Food and Agriculture Organization of the United Nations

Integrating agriculture in National Adaptation Plans (NAP–Ag) Programme

Experiences of integrating agriculture in sectoral and national adaptation planning processes

Public expenditure analysis for climate change adaptation and mitigation in the agriculture sector: a case study of Kenya

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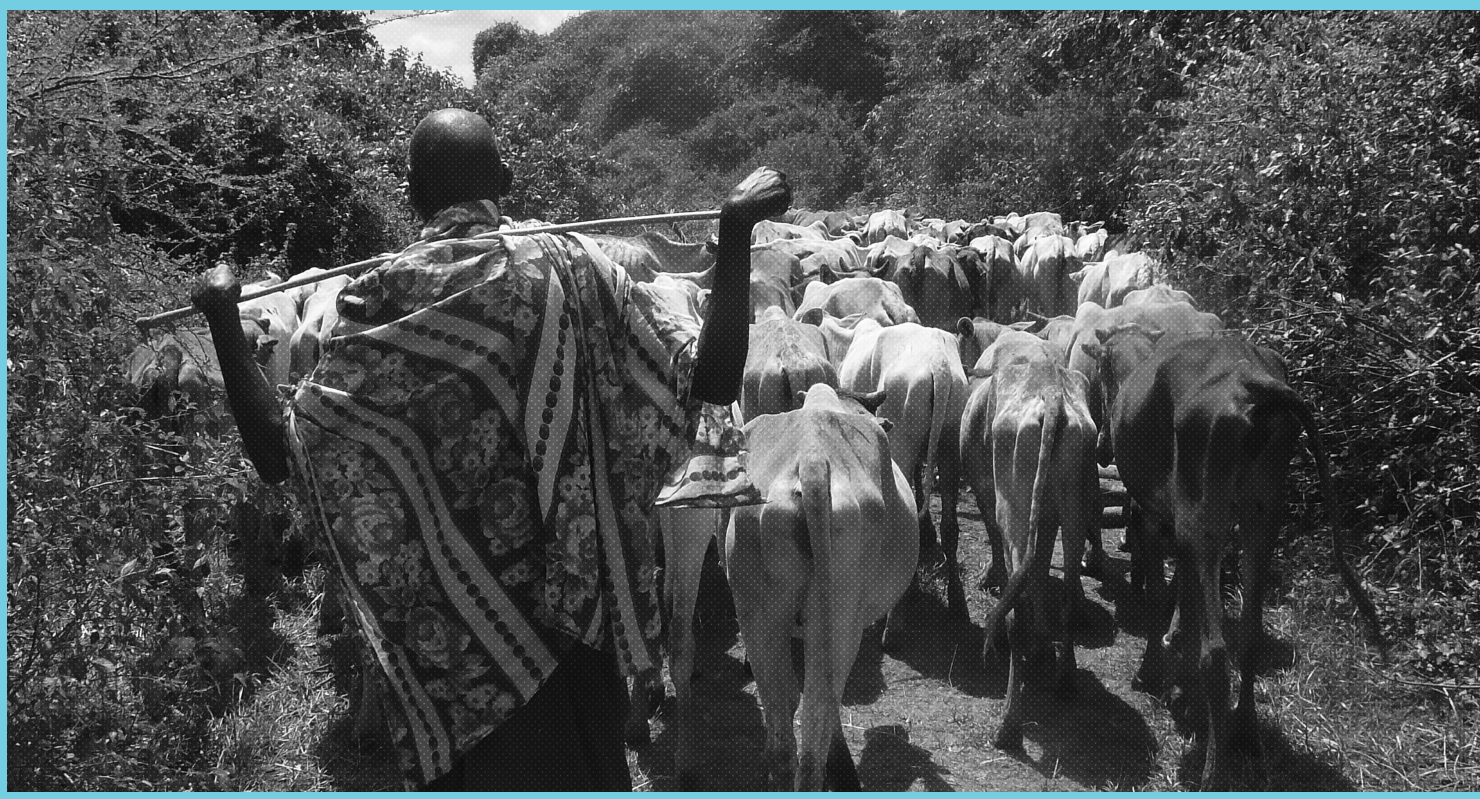
Acronyms

ASAL	Arid and semi-arid land
ASTGS	Agricultural Sector Transformation and Growth Strategy
CPEIR	Climate Public Expenditure and Institutional Review
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross domestic product
GHG	Greenhouse gas
IDB	Inter-American Development Bank
INDC	Intended nationally determined contribution
IPCC	Intergovernmental Panel on Climate Change
MAFAP	Monitoring and Analysing Food and Agricultural Policies
NAP	National Adaptation Plan
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NDC	Nationally Determined Contribution
OECD	Organisation for Economic Cooperation and Development
PEA	Public Expenditures Analysis
PERCC	Public expenditures review and analysis for climate change adaptation and mitigation in agriculture sector
PPP	Purchasing power parity
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change



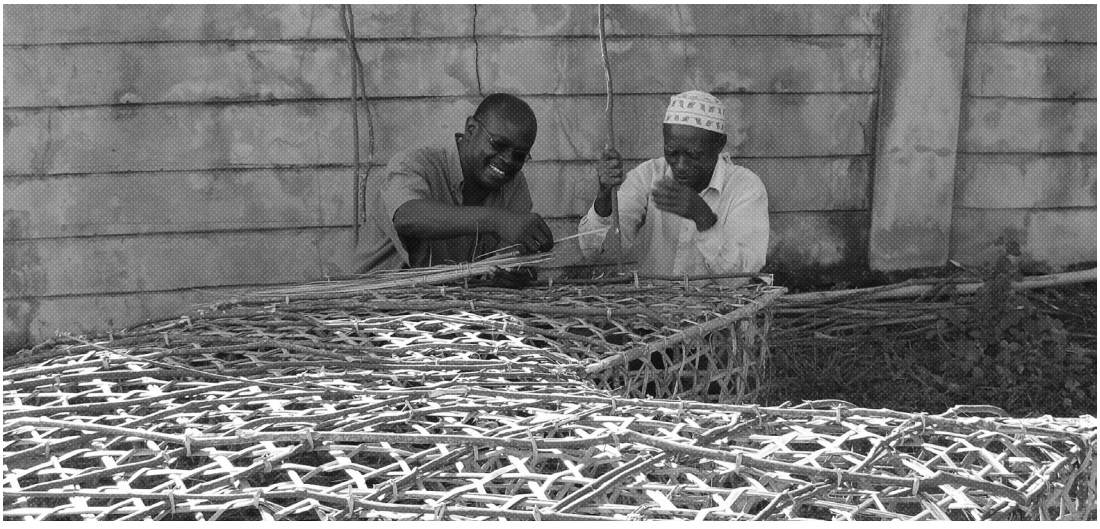
Executive Summary

This document presents a proposed methodology for public expenditure review and analysis for climate change adaptation and mitigation in the agriculture sector (PERCC) and its application to a case study of Kenya. The document starts by explaining the basic methodological concepts, classification and labelling of public expenditures that allow for calculating spending in agriculture related to climate change adaptation and mitigation. Next, the document applies the methodology to public expenditures in Kenya to analyse how agricultural spending policies help, or hinder, Kenya's climate change adaptation and mitigation.

PERCC is a tool that helps in understanding the proportion of public expenditure in support of agriculture sector development that have negative or positive effects on climate change adaptation and mitigation. PERCC aims at analysing the level and the composition of public expenditures that influence the adaptive capacity of the sector to climate change, and actions that increase or decrease Greenhouse Gas (GHG) emissions in agriculture. It looks at all measures addressing climate change adaptation and mitigation in the sector, regardless of the source of financing, instrument used or perceived economic impacts. It analyses the way in which each of the expenditure measures is implemented and assesses the economic signals it sends to the sector. The results allow for assessing whether the agriculture sector is stimulated in a way that facilitates the achievement of a country's climate change adaptation and mitigation objectives and form a basis for further evaluation of the effectiveness of individual measures in reaching these objectives.

The analysis of public expenditures in Kenya reveals that most of the expenditures in support of the food and agriculture sector increase the adaptive capacity of the farming sector. They focus on investments in infrastructure, agricultural research, support to variable inputs use, and support to food consumers, and are broadly consistent with the objectives set out in the National Adaptation Plan (NAP) for the agriculture sector and the resources currently allocated to adaptation activities corresponding to the foreseen budget outlined in NAP. Public expenditures can also stimulate GHG emissions, contribute to emission intensity reduction or increase carbon sequestration. Most of the measures, however, lack detailed descriptions necessary to determine their influence on the GHG emissions, impeding a conclusive assessment. Measures with clear links to GHG emissions account for a small share of agricultural expenditures in Kenya. Some help to reduce GHG emissions by promoting the use of clean energy and service provision to the sector, while others stimulate emissions through actions targeting livestock sector expansion.

The PERCC analysis conducted for Kenya demonstrates the usefulness of this work to better target the expenditure measures for climate change adaptation and mitigation. Unfortunately, the current contents of the database limit the potential of the analysis as full descriptions of the expenditure measures are not available. Furthermore, a proper assessment of the direction of the relationship between expenditure measures and climate change adaptation and mitigation requires detailed contextual information on country characteristics, which would need to be collected and combined with the information included in the expenditures' dataset. Both aspects require substantial additional data collection efforts, which are extremely time consuming and very costly. This constitutes a major drawback of this work and renders it difficult to perform on a regular basis.



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Methodology

The PERCC methodology builds on the public expenditure analysis (PEA) framework developed under the Food and Agriculture Organization of the United Nations' (FAO) project on Monitoring and Analysing Food and Agricultural Policies (MAFAP). PERCC aims at analysing the level and the composition of public expenditures for climate change adaptation and mitigation in agriculture by adding an additional dimension to the standard MAFAP's PEA analysis: each expenditure measure is labelled as related, or not, to climate change adaptation and mitigation (or marked as not determined if information is insufficient to make a proper choice). These are further broken down into measures that are enhancing or constraining climate change adaptation and enhancing or constraining climate change mitigation efforts through decreased or increased GHG emissions, respectively. In cases where it is not possible to establish the role of the measure in climate change adaptation or mitigation, they are marked as "not determined".

Principles of public expenditures analysis

Before labelling expenditures as climate change relevant, a comprehensive PEA in support of agriculture sector development is necessary. The following summarises the most important methodological features of MAFAP's PEA, as described in Ilicic-Komorowska (2010) and MAFAP (2015).

All measures supporting the agriculture sector are considered regardless of their financing source, the finance instrument used, objectives or perceived economic impacts. PEA includes expenditures from the national budget undertaken by either a central or a regional government (regardless of the ministry or agency that implements the policy), and development aid. The agriculture sector is understood in broad terms and it includes forestry and fisheries however some of the key expenditures for agricultural development more broadly address rural areas and they too are also included (e.g., rural roads). General expenditure measures that target the entire economy are not considered, even if they generate monetary transfers to the agriculture sector.

Expenditure measures are analysed and classified according to the way in which they are implemented. The classification makes a broad distinction between expenditures that are agriculture-specific (direct support for the agriculture sector), agriculture-supportive (indirect support for the agriculture sector) and non-agricultural expenditures. Within the agriculture-specific category, the classification makes a distinction between support for producers and other agents in the value chain (e.g., input subsidies, cash transfers), and general or collective support for the sector (e.g. expenditures on research or feeder roads). The agents in the value chain include agricultural producers, input suppliers, processors, consumers, traders and transporters. Agriculture-supportive measures are not strictly specific to the agriculture sector but have a strong influence on agriculture sector development such as investment in rural infrastructure. The detailed classification of support follows the principle of classifying policies according to their economic characteristics (i.e. the way they are implemented), which provides the basis for further policy analysis. This allows us to understand the economic signals that public expenditures provide to the sector and to evaluate the sector's (and agents' operating in the sector) response to them. Box 1 presents the detailed classification.

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Box 1

Classification of public expenditures in support of agriculture sector development

1. ***Agriculture-specific expenditure*** – monetary transfers that are specific to the agriculture sector, i.e. agriculture is the only, or principal, beneficiary of a given expenditure measure
   - **1.1 Payments to agents in the food and agriculture sector** – monetary transfers to individual agents in the food and agriculture sector
     - **1.1.1 Payments to producers** – monetary transfers to individual agricultural producers (farmers)

A. Production subsidies – monetary transfers to agricultural producers that are based on current output of a specific commodity

B. Input subsidies – monetary transfers to agricultural producers that are based on on-farm use of inputs:
- **B1. Variable inputs** (seeds, fertiliser, energy, credit, other) – monetary transfers reducing the on-farm cost of a specific variable input or a mix of variable inputs
- **B2. Capital** (machinery and equipment, on-farm irrigation, other basic on-farm infrastructure) – monetary transfers reducing the on-farm investment cost of farm buildings, equipment, plantations, irrigation, drainage and soil improvements
- **B3. On-farm services** (pest and disease control/veterinary services, on-farm training, technical assistance, extension etc., other) - monetary transfers reducing the cost of technical assistance and training provided to individual farmers

C. Income support – monetary transfers to agricultural producers based on their level of income

D. Other payments to producers – monetary transfers to agricultural producers individually for which there is insufficient information to allocate them into the above listed categories

- **1.1.2 Payments to consumers** – monetary transfers to final consumers of agricultural commodities individually in the form of:

E. Food aid – monetary transfers to final consumers to reduce the cost of food

F. Cash transfers – monetary transfers to final consumers to increase their food consumption expenditure

G. School feeding programmes – monetary transfers to final consumers to provide free or reduced-cost food in schools

H. Other payments to consumers – monetary transfers to final consumers individually for which there is insufficient information to allocate them into the above listed categories

- **1.1.3 Payments to input suppliers** – monetary transfers to agricultural input suppliers individually
- **1.1.4 Payments to processors** – monetary transfers to agricultural commodities processors individually
- **1.1.5 Payments to traders** – monetary transfers to agricultural traders individually
- **1.1.6 Payments to transporters** – monetary transfers to agricultural commodities transporters individually

- **1.2 General support to the food and agriculture sector**– public expenditures generating monetary transfers to agents of the agro-food sector collectively

I. Agricultural research – public expenditures financing research activities improving agricultural production

J. Technical assistance – public expenditures financing technical assistance for agricultural sector agents collectively

K. Training – public expenditures financing agricultural training

L. Extension/technology transfer – public expenditures financing provision of extension services

M. Inspection (veterinary/plant) – public expenditures financing control of quality and safety of food, agricultural inputs and the environment

N. Agricultural infrastructure– public expenditures financing off-farm collective infrastructure
- **N1. Feeder roads** – public expenditures financing feeder roads
- **N2. Off-farm irrigation** – public expenditures financing off-farm irrigation
- **N3. Other off-farm infrastructure** – public expenditures financing agricultural infrastructure that are not feeder roads or off-farm irrigation

O. **Storage/public stockholding** – public expenditures financing public storage of agro-food products
P. **Marketing** – public expenditures financing assistance in marketing of food and agriculture products
Q. **Other general support to the food and agriculture sector** – other transfers to the agro-food agents collectively for which there is insufficient information to allocate them into above listed categories
2. ***Agriculture-supportive expenditure*** – public expenditures that are not specific to agriculture, but which have a strong influence on agricultural sector development
R. **Rural education** – public expenditures on education in rural areas
S. **Rural health** – public expenditures on health services in rural areas
T. **Rural infrastructure** – public expenditures on rural infrastructure
T1. **Rural roads** – public expenditures financing rural roads
T2. **Rural water and sanitation** – public expenditures financing rural water and sanitation
T3. **Rural energy** – public expenditures financing rural energy
T4. **Other rural infrastructure** – public expenditures financing rural infrastructure that are not rural roads, rural water and sanitation, rural energy and other rural infrastructure
U. **Other support to the rural sector** – other public expenditures on rural areas benefiting agriculture sector development for which there is insufficient information to allocate them into above listed categories.

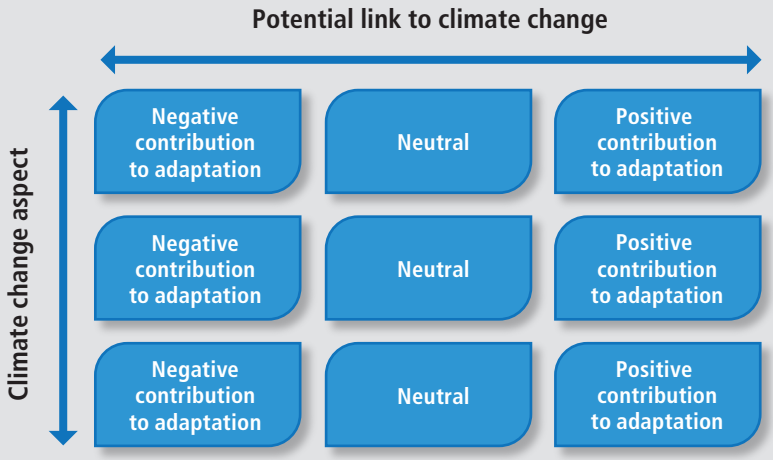
Source: MAFAP (2015).

PERCC climate change labels

PERCC brings the PEA analysis a step further by assigning the climate change labels to each of the measures in the classification. There are multiple options to consider as the same measure can only be related to adaptation or mitigation, or it can be related to both, adaptation and mitigation. Each measure can stimulate the two in a positive or negative way. Further, the measures related to adaptation and mitigation may send signals to the sector that are of opposite signs, for example a measure can be adaptation enhancing and, at the same time, mitigation constraining by inducing additional GHG emissions. Figure 1 summarises the matrix of possible options.

Figure 1

Matrix of interactions between public expenditures and climate change aspects

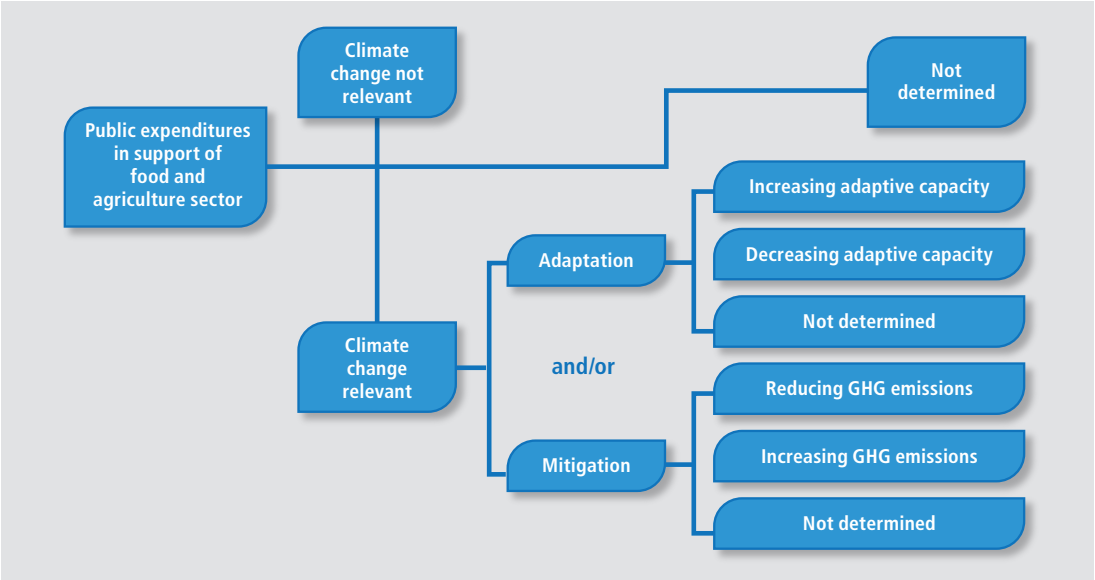


Source: Authors' elaboration.

Considering all the options and taking into account that for a number of measures it may not be possible to determine how the economic signals it sends influence climate change adaptation and mitigation, the following set of labels was defined (Figure 2).

Figure 2

PERCC labels



Source: Authors' elaboration.

This set of labels distinguishes between measures that are relevant to climate change adaptation and mitigation ("climate change relevant" in the diagram), those that are not, and those that cannot be determined due to insufficient information. Moreover, it indicates whether a measure stimulates adaptation and mitigation in a positive or negative way (or when it is not possible to determine). Adaptation and mitigation labels are not mutually exclusive, allowing measures to stimulate both climate change adaptation and mitigation, and not necessarily in the same direction. This is due to the fact that there may be measures that increase climate change adaptation but decrease mitigation capacity as they induce additional GHG emissions. For example, a new road may help remote farmers to increase their adaptive capacity via better access to the markets but increase GHG emissions and negatively contribute to country's mitigation objectives especially if the road runs across a forest and constructing it required cutting down trees.

The labelling is based on the potential of each expenditure to address (or not) climate change issues via the economic signals it sends to the sector, rather than their objectives. The difficulty of such an approach is that the same economic signals may give different environmental results depending on the country's agriculture sector characteristics. As a result, the same expenditure measure may be attributed a different label across countries depending on their characteristics. For example, a fertilizer input subsidy will clearly have a negative link to climate change mitigation as it increases GHG emissions, however, investments in irrigation may have a positive or negative link to climate change adaptation depending on the water resources and climate conditions in a given country. As work on country studies develops, PERCC methodology refines the criteria for attributing the labels and develops a set of rules based on countries' typologies to guide analysts in assigning the labels. Nevertheless, accounting for all possibilities may not be feasible and expert judgement may be necessary.

Climate change adaptation and mitigation definitions

PERCC adopts FAO's definitions of adaptation and mitigation. FAO defines adaptation as "the vital response to the adverse effects of climate and the preparation for future impacts". This includes an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploit beneficial opportunities as noted by the Intergovernmental Panel on Climate Change (IPCC, 2014). In agriculture, adaptation actions

encompass technological responses, enhancing smallholder access to credit and other critical production resources, and strengthening institutions at local and regional levels. Specific responses consist of developing new crop varieties adapted to changes in CO_2, temperature and drought, fostering the capacity for climate risk management, offsetting economic impacts of land use change, crop insurance, and information systems to support early warning and proactive planning.

Mitigation, according to FAO includes all the "human interventions to reduce the emissions of GHGs by sources or to enhance their removal from the atmosphere by sinks (e.g. forests, vegetation or soils that can reabsorb the CO_2)". Mitigation measures in agriculture include technological innovation and transfer, crop diversification, climate-smart agricultural practices to increase soil quality and decrease soil erosion (IPCC, 2014).

PERCC and evaluation of policy measures addressing climate change

Through the classification and labelling of expenditure measures, PERCC feeds into policy analysis in multiple ways. It allows for monitoring the level of expenditures in agriculture that are linked to climate change adaptation and mitigation. It allows for the understanding of how much of them have a potentially positive result on the climate and how much may actually further contribute to climate change. It allows for assessing how much the expenditures address adaptation issues and how much target climate change mitigation respectively. This, in turn, combined with countries' climate change profiles helps to assess whether the spending pattern addresses the most critical issues; determine if the support does not produce counterproductive outcomes in terms of climate change adaptation and mitigation; and assess whether the spending pattern is coherent with governments' climate change objectives. Finally, given that the classification is based on economic characteristics of expenditure measures, it can be further used in modelling work to assess the impacts of the interventions and give insights into the size of the climate change adaptation and mitigation effects, including how effective the expenditures are in reaching the stated objectives. All of the above will feed into evidence-based policymaking and help improving national climate change adaptation and mitigation plans for the agriculture sector and contribute to setting up more realistic climate change targets for agriculture and the whole economy.

PERCC and other initiatives

PERCC has been conceptualized to fill in the gaps in the research on how agriculture support can be more effective in contributing to climate change adaptation and mitigation in the agriculture sector. Most of the public expenditure reviews with climate change focus analyse the the overall levels of public spending, not disaggregating across different sectors of the economy. For example, The United Nations Development Programme's (UNDP) Climate Public Expenditure and Institutional Review (CPEIR), initiated in 2011, looks at how governments allocate national budgets on their national climate change responses (UNDP, 2015). CPEIR, combined with a review of fiscal policies and development

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of national climate change financing frameworks, helps policy makers to understand the resource level required; monitor climate finance flows; assess cost effectiveness and impact of existing expenditures; increase transparency in resource allocations; and formulate economy-wide policy reforms. Public expenditure studies with an agriculture sector focus are very limited and concentrate on selected aspects of climate change. For example, the Inter-American Development Bank (IDB) has linked agricultural support to GHG emission (Joseling et al., 2017) to establish the consistency between agricultural policy objectives and nationally established climate change targets. The authors analysed whether the products that contribute the most to GHG emissions are also those that receive the most protection and whether incentives emerging from agricultural support are in line with GHG emission mitigation objectives. A recent study by the Organisation for Economic Cooperation and Development (OECD, Henderson and Lankoski, 2019) looks at how main categories of agricultural support policies influence selected agro-environmental indicators. Using a combination of farm-level model and a partial equilibrium framework for a limited number of OECD countries, the study evaluates the impacts of selected agricultural support measures on GHG emissions and nutrient balances, and attempts to determine the strength of the relationship between support measures and their environmental impacts. PERCC aims at providing a comprehensive approach in analysing agricultural policies from the perspective of their climate change friendliness.

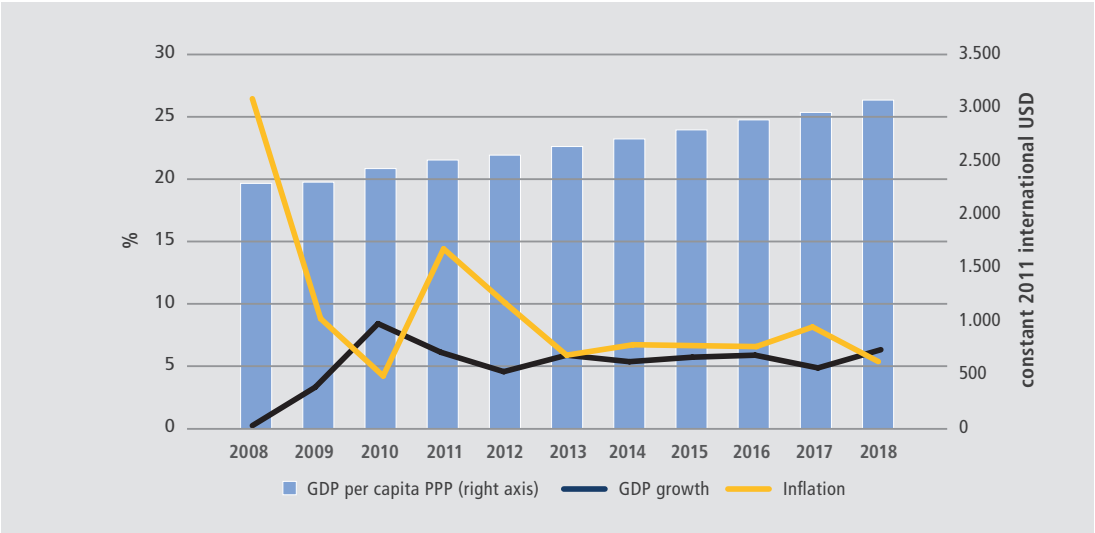
The case study of Kenya

Agriculture sector and climate change in Kenya

Kenya is one of the largest economies in East Africa. With real gross domestic product (GDP) growth at around 5 percent per year and stable inflation in the recent years, the GDP reached USD 88 billion (KES 8.9 trillion)[1] in 2018 and GDP per capita (PPP constant 2011 USD) surpassed USD 3 000 (KES 300 thousand, Figure 3). The agriculture sector is one of the major drivers of Kenya's growth (Figure 4 representing a quarter of Kenya's GDP. Between 2016 and 2018, around 58 percent of the overall people employed were working in agriculture, however as much as 75 percent of Kenyans made at least a part of their living from agriculture. Agriculture is also a key source of foreign exchange earnings: in 2017, agriculture accounted for almost 65 percent of the merchandise exports (USAID, 2019; World Bank, 2019).

Figure 3

Macroeconomic performance of Kenya, 2008 to 2018



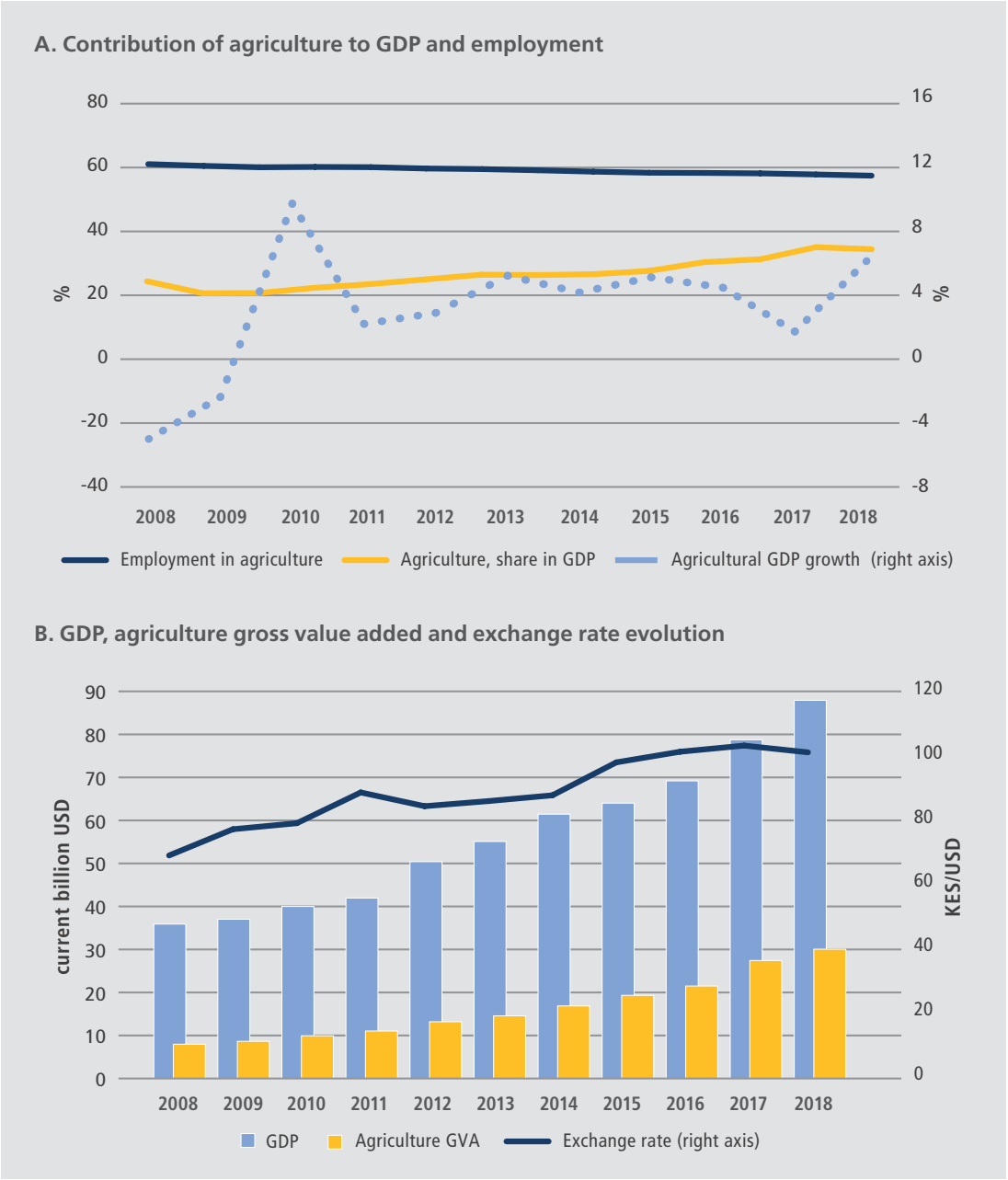
Source: WDI (2019).

1 All monetary values used in the text and in the charts are in USD or KES as provided in original sources of data. For easier comparison all monetary values quoted in the text are accompanied with values in brackets converted using average annual exchange rates KES/USD from IMF (2019), plotted on Figure 3B for 2008 to 2018 period.

Although the share of agriculture in GDP was continuously increasing, the agriculture sector growth has been very unstable in recent years. This is because most of the farmers in Kenya are poor smallholders who are vulnerable to economic fluctuations. Around 75 percent of the total agricultural production comes from small-scale farming and 87 percent of farmers have less than 2 ha of land at their disposal, while 67 percent operate on less than 1 ha (World Bank, 2019). In 2015, more than 86 percent of Kenya's population was still living below the USD 5.50 (KES 540) a day poverty line, while the share of undernourished people has been on the rise since 2013 and reached 25 percent of Kenya's population in 2015 (Figure 5).

Figure 4

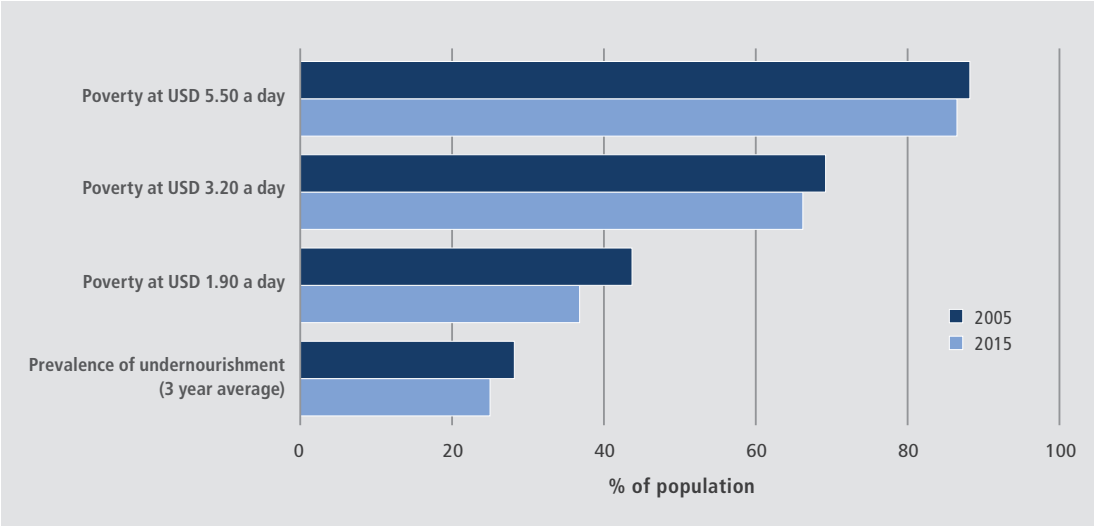
Importance of agriculture sector in Kenya, 2008 to 2018



Source: WDI (2019) and IMF (2019).

Figure 5

Poverty and food insecurity in Kenya, 2005 and 2015



Source: WDI (2019) and FAOSTAT (2019).

The climate change contributes greatly to the irregular performance of the agriculture sector in Kenya. According to the Centre for Global Development (CGD), Kenya is the 13th country (out of 233) most exposed to direct risks arising from extreme weather events and 71st for overall vulnerability to climate change (CGD, 2018). The climate change associated risks are draughts, floods and rising sea levels (GoK, 2016).

Drought is the major recurrent natural disaster in Kenya and their frequency and intensity have increased over time. Droughts caused severe crop and livestock losses and led to famine and population displacement. As arid and semi-arid lands (ASALs) cover over 80 percent of the country and average temperatures are to increase, Kenya is particularly exposed to the risk of droughts. The 2008/2011 drought has slowed down the GDP by an average of 2.8 percent per annum, with total economic losses estimated at USD 12.1 billion (more than KES 1 trillion) with the livestock subsector being the most affected (GoK, 2016).

Floods, linked to El Niño or La Niña phenomena, also occur every three to four years on average while annual rainy seasons in Kenya are becoming wetter and often bringing sudden inundations. Although riverine floods are the most dominant, the ASALs also experience flash flooding. The economic costs of flooding are estimated at 5.5 percent of GDP every seven years.

A rising sea level is a major source of risk to the five coastal counties in Kenya. In combination with extreme weather events, it is likely to intensify flooding, as most of the coastland is low-lying. It is also likely to render more acute the current water supply and salinization problems. Salinization of soils will reduce crop production, particularly mango, cashew nut and coconut. Overall, the losses for the agriculture sector associated with 1-metre rise in sea level are estimated to be USD 472.8 million (around KES 47 billion, GoK, 2016).

Kenya's contributions to the GHG emissions are relatively low. In 2010, GHG emissions were equal to roughly 73 $MtCO_2eq$, however, they are expected to rise to 143 $MtCO_2eq$ in 2030. The land use, land-use change, and forestry (LULUCF) and agriculture sectors are the most important contributors (GoK, 2015). Agriculture emissions are expected to increase from 20 $MtCO_2eq$ in 2010 to 27 $MtCO_2eq$ in 2030. The crop sub-sector accounts for about 10 percent of the agriculture emissions driven by deforestation, conventional tillage, flooding of paddy rice fields and land-use change. Livestock accounts for almost all of the remaining 90 percent of the emissions with enteric fermentation being the leading cause.

Agricultural policy and climate change

The importance of agriculture in Kenya is emphasised through Vision 2030 and the President's Big Four priority agenda for 2017-2022 in which agriculture, along with manufacturing, housing and healthcare, is a key sector to ensure inclusive growth and food security for all. Within this general

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framework, the Agricultural Sector Transformation and Growth Strategy (ASTGS) is guiding the agriculture sector interventions until 2029. It identifies three key pillars of improved agricultural performance: increasing the incomes of small-scale farmers, pastoralists, and fishermen; increasing agricultural production and value-added; and boosting household resilience to food insecurity as well as "enablers" that are necessary to guarantee reaching the objectives defined within the pillars. The specific actions to be undertaken by the government are specified within "flagships", six of which are defined under each of the pillars and three belong to the groups of enablers.

Climate change issues are addressed in economy-wide strategies that specify contributions of individual sectors, including agriculture. Kenya launched a National Climate Change Response Strategy (NCCRS) in 2010 and a National Climate Change Action Plan (NCCAP 2013-2017) in 2013. In 2018, the action plan was renewed into NCCAP II for 2018-2022. The plan provides a framework for Kenya to deliver on its Nationally Determined Contribution (NDC) under the Paris Agreement and transition the country into a low carbon climate resilient development pathway. Climate change adaptation was set as a key priority for the country recognising the adverse socio-economic impacts related to climate change as well as the increasing vulnerability of the different sectors. It was also recognised that adaptation and development goals need to complement each other in order to reach sustainable development. The National Adaptation Plan (NAP), developed for 2015-2030, builds on the foundations laid out in the NCCRS and the NCCAP. It forms the basis for the adaptation component of Kenya's Intended Nationally Determined Contribution (INDC) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat.

The actions proposed in the NAP complement adaptation actions that are ongoing through various projects and programmes already implemented by the public and private sector rather than duplicate ongoing efforts. Related to the agriculture sector, NAP proposes to:

- Reinforce the land reforms and ensure sustainable land use;
- Protect the environment to secure livelihoods, health and ecosystem services, among others;
- Enhance the resilience of the food crops, industrial crops and horticulture value chains;[2]
- Enhance the resilience of the livestock value chains;
- Enhance the resilience of the fisheries value chains;
- Fast track the Common Programme Framework for Ending Drought Emergencies 2012-2022.

2 Referred to as "agriculture" in NAP.

An important number of other actions are foreseen of a cross-cutting nature that will enhance climate change adaptation across all sectors of the economy including health, education and water and sanitation.

Table 1 summarises the detailed action plan for agriculture and associated budget (detailed table with specific short, medium and long term actions is available in Appendix 1.).

Table 1

Kenya NAP – main actions specifically related to agriculture and associated budget for 2015-2030

Land reforms	
Action	Mainstreaming climate change adaptation in land reforms.
Budget	*USD 1.4 million*
Environment	
Action	Mainstream climate change adaptation in the environment sector.
Budget	*USD 636.1 million*
Crops	
Action	Enhance the resilience of the agricultural value chain.
Budget	*USD 375.1 million*
Livestock	
Action	Enhance the resilience of the livestock value chain.
Budget	*USD 299.8 million*
Fisheries	
Action	Enhance the resilience of the fisheries value chain.
Budget	*USD 136.9 million*
Common programme framework for ending drought emergencies 2012-2022	
Action	Fast track the implementation of the Ending Drought Emergencies *(EDE) Common Programme Framework.*
Budget	*USD 2 118.3 million*
Total budget allocated to actions related to agriculture	***USD 3 567.6 million***

Source: GoK (2016).

PERCC in Kenya

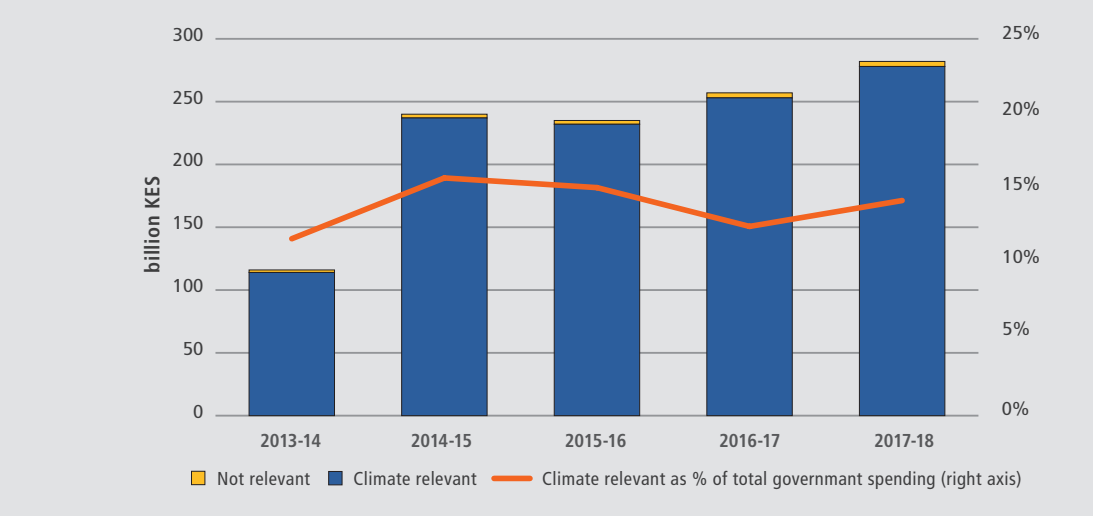
The PERCC analysis is carried out from the period 2013/14 to 2017/18 for which public expenditure data is available in the 2019 edition of the MAFAP database. The analysis starts with an investigation of the share of public expenditures in support of the food and agriculture sector that is related to climate change adaptation and mitigation efforts. Next, the level and composition of public spending for adaptation and mitigation are examined, and a comparison between actual expenditures and budgetary allocations is performed. The last section assesses the coherence of observed spending patterns with the government's objectives stated in the strategies summarized above.

Level and composition of spending

Most of the public expenditures in support of the food and agriculture sector in Kenya affect its capacity to adapt to climate change as well as the level of GHG emissions coming from this sector (Figure 6). The information gathered in the MAFAP database allows for classifying about 99 percent of public expenditures as relevant to climate change adaptation and mitigation (referred to as "climate relevant" for simplicity), on average in the considered period. The amount of climate relevant spending is increasing throughout the aforementioned period from KES 114 billion (USD 1.32 billion) to nearly KES 280 billion (USD 2.7 billion), with an average annual growth rate of 20 percent. The climate relevant spending in agriculture constitutes, on average, 14 percent of total government spending in all sectors of the economy.

Figure 6

Public expenditures in support of food and agriculture sector and climate change related spending, 2013/14 – 2017/18

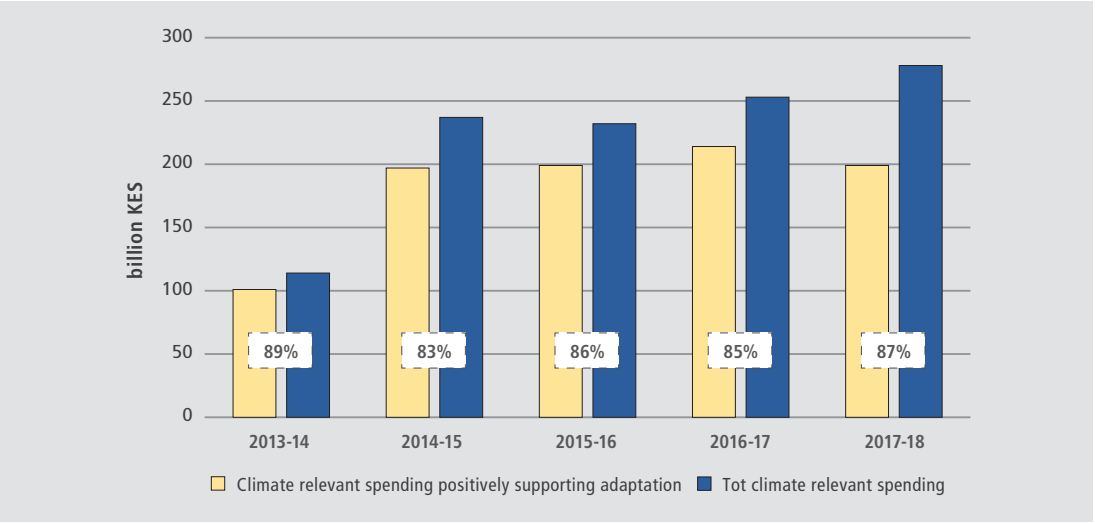


Source: Authors' calculations based on MAFAP database.

Within climate-relevant spending, on average, 86 percent of public expenditures are positively linked to climate change adaptation (Figure 7). This share is relatively stable throughout the years, while the underlying amount increases on average 24 percent per year from KES 101 billion (USD 1.2 billion) to KES 241 billion (USD 2.3 billion). For the remaining 14 percent of the climate relevant spending, it was not possible to determine whether it is related to adaptation or not, nor the direction of the relationship.

Figure 7

Climate relevant agricultural spending positively supporting adaptation, 2013/14 – 2017/18

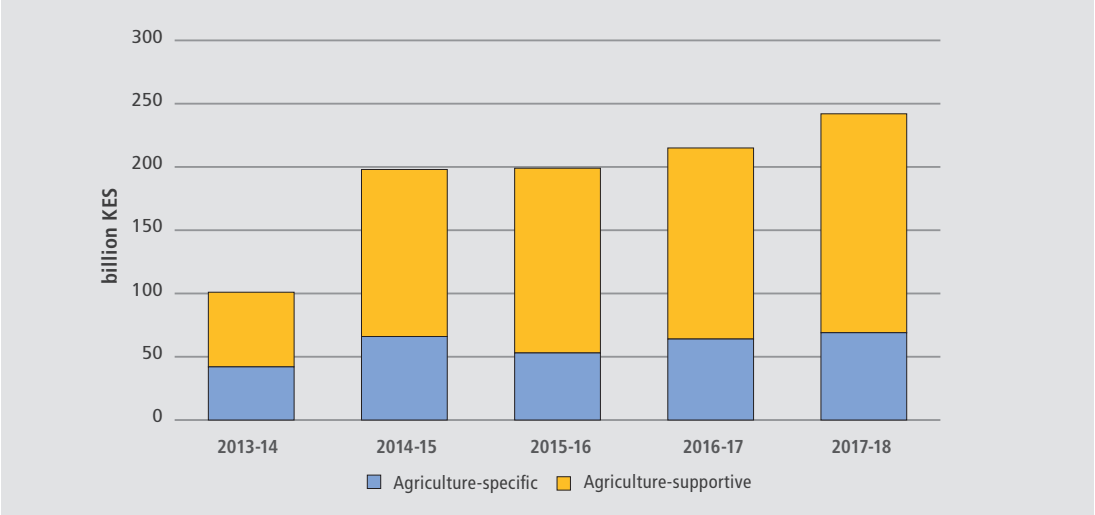


Source: Authors' calculations based on MAFAP database.

The average composition of public expenditures positively supporting adaptation is investigated to determine the type of adaptation-enhancing measures employed. A first broad disaggregation between agriculture-specific and agriculture-supportive measures shows that a higher share of measures in favour of adaptation is spent on agriculture-supportive activities, ranging from 60 percent to 70 percent in the periods considered, and increasing overall, reaching KES 173 billion (USD 1.7 billion) in 2017/18 (Figure 8). Agriculture-specific measures enhancing adaptation grew as well, reaching KES 69 billion (USD 0.7 billion) in 2017/18.

Figure 8

Agriculture-specific/agriculture-supportive public expenditures positively supporting adaptation

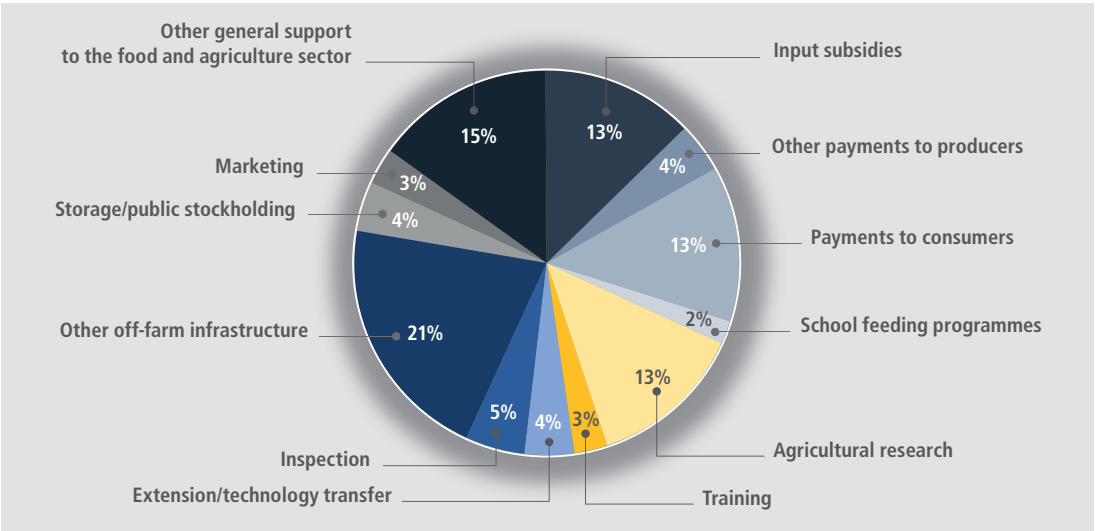


Source: Authors' calculations based on MAFAP database.

Further disaggregating and focusing on the average composition of agriculture-specific public expenditures positively stimulating the adaptive capacity of the agriculture sector (Figure 9), the largest share (21 percent) is given to other off-farm infrastructure (including off-farm irrigation, which contributes the most, and feeder roads), followed by spending in other general support to the food and agriculture sector (15 percent). The 13 percent of adaptation supportive measures was respectively spent on subsidies for improved quality inputs (including variable inputs such as improved seeds or fertilizers, which contributes the most, support to building on-farm capital and on-farm services provision), on agricultural research, and payments to consumers (cash transfers above all). Finally, inspection, training, extension and technology transfers, other payments to producers, storage, marketing and school feeding programs contribute with smaller shares (in the range of 2 to 5 percent).

Figure 9

Composition of agriculture-specific public expenditures positively supporting adaptation, 2013/14 – 2017/18 average



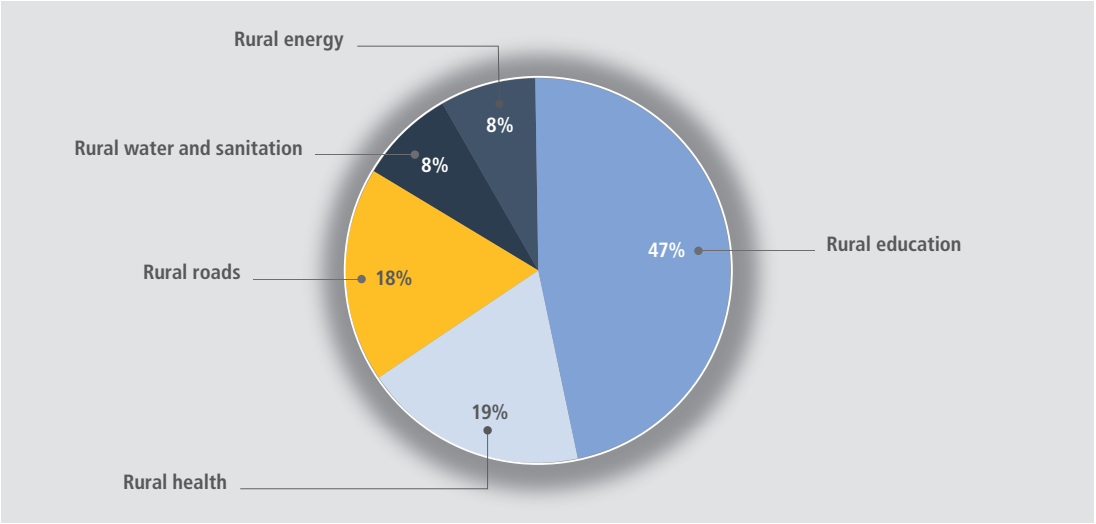
Source: Authors' calculations based on MAFAP database.

The analysis of the average composition of agriculture-supportive public expenditures positively supporting adaptation (Figure 10) reveals that rural education accounts for the largest share

(47 percent), while 19 percent and 18 percent respectively is spent on rural health and rural roads. Finally, rural water and sanitation and rural energy make up the remaining share (8 percent each).

Figure 10

Composition of agriculture-supportive public expenditures positively supporting adaptation, 2013/14 – 2017/18 average

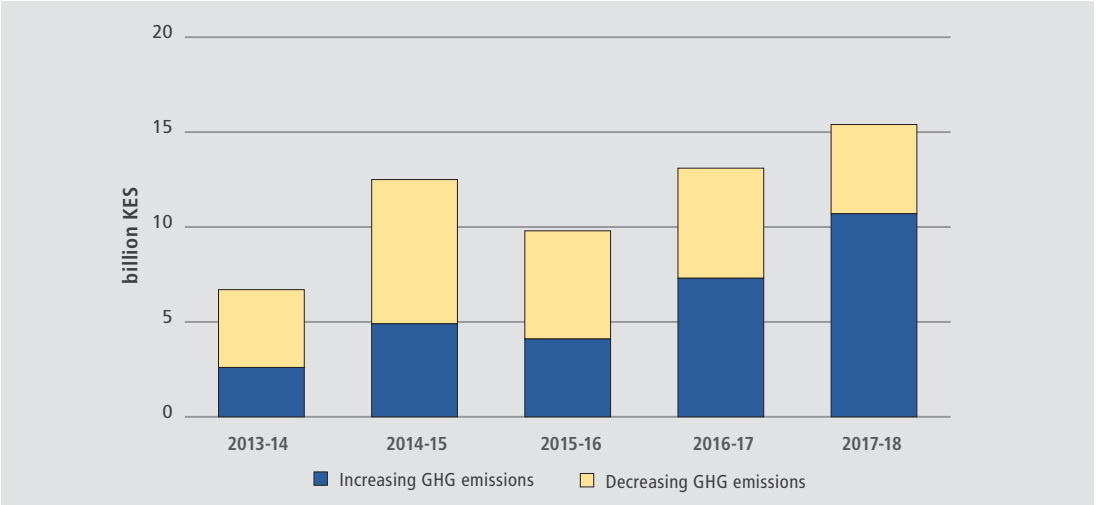


Source: Authors' calculations based on MAFAP database.

While adaptation capacity measures represent an important share of all climate relevant agricultural spending, measures affecting GHG emission levels that could be unmistakeably identified only account for the 5 percent (on average) in Kenya. Within this percentage, half is enhancing mitigation, with the underlying measures contributing to reducing GHG emissions, whereas the other half is contributing negatively and increasing GHG emissions. While this share remained relatively constant, the overall amount grew throughout the periods considered (with an average annual growth rate of 23 percent). The climate relevant spending with adverse effects on mitigation was the largest contributor to this growth, steadily increasing from KES 2.6 billion (USD 30 million) to almost KES 11 billion (USD 104 million), whereas the climate relevant spending enhancing mitigation, after an initial rise in 2014/15, has been decreasing to 2013/14 levels at about KES 4 billion (USD 45 million, Figure 11).

Figure 11

Public expenditures in support of food and agriculture sector linked to mitigation, positive and negative

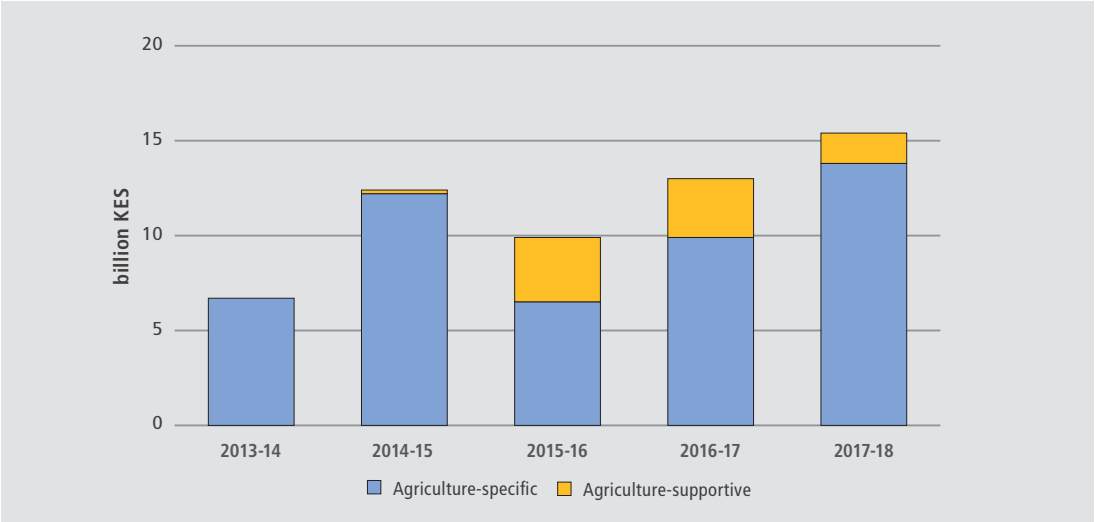


Source: Authors' calculations based on MAFAP database.

To examine the average composition of public expenditures linked to climate change mitigation agriculture-specific and agriculture-supportive spending are disaggregated, and then further distinguished by their positive and negative impact on mitigation. The analysis reveals that mitigation-related spending mainly concerns agriculture-specific measures, while agriculture-supportive measures account for a notably lower share (Figure 12).

Figure 12

Agriculture-specific/agriculture-supportive public expenditures with a link to mitigation

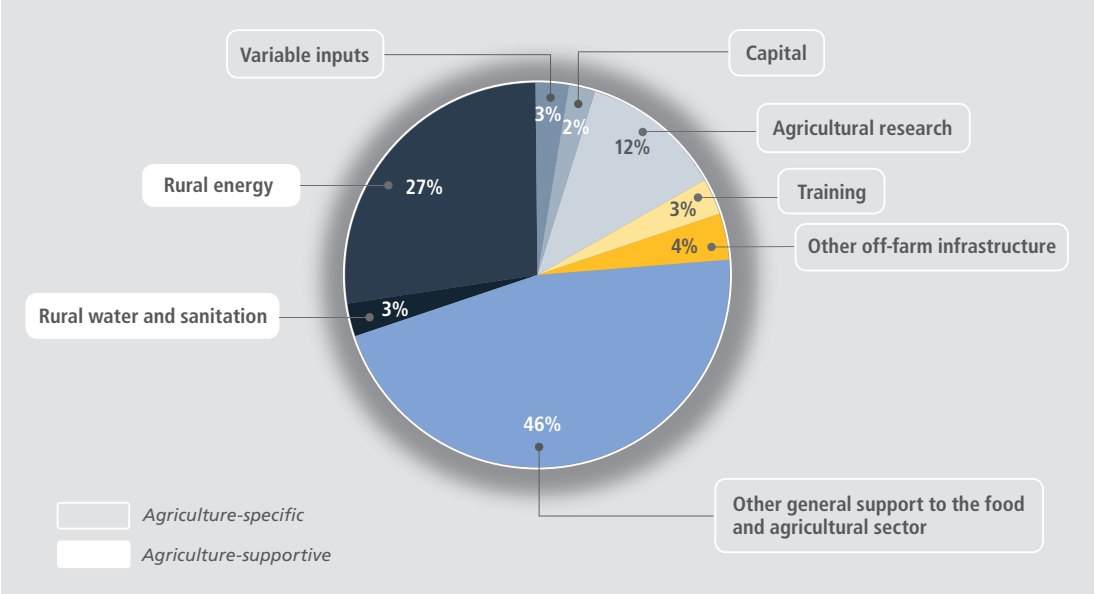


Source: Authors' calculations based on MAFAP database.

Among the public spending positively supporting climate change mitigation (Figure 13), agriculture-specific measures make up, on average, 70 percent, and the main contribution is "other general support to the food and agriculture sector" category with a share of 46 percent, followed by agricultural research with 12 percent. Other off-farm infrastructure, variable inputs, training and capital contribute between 2-4 percent to the total. Agriculture-supportive measures make up the remaining 30 percent, and they consist of spending on rural energy (27 percent) and rural water and sanitation (3 percent).

Figure 13

Composition of public expenditures enhancing mitigation, 2013/14 – 2017/18 average

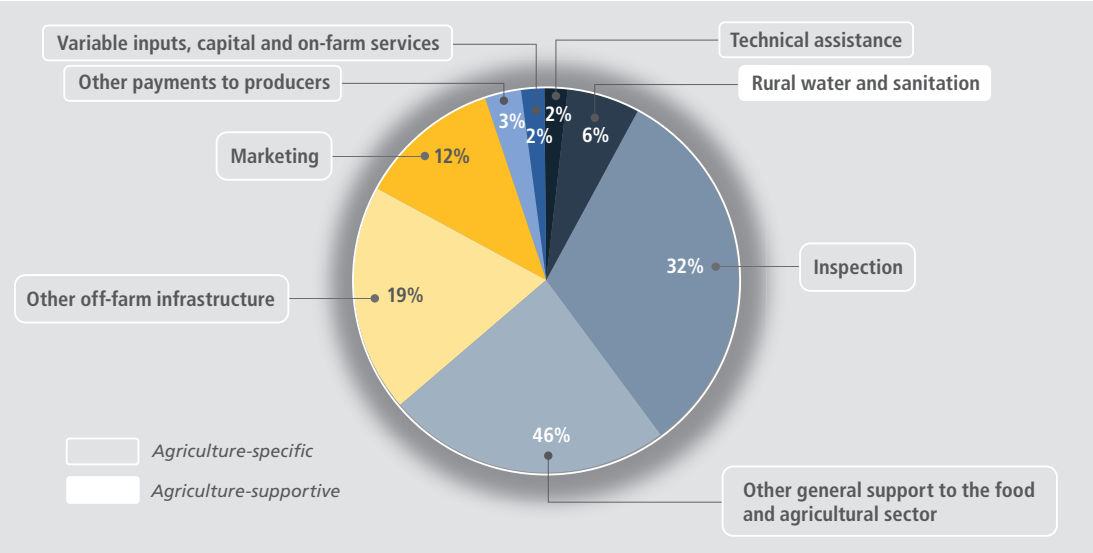


Source: Authors' calculations based on MAFAP database.

Most of the public expenditures with adverse effects on climate change mitigation are agriculture-specific (94 percent on average) driven by expenditures in the livestock subsector, and the main spending components are inspection activities, other general support to the food and agriculture sector and other off-farm infrastructure (32 percent, 24 percent and 19 percent respectively). Marketing accounts for 12 percent, while other payments to producers, input subsidies and technical assistance contribute 2-3 percent each (Figure 14).

Figure 14

Composition of public expenditures with adverse effects on mitigation, 2013/14 – 2017/18 average



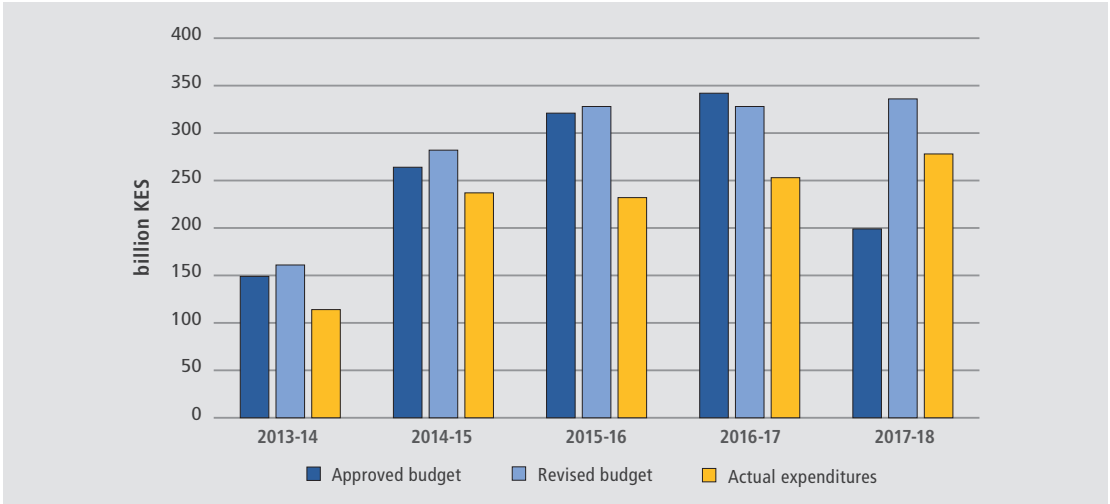
Source: Authors' calculations based on MAFAP database.

Budgeted amounts versus actual spending

Budgetary allocations are higher than actual expenditures in every period considered (Figure 15). The budgeted amounts for the climate relevant spending in agriculture were generally lower than revised budget allocations, except for 2016/17. The actual average execution rate of 77 percent shows that an important part of the allocations is not disbursed. Adaptation enhancing measures received, on average, 77 percent of allocated funds while mitigation enhancing measures received 55 percent. Mitigation-impeding measures received 69 percent of the allocated amount.

Figure 15

Comparison between budget and actual climate relevant expenditures (2013/14 – 2017/18)



Source: Authors' calculations based on MAFAP database.

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Coherence with climate change adaptation and mitigation objectives

The expenditure pattern is broadly coherent with national adaptation and mitigation objectives. Adaptation related measures increase the resilience of the agriculturel sector through promotion of the use of improved inputs and better technologies, providing training and extension services, conducting agricultural research, and supporting food consumption. The identified mitigation related measures that enhance GHG emissions reduction, although limited, stimulate production of clean energy and provide general support to the agriculture sector through various services provision. Measures stimulating the increase of GHG emissions, although on the rise, are limited and are mainly associated with increased production in the livestock sector that can be mitigated by better livestock-related emissions management practices.

The currently allocated public resources are well matched with the national climate change adaptation plan objectives. In particular, NAP has budgeted USD 3.6 billion (about KES 365 billion) for the 2015-2030 period for measures specific to agriculture, which gives roughly USD 0.24 billion per year (KES 24.3 billion). The average budget currently allocated to adaptation enhancing measures specific to agriculture is around USD 0.6 billion per year (KES 58.1 billion). Matching exactly the NAP budgets with currently allocated funds was not possible as some of the actions that in PERCC analysis would fall under the agriculture-specific category were included under broader measures encompassing all sectors of the economy. Nevertheless, the available numbers indicate that the overall planned financial targets have already been met. This is fully in line with the Government of Kenya's decision to streamline existing expenditures to foster climate change adaptation and mitigation rather than implement completely new programmes. This approach should be continued. However, much of the allocated resources are funded from donor contributions and securing future donor funding will be key to reaching the climate change adaptation objectives. Resources destined to mitigation activities cannot be fully analysed given that most mitigation measures could not be clearly identified.

More detailed links with NDCs and NAPs targets and objectives could not be established. First, the MAFAP public expenditures database has limited description of individual expenditure measures, which are indispensable to determine the links to climate change adaptive capacity and GHG emissions of the agriculture sector. The information available allowed only for determining all the relationships for adaptation related measures, while determining the relationship between expenditures and climate change mitigation requires much more information. As a result, the analysis identified only a small proportion of measures as clearly linked to mitigation, while a much higher share should be expected. Furthermore, much more detailed information on specific measures within each of the MAFAP categories would be necessary to assess the coherence with specific objectives outlined in the national climate change related strategies. The information available for this study allows for drawing conclusions on only the broad direction of spending patterns. Finally, to conduct a comprehensive assessment, in addition to the more complete public expenditure data, a detailed contextual database would be necessary, including information on soil quality/ land degradation, nutrient balances, GHG emissions from agriculture, forest coverage, frequency and type of extreme weather events, among many others. This is because the same expenditure measures may potentially lead to different environmental outcomes depending on a given country context. Unfortunately, such datasets are not yet easily available and constructing one would require substantial additional resources that were not available for this study. As a result, more detailed conclusions that would allow formulating concrete policy messages and recommendations could not be drawn.

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Appendix 1.
Kenya NAP – main actions related to agriculture

Land reforms	
Action	***Mainstream climate change adaptation in land reforms***
Short-term sub-actions	Build the capacity of land planners in climate change land use planning.
Medium-term sub-actions	Integrate climate change scenarios into spatial planning (climate resilient spatial planning).
Long-term sub-actions	Build the capacity of land managers in climate change adaptation.
Budget	**USD 1 392 416**
Environment	
Action	***Mainstream climate change adaptation in the environment sector***
Short-term sub-actions	Improve public outreach on environmental issues. Operationalise the climate change coordinating institutions proposed in the Climate Change Act 2016. Review and update existing Environmental Impacts Assessment (EIA) regulations with climate change adaptation considerations. Enhance the capacity to enforce and monitor compliance of adaptation actions. Strengthen early warning and climate information services through improving the Climate Information Service Providers network and enhancing integration of local/indigenous knowledge into early warning systems. Enhance participatory scenario planning with communities. Undertake climate vulnerability and risk assessments on ecosystems and provide guidance on relevant adaptation actions. Finalise and implement the wildlife adaptation strategy. Develop a forestry adaptation strategy. Strengthen tree-planting and conservation initiatives.
Medium-term sub-actions	Strengthen the capacity of national and county institutions responsible for coordinating climate change adaptation. Improve and expand existing climate change modelling work by Kenya Meteorological Department.
Long-term sub-actions	Provide guidance and improve access to climate resilient tree species and cultivars. Integrate ecosystem and community based approaches in sector strategies in support of adaptation to reduce natural resource based conflicts. Continue the rehabilitation of water catchment areas in order to provide sustainable ecosystem services.
Budget	**USD 636 149 705**
Crops	
Action	***Enhance the resilience of the agricultural value chain***
Short-term sub-actions	Promote indigenous knowledge on crops. Increase awareness on climate change impacts on the agriculture value chain. Conduct climate risk and vulnerability assessments of the agriculture value chain. Coordinate and mainstream climate change adaptation into agricultural extension. Promote new food habits.
Medium-term sub-actions	Establish, maintain and promote the uptake of climate change related information on agriculture. Develop and up-scale specific adaptation actions - promotion and bulking of drought tolerant traditional high value crops; water harvesting for crop production; index-based weather insurance; conservation agriculture; agro-forestry; and Integrated soil fertility management. Develop and apply Performance Benefit Measurement methodologies for adaptation and development for the sector; Support adaptation of private sector agricultural value chain actors through capacity building efforts.
Long-term sub-actions	Promote and implement climate smart agriculture practices in Kenya.
Budget	**USD 375 116 887**
Livestock	
Action	***Enhance the resilience of the livestock value chain***
Short-term sub-actions	Increase awareness on climate change impacts on the livestock sector. Strengthen land use management systems including rangeland management, fodder banks and strategic reserves. Conduct capacity building in indigenous knowledge, livestock insurance schemes, early warning systems, early action, livestock management and breeding.

Medium-term sub-actions	Develop new feeds. Promote livelihood diversification and market access (camels, indigenous poultry, beekeeping, rabbits, emerging livestock - quails, guinea fowls, ostriches etc.). Establish price stabilization schemes and strategic livestock based food reserves. Restore degraded grazing lands.
Long-term sub-actions	Enhance selection, breeding and management of animals to adapt to climate change. Promote climate smart agriculture.
Budget	**USD 299 759 329**
Fisheries	
Action	***Enhance the resilience of the fisheries value chain***
Short-term sub-actions	Undertake risk and vulnerability assessment of the fisheries value chain. Enhance capacity of the Ministry of Agriculture, Livestock and Fisheries and the Kenya Marine Fisheries Institute on the impacts of climate change on fisheries, fishing communities and the private sector. Upscale sustainable aquaculture initiatives.
Medium-term sub-actions	Develop and implement a pilot project on climate resilient fish species and the related value chain.
Long-term sub-actions	Strengthen monitoring capacity and capability to prevent overfishing and unauthorized exploitation in the inland waters and Exclusive Economic Zone. Promote the upscaling of climate resilient strategies/ technologies in fisheries and climate resilient fish varieties. Expand the fishing zones in both inland and coastal waters.
Budget	**USD 136 861 840**

Source: GoK (2016).

Appendix 2.
PERCC labelling assumptions

1. All measures that increase adaptive capacity of the sector to climate change are labelled as positively stimulating climate change adaptation. This includes provision of subsidised inputs such as seeds despite their known adverse effects on sustainability of agriculture sector. This is because only first order response of the sector to the policy measure in the context of climate change adaptation is considered.
2. Expenditures related to livestock subsector are all considered as increasing GHG emissions and hence negatively contributing to climate change mitigation. This is because only first order response to the policy measure is considered where any support linked to production in the livestock subsector is assumed to increase numbers of livestock and hence increase GHG emissions. Whether overall emissions will effectively increase depends on a particular measure in place and on other factors in the subsector including other measures that may be implemented helping better management of livestock. For example, veterinary services to the livestock sector are always considered mitigation negative, because treatment of animal diseases will tend to increase numbers of livestock. However, they may decrease emissions intensity because of enhanced animal health, especially if accompanied by better livestock management practices, resulting in overall decrease in emissions if decrease in emission intensity is stronger than the increase in numbers of livestock.
3. Expenditures on research are always considered as mitigation "not determined" because PERCC methodology does not allow establishing clear directional link between research in general and climate change mitigation. Such links could only be established if details on research activities were known for this study.
4. Expenditures on roads are considered mitigation "not determined". This is because there are too many factors that influence the overall response of road construction activities on climate change mitigation, including the travel time before and after the investment, traffic intensity change or impact of the investment on the landscapes (e.g. clearing forest to build the road) that will all contribute to change in GHG emissions. Such information was not possible to obtain for this study.
5. All expenditures on education and health services are considered as benefiting climate change adaptation of the sector because they improve adaptive capacity of the beneficiaries.




Further information

Guidelines:

- UNFCCC National Adaptation Plan – Technical guidelines for the National Adaptation Plan process (2012)
- Addressing Agriculture, Forestry and Fisheries in National Adaptation Plans – Supplementary guidelines (2017)
- Addressing forestry and agroforestry in National Adaptation Plans – Supplementary guidelines (2020)
- Addressing fisheries and aquaculture in National Adaptation Plans – Supplementary guidelines (2020)

NAP-Ag:

- www.fao.org/in-action/naps/partner-countries/kenya/en/
- www.adaptation-undp.org/naps-agriculture/partner-countries/kenya

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