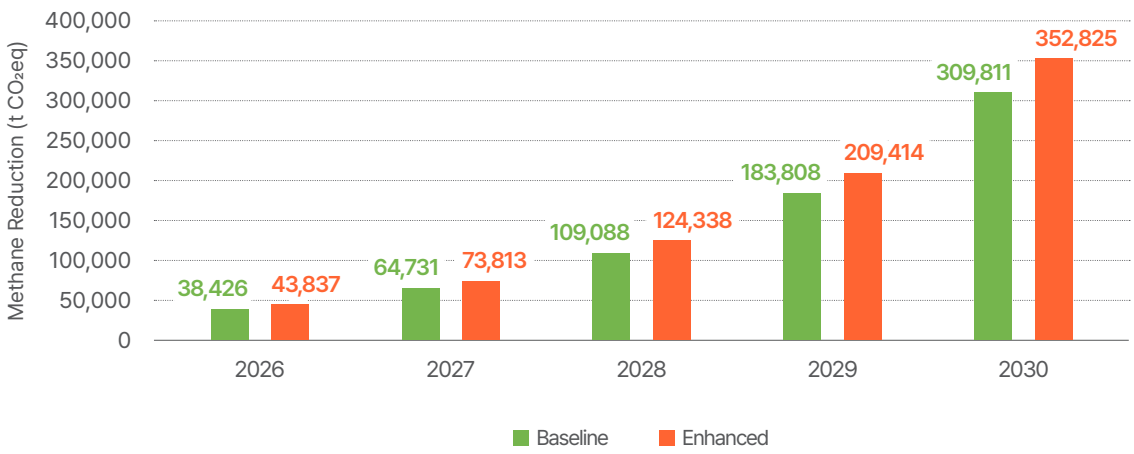
In conclusion, even under conservative assumptions, the methane reduction potential estimated in this study is more than twice the level projected by MAFRA. The government must reaffirm that supplying low-methane feed is the most effective and virtually the only means to reduce methane emissions from enteric fermentation, and must back the 78% supply target with adequate policies and the budget necessary to translate this ambition into measurable outcomes.

[Table 5-1] Estimated Methane Reduction from Low-Methane Feed Supply by Scenario (Baseline vs. Enhanced) (2026–2030)

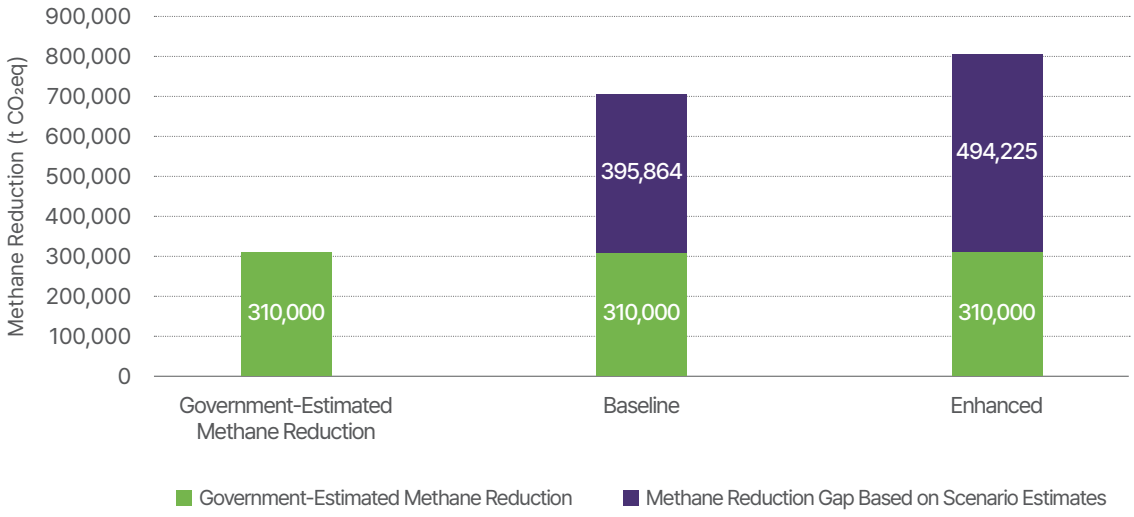
Unit: 10k tons CO_2eq

Year	Supply Rate (%)	Livestock Type	Head	Methane Reduction	
				Baseline Scenario	Enhanced Scenario
2026	10	Hanwoo, beef cattle	313,728	3.1	3.5
		Dairy cow	30,110	0.7	0.9
2027	16.7	Hanwoo, beef cattle	531,429	5.2	5.9
		Dairy cow	49,554	1.2	1.5
2028	27.9	Hanwoo, beef cattle	900,441	8.9	10.0
		Dairy cow	81,575	2.0	2.5
2029	46.7	Hanwoo, beef cattle	1,525,241	15.1	16.9
		Dairy cow	134,248	3.3	4.1
2030	78	Hanwoo, beef cattle	2,584,117	25.5	28.6
		Dairy cow	220,978	5.5	6.7
Total				70.6	80.4

[Figure 4-2] Methane Reduction from Low-Methane Feed Supply by Scenario (Baseline vs. Enhanced) (2026–2030)



[Figure 4-3] Comparison of Methane Reduction Between MAFRA Estimates and Scenarios in the Study (2026–2030, Cumulative)



6. Policy Recommendations: Budget Allocation as the Starting Point for GHG Reduction

A mitigation target without a corresponding budget is merely a declaration. Despite being a key sector capable of achieving substantial methane reductions, the livestock industry continues to suffer from inadequate budgetary allocation.

This report analyzed the methane reduction potential in the livestock sector, and the required budget levels across several scenarios, focusing on the supply of low-methane feed. Analysis results indicate that expanding the low-methane feed supply rate to 78% by 2030 based on MAFRA's current policies would require a cumulative budget of $118.09 million. Under the Enhanced Scenario, with broader eligibility and stronger incentives, the cumulative budget would rise to $378 million. The corresponding cumulative methane reductions are estimated between 0.71 and 0.8 Mt CO_2eq, more than double the government's estimated reduction.

This analysis confirms that the supply of low-methane feed can deliver meaningful methane mitigation as a standalone policy. To ensure successful achievement of MAFRA's supply target, the government should adopt the following policy measures.

First, establish a dedicated budget for the low-methane feed supply. The most crucial factor is demonstrating the government's commitment through budget allocation. The current pilot project framework within MAFRA's limited budget is insufficient to achieve the 2030 target. While the Ministry declared a supply target of 78% by 2030, actual government-funded supply rate remained near zero as of 2024. Insufficient budget allocation is one key reason for this shortfall.

Second, streamline the application process to increase farmers' participation. The current application process for low-methane feed support remains cumbersome for Korea's ageing farming population. Farmers wishing to feed low-methane feed to their livestock must log into the Agrix system and submit photographs of feed deliveries, transaction statements, activity photos, and other documents every quarter. In contrast, Jeju, the first local government in Korea to launch a pilot project, operates a more farmer-friendly system. Instead of farmers submitting documents, the project management body receives transaction records directly from feed suppliers to process subsidies. While safeguarding mechanisms against fraudulent claims remain necessary, the current procedures are excessively complex for farmers and can discourage their participation. These procedural barriers must be reduced to encourage more farmers to participate in the initiative.

Third, designate priority regions and build regional low-methane feed supply models with local governments. This study presented the low-methane feed supply plans included in each metropolitan local government's *Basic Plan for Carbon Neutral Green Growth* in Table 2-1. Thus, the government can select priority regions for low-methane feed among metropolitan local governments willing to expand low-methane feed, create successful cases, and replicate them in other local governments. For example, Jeju began a pilot project for low-methane feed supply in 2023, the first among South Korea's metropolitan governments. Jeju has accumulated on-site data, such as farmer satisfaction levels and evidence of no change in meat quality. The central government should actively support such leading metropolitan governments to scale up this model nationwide.

Fourth, develop and certify home-grown methane-reducing additives to ensure sustainable supply for the Korean livestock industry. To date, the only methane-reducing additive approved by the government is 3-NOP, an imported ingredient. Reliance on overseas technology is a risk in itself, but also it poses a risk of increased import costs. Therefore, in the mid- to- long term, the government should ramp up R&D efforts to develop domestically-produced methane-reducing additives. Regulatory and financial support must be provided to enable home-grown products to enter the market.

In addressing the climate crisis, the budget is not a declaration but the starting point for action. Expanding low-methane feed is a policy for which MAFRA has already set targets, and one that can deliver significant GHG reduction as a single measure. If the government is truly committed to achieving tangible emissions reductions in the agriculture and livestock sectors, there is no justification for delaying sufficient and transparent budget allocation.

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No Budget, No Cuts

Budget and Methane Reduction Impact Analysis for Achieving 78% Low-Methane Feed Supply Target

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Solutions for Our Climate(SFOC) is an independent policy research and advocacy group that aims to make emissions trajectories across Asia compatible with the Paris Agreement 1.5°C warming target.