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ORIGINAL ARTICLE

Searching for synergies for low emission development, the case for dairy subsector in Kenya

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Abstract

This research paper assesses the coherence of policy measures and documents related to low emission dairy development (LEDD) initiatives at different levels with a focus on Kenya. To analyse coherence, an innovative stepwise approach was employed including sampling of measures, assessing for vertical and horizontal coherences, and detecting areas of synergies for prioritisation of measures. Six international level documents, six national level sectoral documents, and two local level documents were analysed to extract a total of 145 measures. These measures were then thematically coded and assessed for coherence with LEDD. The findings reveal that while some policy documents reinforce and enable each other, others show limited coherence in supporting LEDD. The study highlights the importance of classifying coherence among measures and documents to prioritise options for policy makers. The paper identified four key documents as strategic for reinforcing LEDD measures across other policy measures comprising the Kenya Green Economy Strategy and Implementation Plan (KGESIP), the Medium Term Three Big Four Agenda (B4A), the SDGs (Sustainable Development Goals), and the World Bank Climate Smart Agriculture (WB CSA). The paper identifies that policy documents structured to support implementation at the local level tend to be more synergistic. Further, the paper identifies that measures which provide forward-looking pathways, and builds agency among stakeholders, are likely to promote synergistic coherence. This paper contributes to the existing body of knowledge by shedding light on the level of coherence among policy measures and documents in the context of sustainable agriculture in Kenya. It provides insights and recommendations to facilitate effective implementation of LEDD initiatives at national and local levels.

Keywords Low emission dairy development · Synergies · Dairy · Cross-coherence

Introduction

The efforts in Kenya to mitigate emissions from the dairy subsector have been tackled in silos such as climate change, livestock, and development sectors, resulting in disjointed management measures, likely to hinder achieving the mitigation agenda in the country. This paper explores methodological innovation to identify policy entry points that promote inclusive mitigation efforts for the dairy subsector through coherence analysis. Policy coherence studies have been carried out for priority setting and evaluating consistency among statements of intent (Antwi-Agyei et al. 2017; England et al. 2018) and across governance levels (Sandström et al. 2020). Exploring policy coherence has been used to frame pathways towards maximising synergies and assess policy fit among various sectors, and identify policy entry points, with the greatest positive implication (Baker et al. 2019; Phulkerd et al. 2022; Thow et al. 2018). Prioritising

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policy options through policy coherence has mainly been documented in vertical or horizontal contexts.

Vertical coherence studies have explored how international priorities and policies have been actioned at the local level, referred to as policy domestication, for instance in infrastructure development (Lambert et al. 2013) and climate change (Atela et al. 2016). The vertical coherence study approach has given a linear view to policy coherence and assumes little or no interaction with adjacent development plans. Other studies have explored horizontal coherence in identifying cross-sectoral policy priorities, referred to as policy mainstreaming, in climate planning into agricultural policies (Maina et al. 2013); climate change and forestry (Ranabhat et al. 2018); environment, energy, and agriculture (Kalaba et al. 2014); subsectors in agriculture (Ashley 2019); or research in climate smart agriculture, environment, and society (Thornton et al. 2018). Notably, these policy coherence studies have mainly explored cross-scale (vertical) or cross-sectoral (horizontal) linear policy coherences without considering the integration of both, therefore limiting the potential to identify non-linear integral practical policy trade-offs and synergies. These approaches have largely reinforced the silos action towards mitigation efforts in the dairy subsector.

This paper goes beyond the nexus of analysing the vertical and horizontal coherences, by exploring non-linear cross-coherence integrating both the vertical and horizontal coherences, as a methodological innovation, with a case study of Kenya. The paper therefore not only contributes to the main entry points for policy synergies, but analyses what emerges when a cross-coherence analysis is considered, to identify these synergies. Kenya presents a relevant case study to assess both vertical and horizontal coherences in dairy policy interventions because of devolved governance and the relevance of dairy in climate change mitigation. This paper provides supporting information on how vertical and horizontal coherences have been applied to identify priority policy measures and explores how integrated coherence aligns with inclusive agenda setting for low emission dairy development.

Method

Case selection

Dairy is the single largest subsector within the agriculture sector in Kenya, with the thirteenth largest number of dairy cows in the world. The subsector contributes 14% to agricultural gross domestic product (GDP) and 3.5% of total GDP (Muriuki 2011). Approximately 2 million farming households produce milk, 70% of whom are smallholder farms, with low productivity of approximately 1800 kg/cow/year (Odero-Waitituh 2017). Dairy is part of livelihood diversification practices and herd management serves multiple functions including cultural perspectives at the local level. The dairy subsector is associated with high greenhouse gas (GHG) emission intensity, contributing 20% of Kenya's agricultural emissions from the 4.3 million dairy cows (Ericksen and Crane 2018; Kasyoka 2018). This makes the dairy subsector socio-economically significant and an area of interest in climate change mitigation. Notably, in 2020, Kenya submitted Nationally Determined Contributions (NDCs) aimed at 32% abatement of GHG emissions by 2030 relative to the business as usual (BAU) scenario of 143 MtCO2e (Ministry of Environment and Natural Resources 2020).

Kenya presents a relevant case study in assessing both vertical and horizontal coherences in dairy policy interventions because of devolved governance and the relevance of dairy in climate change mitigation. The devolved system of government in Kenya resulted in the decentralisation of agriculture and livestock production governance functions to the subnational levels (county governments), with the mandate to formulate policies and strategies for development (Hussein and Minja 2019). Political decentralisation provides an additional subnational (county governments) level in vertical policy coherence analysis that needs to be considered in policy coherence studies in low emission development in Kenya.

The key sectors that contribute to measures for low emission dairy development (LEDD) include the agriculture and livestock sector, climate change (through the NDC actions), and development sector (promoting sustainable livelihoods). Moreover, the governance of these three sectors is either devolved in Kenya or is managed by distinct institutions. As a result, this study focuses on policy measures from these three sectors with ties to LEDD.

Data collection

Selection of policy documents

This study scoped policy, initiatives, and intervention documents from global, national, and county levels, in agriculture and livestock (with a focus in dairy), climate change, and integrated development pathways. Through a stepwise process, 14 international, national, and subnational documents were selected for inclusion in the study (see Supplementary Table 1). The documents were selected on the criteria that they (i) presented at least three clear policy intervention measures (actions that are taken in implementing the policy); (ii) that are contextually relevant to Kenya (or relevant to dairy in the counties); (iv) have already been instituted (excluding documents in development); and (v) have been active for more than 2 years. Six (6) international level documents were analysed to generate information into the global low emission and dairy development initiatives that have historically been and are currently being promoted for implementation at the national level. Six (6) national level sectoral documents purposefully selected for analysis to generate insights on the process of incorporating

international initiatives, and dissemination to local (county) levels for implementation. At the local (county) level, two (2) documents were purposefully selected for analysis to gain information on actions to align to local practices and actions based on national/international discourses. A total of 145 measures were extracted through thematic coding for assessment of coherence.

Selection of low emission dairy development practices

LEDD practices were identified from literature, with a focus on indicators of low emission dairy development. Through purposeful selection, measures that focus on climate change mitigation have been documented to have the potential to reduce emission intensities and have been practiced in dairy production systems. This study identified nine (9) practices following components of analysis proposed by OECD (2016) and applied by Ashley (2019) comprising of selected dairy sector relevant mitigation (low emission) indicators (FAO 2013; Food and Agriculture Organization of the United Nations (FAO) 2017) (see Supplementary Table 1).

Analysis for coherence

Assessment of coherence was done through three stages and five steps (see Fig. 1): the first step was to assess whether the measures reinforced or enabled LEDD practices; the second step was to assess whether there is coherence of measures across implementation levels (vertical coherence); the third step assessed coherence of measures across sectors (horizontal coherence); the fourth step evaluated whether the measures enable each other; and the fifth step assesses the potential synergies among measures and documents. The steps provide a stepwise approach to funnel policy measures and provide policy makers with a method to prioritise options.

Stage 1: Sampling of measures

This stage focuses on assembling all the policy documents and policy measures, and sampling a few for further analysis steps. The criteria for sampling the policy measures are whether they promote LEDD by being either enabling or reinforcing LEDD practices. In this stage, the aim is to pool together all the measures in the policy documents, score them based on their probability to promote LEDD practices, and funnel the measures to focus on the ones that reinforce and enable LEDD practices. The stage had one step:

Step 1: Coherence of measures to low emission dairy development practices This step aimed at identifying the potential of measures to enable or reinforce LEDD practices. With the measures as rows and LEDD practices as columns, each of the listed policy measures was assessed against each of the LEDD practices. Considering that there were multiple

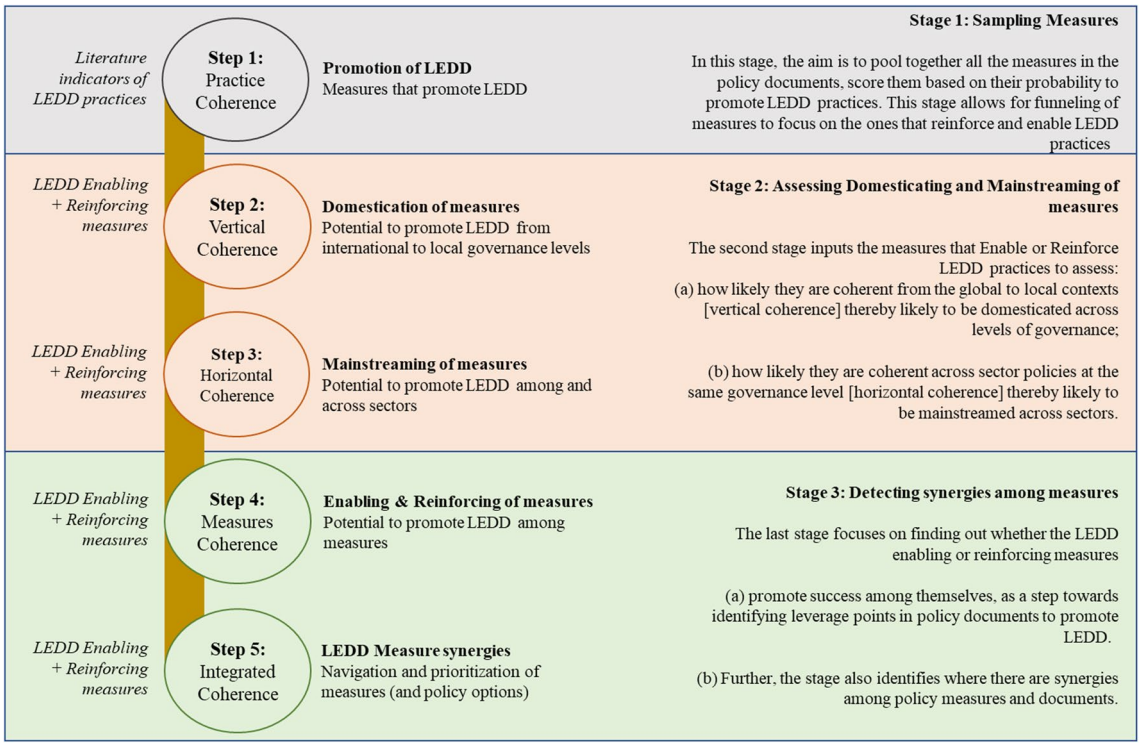

Fig. 1 Analysis steps for detecting synergies among policy measures and documents

measures described in each policy document, the policy measures were grouped by policy document, by sector, and by level of implementation. For instance, the measures within the Kyoto protocol were grouped as climate change sector, and being implemented at the international level.

The policy measures were then assessed for the extent to which they referred to LEDD practices. For instance, how did the Green Climate Fund-related measures refer to LEDD practices? A qualitative score was applied to the level of coherence, ranging from 1 to 5 following Gouais and Wach (2013) (see Supplementary Table 3). Using the qualitative scoring, each of the policy measures was analysed to reveal measures that support low emission dairy development. With the case of the extent at which 'increased efficiency of productivity' measure in the World Bank Climate Smart Agriculture (as a policy document), contribute to 'supplementary feeding' as a LEDD practice, the score assigned was 5 (full extent of reference). This is because efficient productivity contributes to sustainable feeding and nutrients management with multiple co-benefits for carbon sequestration, land restoration, and biodiversity conservation.

Consequently, coherence of policy documents relative to LEDD practices, by sector and implementation level, was determined based on calculating measures' averages across LEDD practices, within policy documents, within sectors, and at the three implementation levels following Nilsson et al. (2016). The resultant average score was then classified as counteracting (less than 1), constraining (1–2), consistent (2–3), enabling (3–4), and reinforcing (4–5) (see Supplementary Table 4). The ultimate result of this step is selecting the measures that reinforce or enable LEDD practices, to be used in the follow-up stages of the analysis.

Stage 2: Assessing domesticating and mainstreaming of measures

The second stage of the analysis tabulated the enabling and reinforcing measures to be able to analyse whether they are domesticated from the international to the local governance levels or mainstreamed across sectors. Domesticating in the context of this paper is defined to assume a degree of control from international level to the subnational county level of policy measures. This assumption allows for analysing whether measures implemented at the subnational county level are aligned across governance levels. However, policy measures' domestication can only occur within sectoral policies and not across sectors. Domestication in this paper is analysed through vertical coherence.

The stage further tabulates and analyses the enabling and reinforcing measures that are mainstreamed across sectors. In this paper, mainstreaming is defined as the potential to align policy measures across the three sectors of focus. The mainstreaming is analysed at each governance level, that is, mainstreaming of the agriculture and livestock policy measures, climate change, and development policies at the international, national, or subnational county levels. The mainstreaming is analysed through horizontal coherence.

Step 2: Assessing vertical coherence of reinforcing and enabling measures In this step, the extent to which measures contribute to each other across three implementation levels (comprising international, national, and subnational/county levels) was analysed. For instance, among the integrated development documents, how measures within the county integrated plan in Bomet (at the subnational level) would contribute to the MTP3 Big Four Agenda (at the national level) or the SDGs (at the international level). The measures were categorised among the sectors, and vertical coherence assessed through qualitative scores applied to the potential of coherence ranging from 3 (high coherence) to 0 (no coherence) for each of the measures based on England et al. (2018) (see Supplementary Table 5).

Vertical coherence was assessed as an average of the coherence among policy documents for each of the three sectors (i.e. vertical coherence was determined per sector) across implementation levels. Higher averages indicated higher potential of domestication of measures across implementation levels. For instance, in agriculture sector, the coherence score averages on measures in policy documents at different implementation levels comprising international (World Bank Climate Smart Agriculture initiative and Feed the future Kenya initiative), national (the Kenya Climate smart agriculture strategy and National livestock policy), and county (Bomet and Murang'a County Integrated Development Plans (CIDPs)) were determined (in this case as an average 0.88 ± 0.01 indicating low potential for domestication in the sector).

Step 3: Assessing horizontal coherence of reinforcing and enabling measures In the third step, the potential of measures being mainstreamed across sector is assessed through qualitatively evaluating the extent to which measures within the same implementation level contribute to each other across three sectors (climate change, agriculture, and development). The measures were categorised among the implementation levels, and horizontal coherence assessed through qualitative scores applied to the potential of coherence ranging from 3 (high coherence) to 0 (no coherence) for each of the measures (see Supplementary Table 5). Horizontal coherence was assessed as an average of the coherence scores among policy documents at the same implementation levels. At the county level for instance, an average of the coherence scores of the Bomet and Murang'a CIDPs (of $0.85 \pm 0.0.04$) was used to determine the potential that there is policy mainstreaming across sectors at the sub-national implementation level.

Stage 3: Detecting areas of synergies

In the final stage, the analysis focuses on combining horizontal and vertical coherences, to identify the potential of the policy measures to enhance the impact of other measures by classifying coherence among the measures and integrating the coherences to identify synergies across policy documents. While classification allows for evaluating the vertical and horizontal coherence analyses on their cumulative contribution to each other, the integrated coherence synthesis promotes the overarching potential that the policy measures result to synergies.

Step 4: Classifying coherence among reinforcing and enabling measures Classification of measures is an important step for policy processes aimed at identifying the measures to focus on among all measures. In the fourth step, the aim is to evaluate the potential that each measure and policy document contributes to enabling or reinforcing each other, irrespective of the level or sector of consideration. The measures were assessed through averaging the vertical and horizontal coherence scores for each measure and policy document. The average scores applied to the coherence among measures ranging from above 1 (reinforcing), to 0 (counteracting) for each of the measures (see Supplementary Table 6).

Step 5: Assessing integrated coherence of reinforcing and enabling measures In the last step, the extent to which domestication or mainstreaming of measures contributes to enhance (synergy area) or diminish (trade-off area) LEDD practices is explored as units of analysis. Integrated coherence enabled identification of measures that were more domesticated than mainstreamed through a ratio of the vertical and horizontal scores, and their relationship with LEDD practices. This is presented as a graph with two axes. On one axis is the ratio between vertical coherence and horizontal coherence scores. Higher scores (above 1) indicate that the measure has lower horizontal coherence score, meaning it is less integrated across sectors (more domesticated than mainstreamed), while lower scores (below 1) indicate that the measure has lower vertical coherence score, meaning it is less integrated across governance levels (more mainstreamed than domesticated). On the other axis is the coherence to LEDD practices, focusing on the measures that are enabling (scoring up to 4) or reinforcing (scoring above 4).

Further the policy documents were then classified as to whether they need considerations to trade-off some measures (let go at the expense of other measures), or they have potential of synergy (scale the achievement of other measures) towards LEDD (see Supplementary Table 7). For instance, while the NCCAP (as a policy document) has measures that enable LEDD, the measures in the document show limited vertical and horizontal coherences with other measures enabling/reinforcing LEDD. This indicates that the NCCAP has major areas that can be considered as potential trade-off, towards promoting LEDD.

Results

Coherence of policies to low emission dairy development practices

The extent to which policy documents are aligned to LEDD measures is presented in Table 1. The findings indicate that more than 60% of the policy measures are enabling LEDD, while about 20% of the measures are reinforcing LEDD.

Reinforcing measures

Reinforcing policy measures comprised of measures that would aid in the achievement of LEDD. These measures included research, capacity development, awareness creation, emission management, and efficiency in production (as summarised in Table 2).

The reinforcing measures are promoted at international, national, and local levels. However, at international level, the key measures are associated with broad spectrum actions such as awareness programmes, emission management, and

Table 1 Extent to which policy measures contribute to LEDD

Implementation level	Sector	Number of policy measures contributing to LEDD			
		Constraining	Consistent	Enabling	Reinforcing
International	Agriculture	1		6	2
	Climate change		2	6	6
	Development		1	11	7
National	Agriculture			25	3
	Climate change			12	5
	Development		10	4	3
County	Agnostic			35	6
	Total	1	13	99	32

Table 2 Key reinforcing measures identified from the analysis

Key measure	Descriptions
Research	Research towards LEDD was represented at the national implementation level and across sectors; while the National Livestock policy promotes livestock research, the Climate Change Act 2016 calls for climate change research, development, and training, and the Bomet CIDP is in support of agricultural research and innovation
Capacity development	Capacity development as a reinforcing measure was nationally important for policy documents, with the Kenya Climate Smart Agriculture Strategy urging the enhanced adaptive capacity and resilience of farmers, while the Big 4 Agenda boosts capacity of small-scale producers, while the Bomet CIDP urges capacity building and extension, and training of farmers on livestock husbandry. Additionally, the SDGs (at the international level) also promote knowledge sharing and capacity building as measures that can reinforce LEDD
Awareness creation	Awareness creation on potential LEDD practices is mostly promoted at the international level, with both the Kyoto protocol and the SDG promoting awareness programmes, while the Bomet CIDP through training on livestock management contributes to creating awareness
Emission management	Emissions management is promoted by international level policy documents, especially under climate change documents (i.e. Kyoto protocol and GCF) and development (the Helsinki principles and the SDGs). At the national level, the Climate Change Act 2016 and the Kenya Climate Smart Agriculture Strategy include measures that would promote LEDD through managing emissions
Efficiency in production	Measures that promote efficient productivity comprise actions at the international and local implementation levels, especially in development and agriculture. The World Bank Climate Smart Agriculture initiative, the Feed the Future Kenya, and the SDGs at the international level call for increased efficiency in production, while both the Bomet and Murang'a urge for affordability of inputs that would contribute to efficiency in dairy production

targets to achieving efficiency in production. At the national level, the need is still in meeting the research and capacity gaps, while at the local level, the focus in reinforcing LEDD actions is associated with creating awareness and promoting efficiency in production. To promote reinforcing measures, it emerges that there is need to broaden out the architecture of policy measures, applicable at the local level.

Enabling measures

Enabling measures create conditions that would enhance the achievement of LEDD practices, even though they may not directly achieve LEDD. In the study, this included majority of the measures categorised into ecosystem management, creating an enabling environment, economic empowerment, and dairy value chain development, as summarised in Table 3.

Consistent measures

In this category, are measures that may not have any significant positive or negative interaction with LEDD practices. The measures comprise general subsidy and taxation-related measures, and measures contributing to the management of extractive industry. At the international level, these measures are attributed to climate change (i.e. GCF) and development (e.g. SDGs) that promote reducing reliance on fossil fuels and building climate-resilient cities. At the national level, these measures are aimed at managing subsidy, reducing manufacturing taxation, reducing importations, reducing the cost of doing business, and establishing a framework to manage extractive industries. The implication being that these measures may not be leveraged for accelerating LEDD in Kenya.

Constraining measures

In this study, there was only one measure that would be considered constraining: broad financial support within the Feed the Future Kenya initiative. This was an indication that without specificity, financial support would limit options for LEDD practices, especially without being integrated into specific LEDD practices.

Vertical coherence

Vertical coherence was considered as the extent at which policy/initiative documents refer to other documents and action plans, within each sector. For instance, in this study, the extent at which the enabling and reinforcing measures within World Bank Climate Smart Agriculture initiative are aligned with other reinforcing measures (among the documents considered in the study) was determined as 1.00 ± 0.13, indicating that the initiative is only partially coherent (Table 4). Cumulatively, the climate change-related policy documents had the lowest (0.78 ± 0.03) average coherence score for the enabling and reinforcing measures, while the development policy documents had the highest (0.95 ± 0.09) average coherence score. Nonetheless, the cumulative average scores indicated limited coherence of the policy/intervention documents to other documents, in enabling or reinforcing LEDD practices for each sector.

Development policy/intervention documents such as the SDGs and the Kenya Green Economy Strategy and

Table 3 Key enabling measures identified from the analysis

Key measure	Descriptions
General ecosystem management	General ecosystem management as a measure has the potential to provide conditions that would promote LEDD. Ecosystem management measures, such as forest management, land resources management, reducing vulnerability to drought, and development of efficient energy systems, are instrumental in ensuring that mitigation actions to climate change are enhanced, especially for the dairy sector. These measures cut across all implementation levels and across sector policy documents. At the international level, for instance, GCF urges sustainable land and forest management measures, while the SDGs support sustainable forest management, and the World Bank Climate Smart Agriculture initiative encourages reducing vulnerability to droughts. Whereas at the national level, the livestock policy, the Climate Change Act, and NCCAP all promote actions that enhance sustainable management of forests, wildlife (including human-wildlife conflicts management), energy resources, and drought management among other measures that would indirectly support achievement of LEDD. At the county level, especially in the Murang'a CIDP, there are various measures that contribute to ecosystem management and planning such as rehabilitation of degraded sites, waste management, and increase in farm forest cover
Creating an enabling environment	Creating an enabling environment is a priority area for LEDD. At the international level, the creation of the enabling environment is skewed towards voluntary actions such as promoting voluntary agreements in the Kyoto protocol, and promotion of cooperative agreements within the SDGs. At the national level, the enabling environment is promoted through strategic planning (e.g. the Kenya Climate Smart Agriculture Strategy and the Big 4 Agenda) and sector policies (e.g. National Livestock policy). The strategies are related to creation of regulatory and institutional frameworks and structural governance transformations. While national policies are more specific including promoting livestock sector funds and insurance, cross-border disease management, as well as establishment of inspectorates to maintain the standards. At the local level, especially in the Bomet CIDP, measures that promote safety and standards, strengthening the cooperative movement framework, and enhancing partnerships and collaborations among sector players, significantly contribute to creating an enabling environment
Economic empowerment	Economic empowerment and livelihood support measures have the potential of ensuring that at farm and market level, LEDD practices can be supported. Majority of these measures are implemented at the national and local levels. The National livestock policy for instance urges development of market infrastructure and information, and promotion of livestock products consumption, and enhancing agribusiness associated with livestock production. The county level actions are associated with enhancing the sustainability of the market systems and diversification of income sources for the small-holder livestock farmers. The Bomet CIDP for instance promotes modernisation of livestock infrastructure, and developing health insurance systems, while the Murang'a CIDP include measures that promote value addition thus diversification of income sources for smallholder farmers
Dairy value chain development	Sustainable dairy value chain development is promoted as part of support actions for LEDD, by promoting the cross value-chain actions that would in the broader sense, allow the thriving of LEDD. Although these measures are more prominent at the national and local level, international interventions promote LEDD actions through measures associated with lowering GHG emissions per unit of production and reducing the waste streams associated with production (for instance in the SDGs, Feed the Future Initiative, and World Bank Climate Smart Agriculture initiative). At the national and county levels, the value chain development measures are promoted from input supply (including development of improved genetic material, artificial insemination, concentrate and improved feed resources, pest and vector control inputs), production (including ensuring animal welfare, feed and nutritional security), trade (through promotion of livestock products trade, and sustainable trade regime options), processing (including promotion of manufacturing and processing), and consumption (through promotion of livestock and livestock products consumption)

Implementation Plan (KGESIP) showed higher coherence scores compared to other documents. The higher score among the documents is associated with their collective push towards building the capacity and awareness at various levels on actions that would contribute to low emission development. Although the two documents provide broad action areas in human development, the low local capacity and awareness on LEDD practices would explain why the documents show better coherence with other initiative/policy documents supporting awareness and capacity building.

In the agriculture sector, documents that promote efficiency in production and management, pest and disease management, and research showed higher coherence across documents. The World Bank Climate Smart Agriculture and the Feed the Future Kenya initiatives aim at increasing the efficiency of productivity, while the National Livestock policy and the Bomet CIDP push for research on livestock and animal welfare. This is essentially an indication that productivity and generation of information and innovative solutions through research are essential to promote dairy development.

Table 4 Vertical coherence assessment among the policy/initiative documents in the study (Mean ± SEM)

Selected policy and intervention documents	Focal sectors in the study		
	Agriculture	Climate change	Development
World Bank: Climate Smart Agriculture	1.00 ± 0.13		
Feed the future: Kenya	1.07 ± 0.19		
Kyoto protocol		0.73 ± 0.14	
Green Climate Fund		0.86 ± 0.11	
SDG			1.04 ± 0.07
Helsinki principles			0.61 ± 0.15
Kenya Climate smart agriculture strategy	0.82 ± 0.14		
National livestock policy	0.85 ± 0.06		
Climate Change Act 2016		0.90 ± 0.11	
National Climate Change Action Plan (NCCAP) 2018		0.69 ± 0.10	
Big 4 Agenda			1.04 ± 0.17
Kenya Green Economy Strategy and Implementation Plan			1.21 ± 0.06
County Integrated Development Plan – Bomet	1.01 ± 0.05	0.77 ± 0.04	0.97 ± 0.05
County Integrated Development Plan – Murang'a	0.73 ± 0.06	0.72 ± 0.04	0.82 ± 0.06
Cumulative per sector	0.91 ± 0.05	0.78 ± 0.03	0.95 ± 0.09

The National Climate Change Action Plan (NCCAP) 2018, within the climate change policy/intervention documents, had lower coherence score of 0.69 ± 0.10. This was mainly because majority of the measures under the NCCAP plan are enabling (may support the achievement of LEDD), are skewed towards national level resilience, and may not integrate the sectoral development pathways. For instance, the document promotes measures such as manufacturing, energy and transport, food, and nutrition security that could enable low emission development, but not directly for the dairy sector. On the other hand, the Green Climate Fund and the Kenya Climate Change Act (KCCA) 2016 score higher under the climate change sector documents coherence. This would indicate that measures promoted under climate change initiatives/policies resonate across implementation levels.

Horizontal coherence

Horizontal coherence was assessed at three implementation levels (international, national, county). At each implementation level, the coherence among the policy/intervention documents was determined as presented in Table 5. The highest average coherence (1.00 ± 0.07) was determined at the international level, which would suggest that the policy documents at the international level are more aligned, and

Table 5 Horizontal coherence assessment among the documents in the study at the three implementation levels (Mean ± SEM)

Selected policy and intervention documents	Focal governance levels in the study		
	International	National	County
World Bank: Climate Smart Agriculture	1.22 ± 0.10		
Feed the future: Kenya	0.70 ± 0.17		
Kyoto protocol	0.96 ± 0.06		
Global Climate Fund	1.10 ± 0.10		
SDG	0.97 ± 0.07		
Helsinki principles	1.04 ± 0.09		
Kenya Climate smart agriculture strategy		0.99 ± 0.10	
National livestock policy		0.83 ± 0.06	
Climate Change Act 2016		1.02 ± 0.13	
National Climate Change Action Plan (NCCAP) 2018		0.84 ± 0.08	
Big 4 Agenda		1.07 ± 0.14	
Kenya Green Economy Strategy and Implementation Plan		1.09 ± 0.13	
County Integrated Development Plan – Bomet			0.93 ± 0.04
County Integrated Development Plan – Murang'a			0.76 ± 0.07
Cumulative per governance level	1.00 ± 0.071	0.97 ± 0.046	0.85 ± 0.083

partially coherent. The potential for mainstreaming of policy measures at the national and county levels was limited (0.97 ± 0.05 and 0.85 ± 0.08), indicating that the measures become more diversified when considered from an international to county level. This indicates that as the policy implementation level becomes localised, the uniqueness in the local setting results in detachment with measures promoted at higher implementation levels. The higher implementation levels have more generalised measures that when localised, would need reprioritisation.

At the international level, except for the feed the future Kenya initiative, the intervention documents seem partially coherent across the measures, with the World Bank Climate Smart Agriculture initiative having the highest agreement (1.22 ± 0.10) with other documents. The Feed the Future Kenya Initiative shows limited coherence across documents, which could be attributed to the specificity of the enabling and reinforcing measures in the document (including sale of improved fodder), which at the international level might not be priority. However, because of the specificity of measures, the Feed the Future Kenya initiative scores higher in the vertical coherence (especially in resonance with the national and county level initiatives).

The variation in priority among counties saw Bomet CIDP having potential partial coherence compared with other documents, while the Murang'a CIDP indicated limited coherence. While the Bomet CIDP was skewed towards livestock research and extension which are broad spectrum and align with majority of measures, Murang'a CIDP was productivity centred, aiming for efficient production and management systems. The diversity in priority between a dairy developed Murang'a (where the priority is now to produce), and a dairy developing Bomet (where the priority is to have the capacity, knowledge, and structures in place) reinforces the trends towards their policies being LEDD promoting. Cumulatively, the county level policy documents indicated limited horizontal coherence across sectors.

Cumulatively, the national level shows limited coherence among policy documents; however, the development-oriented policy documents comprising the Big 4 Agenda and the Kenya Green Economy Strategy and Implementation Plan (KGESIP) show partial coherence with the other national documents. The development policy documents are broad spectrum, cutting across key underlying issues that are contextually important for the country. However, the more sectoral specific policies (e.g. the National Livestock Policy) show limited coherence with other documents, an indication that the potential for mainstream climate actions or inclusive agricultural development actions is still low in Kenya.

Classifying coherence among measures

Classification of coherence was used to evaluate the potential of measures interacting with each other to yield positive policy outcomes. With a focus on enabling and reinforcing measures, this study established that the policy documents were either reinforcing or enabling each other (see Fig. 2).

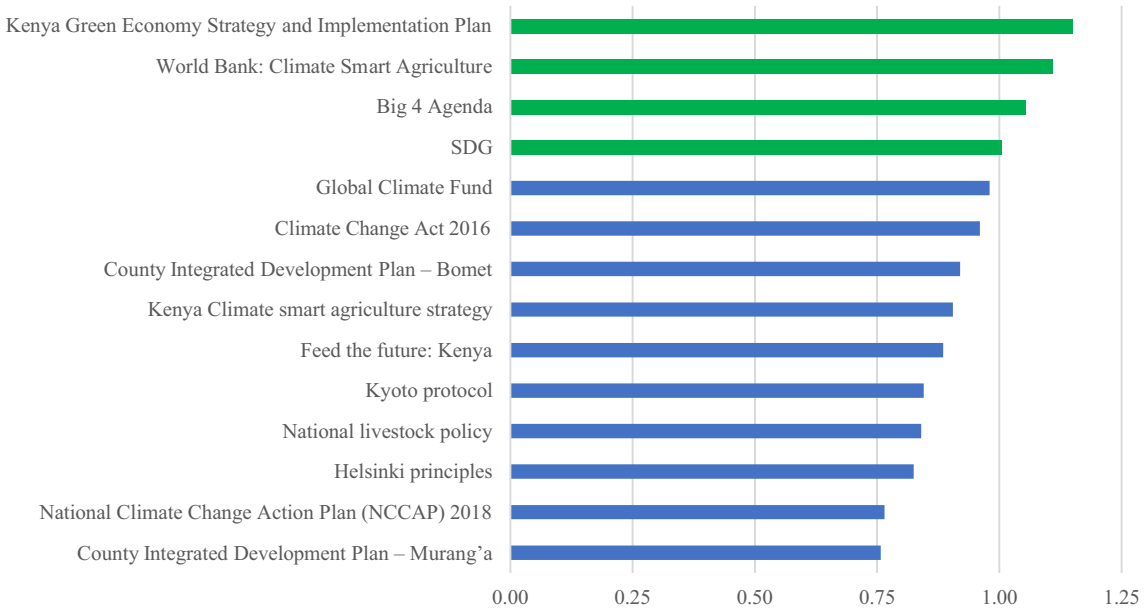

Fig. 2 Inter-measure scores evaluated among the policy documents (counteracting < 0.25, constraining 0.25 to 0.5, consistent 0.5–0.75, enabling 0.75–1.00, reinforcing > 1.00). Green bars indicate the policy documents that are reinforcing; blue bars indicate policy documents that are enabling

The most strategic policy documents in reinforcing measures from other documents at a national level were the Kenya Green Economy Strategy and Implementation Plan (KGESIP) and the Medium Term Three Big Four Agenda (B4A), and indication that the development and sector-specific blueprints took cognisant of other policy measures, being representative of aspirations for LEDD. At a local (county) level, the Bomet CIDP indicates a more integrated policy document when it comes to LEDD measures, while the Murang'a CIDP is almost consistent with lower potential to promote LEDD. At the international level, like the national level, broad spectrum development blueprint, that is the SDGs (Sustainable Development Goals), sector-specific World Bank Climate Smart Agriculture (WB CSA) documents, are more integrative of the measures from other documents in promotion of LEDD. Nonetheless, the policy documents present opportunity for enabling/reinforcing measures detailed in other policy documents. However, the pathway to enhance the potential of reinforcing would require an understanding and a leverage point through identifying synergies and trade-offs, which is presented in the integrated coherence results section.

Integrated coherence

The ratio between vertical and horizontal coherence scores of measures as presented in Fig. 3 indicated that majority of the enabling measures were derived from other implementation levels, corresponding to higher potential for domestication. This would suggest that the provision of an enabling environment to promote LEDD is a fraction of measures from different implementation levels. For example, provision of clean energy is a domesticated measure, which is not integrated across policy measures within each implementation level.

On the other hand, the potential of mainstreaming is higher for policy measures that are reinforcing LEDD. For example, imposing taxes on GHG emission as a measure reinforcing LEDD is better mainstreamed across sectors, than is cascaded along implementation levels. Consequently, whether a measure is domesticated or mainstreamed brings a fundamental question of whether it is an area of potential synergy or trade-off. Trade-offs are more important at the same implementation levels, while synergies are crucial across implementation levels. In Fig. 4, the study presents the spread of measures across vertical and horizontal coherence scores. The study indicates that majority of the measures across the documents need to be selected for implementation at the expense of other measures, with a few measures having the potential for synergies.

The study further identified five policy documents that present low potential for synergy potential in promoting LEDD (Fig. 5). Climate change-related policy documents were determined as documents with measures with lower synergies, while the development-related documents showed higher potentials for synergy towards promoting LEDD.

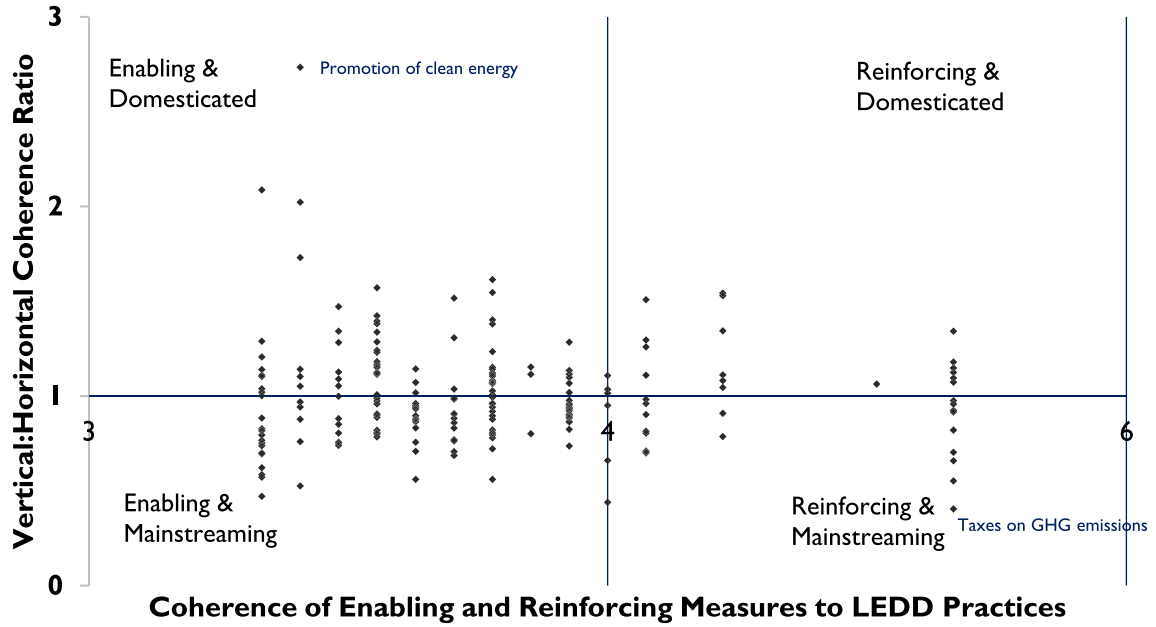

Fig. 3 Integrated coherence assessment through vertical:horizontal score ratios and coherence to LEDD practices. Coherence to LEDD practices focuses on the enabling (3–4) and reinforcing (4–5) measures only. Ratios between vertical and horizontal coherences of more than 1 are likely to be domesticated, while below 1 are likely to be mainstreamed

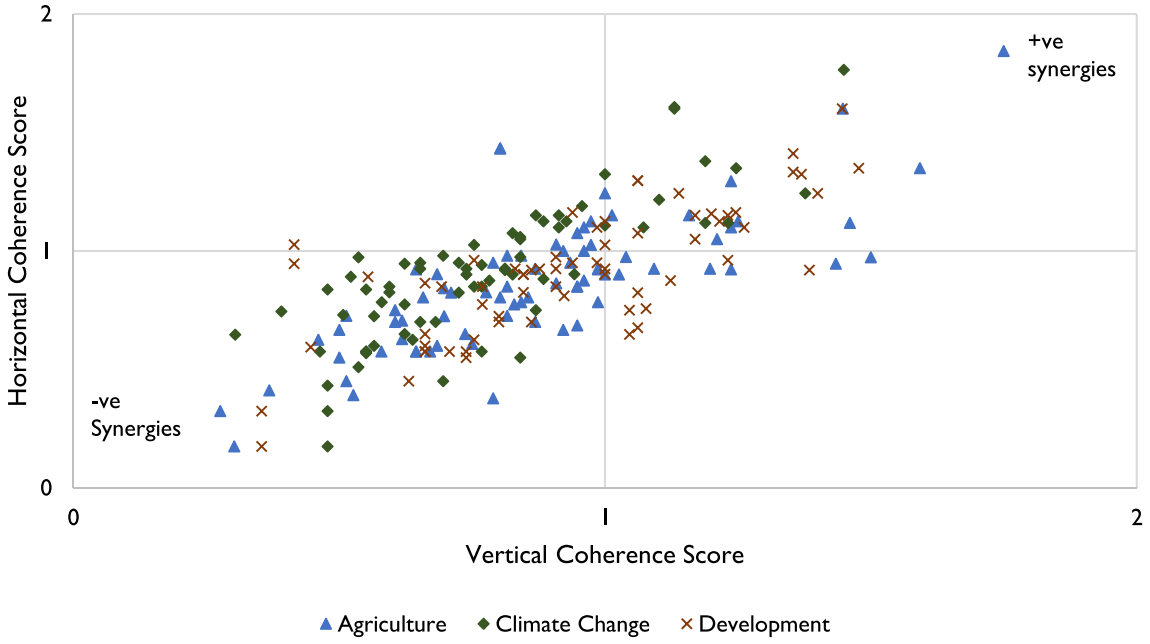

Fig. 4 Potential of negative or positive synergies among measures in promotion of LEDD practices

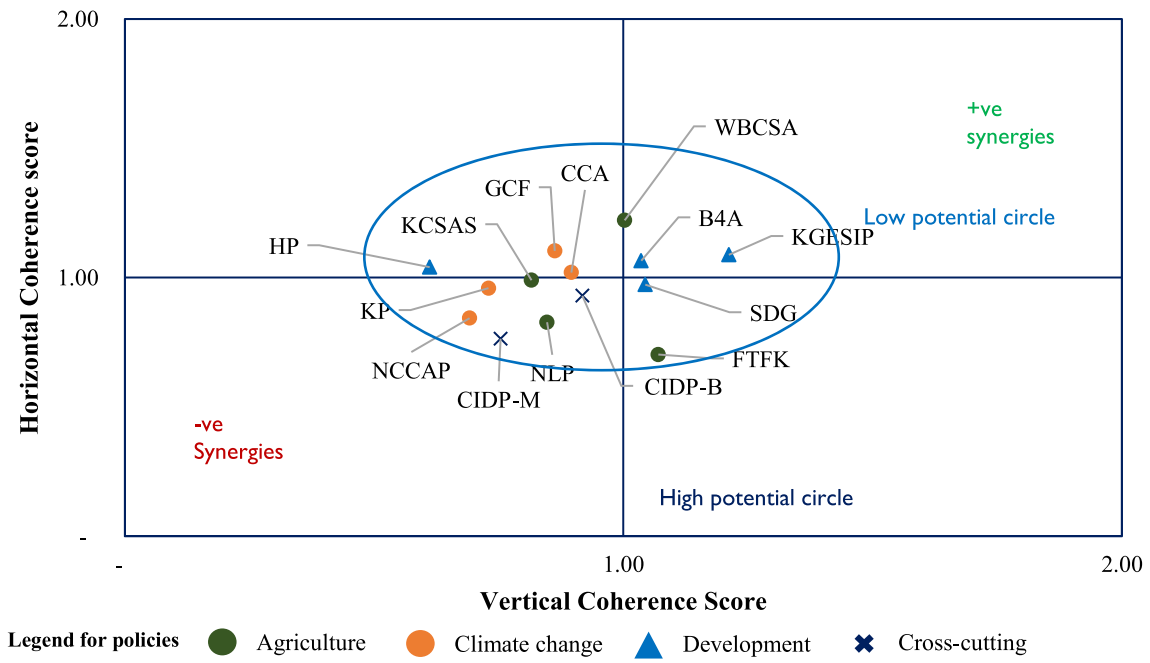

Fig. 5 Integrated coherence of the policy/intervention documents. WBCSA (World Bank: Climate Smart Agriculture), FTFK (Feed the future: Kenya), KP (Kyoto protocol), GCF (Green Climate Fund), SDG (Sustainable Development Goals), HP (Helsinki principles), KCSAS (Kenya Climate smart agriculture Strategy), NLP (National livestock policy), CCA (Climate Change Act 2016), NCCAP (National Climate Change Action Plan 2018), B4A (Big four Agenda), KGESIP (Kenya Green Economy Strategy and Implementation Plan), CIDP-B (County Integrated Development Plan – Bomet County), and CIDP-M (County Integrated Development Plan – Murang'a County)

Discussions

There are many initiatives towards low emission development and there is a need for us to find a way of identifying what works better together and what is in the way of other measures to be successful (Clapp et al. 2010). Having policy measures in a basket makes it possible to identify areas in which they enforce each other and in areas in which they do not (Ashley 2019). This is a different approach to how policy measures have been looked at ideally as standalone initiatives that require standalone action (Phulkerd et al. 2022). In this paper, low emission development is demonstrated as a basket that brings together different initiatives and measures, with different interests from (inter)national to sub national, and yet there are areas of synergy that need to be promoted further and areas of low synergy that requires attention to ensure that there are no conflicts or counteraction in the implementation of the policy measures.

The assumption is that synergy is required across measures to result in positive outcomes across governance levels and sectors. An approach that allows for identifying policy synergies is crucial in opening spaces for policy dialogue and prioritisation (Laurens et al. 2022). However, with the many interests in LEDD, it becomes complex to achieve synergy and it is unlikely to achieve policy cohesion without a guided process. Through the methodological innovation presented in this paper, the focus is on measures that enable or reinforce the targeted action—LEDD.

In the methodological innovation presented in this paper, the first stage provides an opportunity to filter positive measures, able to identify the strategic measures likely to have the greatest impact for LEDD. Many studies on policy coherence, such as OECD (2016), Antwi-Agyei et al. (2017), Ashley (2019), and Atela et al. (2016), often skip this stage. The stage is strategic in prioritisation of measures that would be important to policy development across levels of implementation. The second stage of our innovation is aimed at assessing how well the priority measures from the first stage align with other measures from local to global (vertical coherence), and across sectors within the same level of implementation (horizontal coherence). This stage has been commonly applied in various studies including Lambert et al. (2013), Atela et al. (2016), Maina et al. (2013), Ranabhat et al. (2018), Kalaba et al. (2014), Ashley (2019), and Thornton et al. (2018). In the third stage, the innovation is in identifying how enabling and reinforcing measures interact with each other. The objective is being able to identify measures that are likely to lead to stronger synergies and prioritise the measures that need immediate action. In the methodological approach, it was possible to identify the factors that would result to priority measures. This third stage is entirely unique to this paper.

Through the stepwise approach in this study, four key documents were identified as strategic for reinforcing LEDD measures across other policy measures. The policy documents comprised of the Kenya Green Economy Strategy and Implementation Plan (KGESIP), the Medium Term Three Big Four Agenda (B4A), the SDGs (Sustainable Development Goals), and the World Bank Climate Smart Agriculture (WB CSA). The qualities about these three policies making them likely to contribute to synergies can be summarised into three: supporting local level implementation, foresighted pathway, building agency of actors.

Policy documents structured to support implementation at the local level tend to be more synergistic. All the four policies present mechanisms for local level implementation to align with the overall direction of climate smart development. As such, measures that contribute to dairy development through anticipating, preparing, and responding to climate change effects contribute to low emission development (Lim-Camacho et al. 2017) and livelihood support (Dey et al. 2019). This allows for dairy to develop in a way that absorbs climate-related stress and maintain productivity, while also adapting, reorganising, and evolving to enhance sustainability of the sector (Pervin et al. 2013).

The second factor is providing a forward-looking pathway presented by Pearce-Higgins et al. (2022) rather than a framework of compliance as argued by Weikmans and Gupta (2021). The KGESIP for instance provides a range of implementation pathways that integrate with other measures in climate-resilient development. At the subnational level, the factor of forward-looking pathways distinguishes the two documents. While Murang'a has been documented to be doing better in daily development (Okello et al. 2020), the measures that have been put forward in their CIDPs could be considered unique and contextual to the priorities of Murang'a, making it difficult to resonate easily with other policy documents. The Bomet CIDP, on the other hand, has aspirations drawn from different contexts and different sectors making it more likely to synergise with other policy documents. As such, forward looking pathway is about broadening out and opening up policy choices representing both local contexts, but with room to accommodate global discourses (Pathways Network 2021).

The final factor of synergy is agency. Agency is defined as the capacity to act (Vellema 2016), especially through capability and capacity development. A policy document that enhances agency of stakeholders to influence the direction of its outcomes is likely to present more synergy. In this study, it emerges that policy document where stakeholders are perceived to be involved, or the outcomes of the document resonate with the contextual needs as well as contextual requirements, tends to be more synergistic. The SDGs and the B4A, for instance, are perceived to give agency to

the stakeholders by supporting capability and capacity of the users (Ajwang et al. 2023). Essentially, ssupporting the implementation of the measures towards low emission development requires smallholder capacity to be built, while also providing reliable information to target beneficiaries, through extension services for instance.

The Kenyan context has presented a unique space for this study because of the different levels of governance with a supra-subnational governance framework through the Council of Governors (CoG) secretariat (Steeves 2015). While the CoG functionality has been criticised as over representation and tokenism (Musandu 2019), in this study, the CoG is seen as an enabler that can use the stepwise approach to determine policy choices within a basket and identifying points of synergy as a strategic function of the supra-subnational framework. CoG secretariat has an opportunity to utilise the findings in this paper as a tool in identifying synergies along different policy documents, and across subnational governments, considering the importance of the approach for policy actors that lead decision-making across different governance levels.

Conclusions

We conclude that through applying an integrated approach in policy coherence, synergy measures that promote LEDD, or any mitigation objectives can be identified, through synthesis, and promoted for positive climate action. Through refining the approach, governance frameworks can utilise basket of tools—especially in devolved or territorial governance arrangements, to not-only identify synergy measures in mainstreaming efforts, but also in efforts to domesticate policy measures. Notably, identifying synergy measures in policy is not readily obvious in policy planning, and the tools as applied in this paper provide recommendations that would support integrated multi-sectoral policy development.

Discourses for low emission dairy development highlighted in the paper provide important considerations towards local level implementation, providing a forward-looking pathway, and fostering agency among actors. These insights provide valuable guidance for policymakers and stakeholders involved in the design and implementation of policy measures, promoting synergies and positive outcomes in the pursuit of sustainable and climate-resilient dairy development.

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Data Availability All data generated or analysed during this study are included in this published article and its supplementary information files.

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