Climate-smart agriculture and REDD+ implementation in Kenya

REDD+ Law Project - Briefing Paper

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The **REDD+ Law Project** is led by Baker & McKenzie and the Cambridge Centre for Climate Change Mitigation Research (University of Cambridge), working with international and local advisers/institutions to assist countries in the development and implementation of their national REDD+ legal frameworks.

More information regarding this initiative is available at http://www.4cmr.group.cam.ac.uk/research/projects/reddpluslawproject

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Pastureland between Nairobi and Lake Naivasha.

GLOSSARY

agribusiness – the business of agriculture, involving crop production; seed development, manufacture, and supply; chemical manufacture of fertilisers and pesticides; equipment; food processing, marketing and retail.

agroforestry – woody perennials (trees, bushes, shrubs, bamboo, palm trees) are grown on the same plot of land with other crops or animals.

biotechnology – using living organisms or cells to improve other animals or plants, develop products, or manipulate biological processes.

carbon sequestration – uptake of carbon from the atmosphere and storage in a terrestrial sink, such as soils or forests.

composting – using organic material, such as animal or plant waste, and allowing it to decompose through exposure to the air and controlled methods, such as mechanical mixing and aerating.

conservation tillage (ie. conservation agriculture) – farming method that allows plants to grow and for weed control yet the ground is covered throughout the year and the soil is disturbed as little as possible. "The aim is to reduce soil loss and energy use while maintaining crop yields and quality. No-till is the most restrictive (soil-conserving) form of conservation tillage. Other practices include ridge-till, strip-till, and mulch-till."[1]

co-operative – an organisation formed by farmers (in the agricultural context) in order to produce and market goods or products collectively for more bargaining power. Each member receives a share of the benefits gained from the collective sale of the product.

cover cropping – planting crops to grow during the period between harvest and replanting of the main crops in order to protect the soil from erosion and contribute to soil health by adding nutrients.

crop residue – organic matter remaining in the field after a crop is harvested (eg. stalks, roots, leaves), which is managed so that it provides cover for the soil against erosion and is ploughed into the soil for the next round of planting.

crop rotation – different crops are planted in consecutive seasons in order to contribute different nutrients to the soil.

[1] United States Department of Agriculture (USDA), *Agriculture Fact Book*, at http://agclass.nal.usda.gov/mtwdk.exe?k=glossary&l=60&w=1883&n=1&s=5&t=2, last accessed 28 June 2013.

extension services – educational information and training for farmers usually provided by an extension agent, a farming expert employed by the government at the local level, or through pamphlets, brochures, or similar materials (including information communication technology (ICT)).

fodder – crops grown to feed livestock or the remaining plant parts from crops grown for human consumption on which livestock graze.

industrialised agriculture – term commonly used to refer to modern methods of production that employ machinery, non-organic fertilisers, and biotechnology typically on a large scale.

inputs – the materials a farmer has to purchase or put into his operation in order to produce crops (eg. varieties of seeds, fertilisers, pesticides, irrigation systems, seedlings for agroforestry).

integrated pest management – "A pest management strategy using a systematic approach in which pest populations are monitored to determine if and when control methods are required. Integrated pest management (IPM) uses biological, chemical, physical, cultural and/or genetic control methods in order to minimize pesticide use, reduce production costs, and protect the environment."[2]

intensification – increasing the amount of crops or livestock grown on the same piece of land through planting or stocking more animals in the same area or achieving higher yields (eg. new seed varieties, more fertiliser application, irrigation).

intercropping – planting two or more different crops simultaneously in the same field (eg. in alternating rows or among the rows).

irrigation – applying water to the soil in order to assist with plant production.

leaching – biological process by which nutrients in the soil are lost through rain or irrigation and 'leach' or seep into the groundwater.

litter – leaves from the agroforestry trees that have fallen onto the soil below or plant materials remaining where crops will be produced. This extra organic material becomes integrated into the soil and adds to the soil organic matter.

monoculture plantations – term referring to large-scale production of a single crop, in the case of forestry usually fast-growing or non-native tree species. These systems are potentially lacking in biodiversity and may degrade the soil (eg. if the non-native tree species require more water or nutrients).

[2] *Ibid.*

mulching – applying a layer of organic material to the top of the soil in order to cover and protect the soil, add nutrients, retain moisture and increase soil fertility.

nitrogen-fixing legumes – plant that may be intercropped in order to contribute nitrogen to the soil and substitute for applying chemical nitrogen fertilisers.

perennial crop – crops that do not need to be replanted every year; they reduce the need for inputs, and they reduce soil erosion by providing soil cover.

permanent crop – plants that remain in the soil for many seasons even after they are harvested. Examples include coffee, citrus, olives, nuts, grapes, and other trees, shrubs or vines producing food or fibre (rubber), not timber.

plough – farming device that cultivates the soil in preparation for planting by loosening or turning the soil over. Also, refers to the act of ploughing or using the piece of equipment to turn the soil.

precision irrigation – applying water very specifically to the root or location where the plant will receive as much of the water as possible to reduce excess water usage. Technical systems have been developed (labelled 'drip systems') which release small droplets of water at the base of the crop at slow intervals.

runoff – where precipitation or irrigation water does not actually soak into the soil and instead runs off into streams or other water bodies. The concern with this is what the water takes with it (eg. chemical fertilisers or excessive manure), which may pollute the water bodies.

salinisation – high salt content in soil, which can be built up from excessive irrigation, causing reduced soil health and fertility.

silage – "Any crop that is harvested green and preserved in a succulent condition by partial fermentation in a more-or-less airtight container such as a silo."[3] This technique is useful for preserving livestock feed for periods between harvests or in times of crop losses.

soil degradation – negative change in soil nutrient content or soil structure leading to lower fertility.

soil disturbance – where the surface of the soil is broken (eg. ploughing).

soil erosion – loss of soil or land surface by water, wind, ice, or other agents.

soil functionality – processes and benefits provided by soil at varying degrees based upon soil health, such as food and biomass production, environmental processes, biological habitat, raw materials, physical and cultural heritage, and a platform for construction.

[3] *Ibid.*

soil organic carbon – "That portion of non-living organic compounds in the top one meter of soil, eg. humus, which is important to soil quality and plant nutrition and is replenished by the decomposition of plant material."[4]

soil organic matter – organic matter within the soil composed of living microorganisms, fresh or partially decomposed residues, and well-decomposed/highly stable organic matter.[5]

subdivision – dividing a plot of land into smaller pieces (in the Kenyan context, often for inheritance purposes).

subsistence agriculture – farmers focus on growing enough to feed themselves and their families rather than selling crops and using the income to purchase food.

tillage – the act of ploughing or turning over the soil in preparation for planting.

terracing – natural or man-made landforms that allow for planting on a slope by running perpendicular to the slope. This avoids soil erosion down the hillside.

yield – refers to both the crop output for a certain area of land, as well as the generation of a plant itself (eg. a wheat plant may produce three seeds for each grain).

A crop on land between Nairobi and Naivaisha (Great Rift Valley region).

[4] *Ibid.*

[5] USDA, Natural Resources Conservation Service, *Glossary of Terms: Soil Quality/Soil Health Terms*, at http://soils.usda.gov/sqi/concepts/glossary.html, last accessed 28 June 2013.

1. INTRODUCTION

The agricultural sector is a key sector of both the global economy and many national economies. It provides livelihoods and basic subsistence needs for millions of people, and contributes to the achievement of food security in both developing and developed countries.

The relationship of agriculture to climate change is a topic of increasing interest. Worldwide agricultural production is expected to decrease under climate change projections, posing a threat to global food security.[6] However, it is also important to note that agriculture contributes a significant amount of global emissions annually, which would increase with the intensification or expansion of production to meet higher demand.[7] In addition, estimates attribute as much as 80% of global deforestation to agriculture[8] - a fact that is very relevant in the context of designing national strategies to implement the United Nations Framework Convention on Climate Change (UNFCCC) policy framework for reducing emissions from deforestation and forest degradation plus conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+).[9]

'Climate-smart' agriculture might have the potential to offer 'triple-win' benefits from increased adaptation, productivity, and mitigation[10], providing a possible strategy to address both climate change and food security concerns. Climate-smart agriculture involves the use of different 'climate-smart' farming techniques to produce crops or livestock, which could help reduce pressure on forests for agricultural use as well as potentially maintain or enhance productivity, build resilience to climate change and mitigate the sector's high emissions.[11]

The agricultural sector is significant to Kenya's economy, providing employment and basic subsistence needs for a large percentage of the population.[12] Possible reductions in agricultural productivity due to climate change impacts could have a negative affect on the livelihoods and food

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[6] Intergovernmental Panel on Climate Change (IPCC), *Assessment Report 4 Synthesis Report* (2007), Sect. 3.

[7] *Ibid.*

[8] Kissinger, G., Herold, M., and de Sy, V., *Drivers of Deforestation and Forest Degradation: A Synthesis Report for REDD+ Policymakers*, Lexeme Consulting (2012), at 5; Steinfeld, H. et al., *Livestock's Long Shadow: Environmental Issues and Options*, The Livestock, Environment and Development (LEAD) Initiative (FAO 2006), at xxi; and Smith, P. et al., 'Competition for land' (2010) 365(1554) *Philosophical Transactions of the Royal Society B: Biological Sciences*, pp.2941-2957, at 2945.

[9] Cancun Decisions (Decision 1/CP.16/2010), at 68-79.

[10] Lipper, L. et al., *"Climate-Smart" Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation*, Report for the FAO (2010), at ii, n.1.

[11] Meybeck, A. and Gitz, V., 'Module 1: Why Climate-Smart Agriculture, Forestry and Fisheries', in FAO, *Climate-Smart Agriculture Sourcebook* (2013), at 27.

[12] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 4.

security of millions of Kenyans.[13] Agriculture is emphasised as an important part of Kenya's REDD+ planning, which proposes strategy options to address agriculture's role as a driver of deforestation.[14] However, this REDD+ planning must balance the need for continued agricultural productivity to combat food insecurity.

Given the interaction between Kenya's agricultural sector and REDD+ implementation, the potential role for climate-smart agriculture could be considered in more death. For example, climate-smart agriculture could be included as part of Kenya's REDD+ strategy in terms of (i) on-farm actions that indirectly reduce emissions from deforestation and forest degradation; and (ii) policy, legal, and institutional actions at national, regional, and local levels that support investment in and adoption of climate-smart agricultural practices. To provide some context to a possible policy dialogue about the role of climate-smart agriculture in Kenya's REDD+ implementation, this Background Paper presents:

- Background information regarding climate-smart agriculture;
- The potential to include climate-smart agricultural practices in Kenya's agricultural sector;
- The role of Kenya's agricultural sector in REDD+ planning and implementation i) at the policy level and ii) for carbon farming projects; and
- Whether the regulatory framework in Kenya currently supports climate-smart agriculture.

2. BACKGROUND TO CLIMATE-SMART AGRICULTURE

2.1 The relationship between agriculture, climate change and food security

Many international agreements and declarations[15] recognise agriculture as a major concern for reasons independent of climate change - such as sustainability and conservation of biodiversity, natural

[13] Bryan, E. et al., *Agricultural Management for Climate Change Adaptation, Greenhouse Gas Mitigation, and Agricultural Productivity: Insights from Kenya*, International Food Policy Research Institute (IFPRI), Discussion Paper 01098 (2011), at 1.

[14] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility (August 2010), at 37-41.

[15] The Convention on Biological Diversity (**CBD**) has an Agricultural Biodiversity Thematic Programme: refer to CBD, *Agricultural Biodiversity*, http://www.cbd.int/agro. The 10-Year Strategy of the United Nations Convention to Combat Desertification (**UNCCD**) lists sustainable agriculture as one of its indicators for successful implementation: refer to UNCCD, *The 10-year strategic plan and framework to enhance the implementation of the Convention*, Decision 3/COP.8, Strategic Objective 3, at 10. **Agenda 21** promotes Sustainable Agriculture and Rural Development (SARD) macroeconomic conditions in developed and developing countries for increased uptake: refer to *Agenda 21*, United Nations Conference on Environment and Development, Rio de Janeiro, Brazil (3-14 June 1992), Section 14.2. **Rio+20**, United Nations Conference on Sustainable Development, *Food Security and Sustainable Agriculture*, Rio 2012 Issues Brief No. 9 (2011) [citing Rome Declaration on World Food Security, Preamble, 32(a), 35(i), 36(k), 53 (1996); Johannesburg Plan of Implementation, 20 (2002); Millennium Development Goals 1 (2000); and Commission on Sustainable

resources, wildlife habitat, as well as economic development.[16] For example, the recent Rio+20 Summit recognised the need to increase sustainable agricultural production, particularly in developing countries.[17] These international commitments are intended to support national-level actions to improve the sustainability and reduce the environmental impact of agricultural production.

In this context, it is important to realise that climate change impacts could have a negative impact on agricultural production, and agricultural production is also a major source of emissions. Policy strategies to balance the need for both food security (via productive and climate-resilient food production techniques) and climate change mitigation from the agricultural sector are therefore required.

If, as projected, the global population increases to over 9 billion by the year 2050, the demand for food products will rise.[18] Global agricultural production might need to grow by 60-70% by 2050 in order to meet future demand.[19] However, during the same time period, it is likely that climate change will have a negative impact on agricultural production.[20] The IPCC 4th Assessment Report predicts that climate change could cause yields to decrease by as much as 50% in some highly vulnerable areas[21], including sub-Saharan Africa.[22] In addition, changes to the climate could contribute to land degradation and reduce the amount of suitable land for agricultural production.[23] It is likely that

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Development 17th Sess., Decision, *Agriculture*, E/CN.17/2009/3 (4-15 May 2009)); UN General Assembly Resolution, *Agriculture development and food security*, A/RES/65/178, 65th Session (24 Mar. 2011)].

[16] Dubois, K.M. et al., *Incorporating Climate Change Considerations into Agricultural Investment Programmes: A Guidance Document*, FAO Investment Centre Division (2012), at 8.

[17] Rio+20, United Nations Conference on Sustainable Development, *The Future We Want*, UN General Assembly 66th Sess., A/RES/66/288 (11 Sept. 2012), at 20, para. 111.

[18] United Nations (UN) Department of Economic & Social Affairs, *World Population to 2300*, ST/ESA/SER.A/236 (2004), at 4.

[19] Bruinsma, J., *The Resource Outlook to 2050*, in Expert Meeting on 'How to Feed the World in 2050' (FAO 2009), at 4.

[20] IPCC, *Assessment Report 4 Synthesis Report* (2007), Section 3, citing Working Group II SPM examples in Table SPM.2.

[21] *Ibid.* Changes in warming, precipitation, and frequency and intensity of extreme weather events will stress agricultural and natural systems. Branca, G. et al., *Identifying Opportunities for Climate-Smart Agriculture Investments in Africa*, Report for the FAO (2012), at 7 (citing the IPCC 4th Assessment Report 2007).

[22] Potsdam Institute for Climate Impact Research and Climate Analytics, *Turn Down the Heat: Why a 4°C Warmer World Must be Avoided*, Report for the World Bank (2012), at 62.

[23] Boko, M. et al., 'Africa', in *Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the IPCC*, Ch. 9 (Parry, M.L. et al. eds., 2007), Section 9.4.4. *See also* Brown, O. et al., 'Climate change as the "new" security threat: implications for Africa' (2007) 83(6) *International Affairs*, pp.1141-1154, at 1141. Land degradation may be furthered by unsustainable management in addition to climate variations, such as exploitation of the soil without fertiliser, shortened fallow periods in shifting cultivation systems, or lack of irrigation. FAO, *World agriculture: towards 2015/2030* (2002), at 39-44.

developing countries, including Kenya, will be more vulnerable to these negative effects of climate change if they do not have appropriate adaptation strategies.[24]

One strategy to address food security issues is the intensification of agricultural production, which aims to increase the amount of food produced from the same piece of land by using different or enhanced agricultural management practices.[25] This has the potential to avoid emissions from land-use change (such as the conversion of forests to agricultural land),[26] however, intensification could also increase emissions if high-emission farming techniques are used to achieve this, such as using more fertiliser.[27] Agriculture is already a major contributor to annual global emissions,[28] contributing approximately 12-14% of the total.[29] Therefore, methods to increase food production while simultaneously lowering emissions need to be explored.[30]

Agriculture is a politically sensitive sector for many reasons, including the global population's need for the agricultural sector to provide an adequate food supply in the face of rising demand.[31] Strategies designed to mitigate emissions from the agricultural sector but decrease food security would not be politically popular in either national or international fora given that millions of poor people in rural areas depend on agriculture for their subsistence and livelihoods, whilst urban populations rely on a predictable supply of agricultural products in local food markets to meet their

[24] Bryan, E. et al., 'Adapting agriculture to climate change in Kenya: Household strategies and determinants' (2013) 114 *Journal of Environmental Management*, pp.26-35, at 26.

[25] International Union for the Conservation of Nature (IUCN), *IUCN Definitions: Agricultural Intensification*, at http://cmsdata.iucn.org/downloads/en_iucn__glossary_definitions.pdf, last accessed 28 August 2013.

[26] DeFries, R. and Rosenzweig, C., 'Toward a whole-landscape approach for sustainable land use in the tropics' (2010) 107 *Proceedings of the National Academy of Sciences in the United States of America*, pp.19627-19632, at 19627.

[27] Valin, H. et al., 'Agricultural productivity and greenhouse gas emissions: trade-offs or synergies between mitigation and food security?' (2013) 8 *Environmental Research Letters* 035019, at 2.

[28] Agricultural sector emissions are due to soil disturbance when crops are planted (releasing carbon dioxide (CO_2)), application of chemical fertiliser, use of fossil fuels to power equipment, and production, storage and spreading of livestock manure. Smith, P. et al., 'Agriculture', in *Climate Change 2007: Mitigation, Contribution of Working III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Ch. 8 (B. Metz et al. eds., 2007), at 503.

[29] *Ibid.* Including N_2O emissions from agricultural soils, CH_4 from enteric fermentation, biomass burning, rice production, and manure management). Emissions from manufacture of chemical fertilisers is included under another category of global emissions, but nitrous oxide (N_2O) emissions result from the soil on which nitrogen fertiliser and/or manure is applied.

[30] This elimination of forest and land sinks that absorb carbon dioxide from the atmosphere pushes the Agriculture, Forestry, and Other Land Use (AFOLU) total contribution to around 30%. Tubiello, F. et al., 'The FAOSTAT database of greenhouse gas emissions from agriculture' (2013) 8 *Environmental Research Letters* (FAO), at 2.

[31] *See* Negra, C. and Wollenberg, E., *Lessons from REDD+ for Agriculture*, Research Programme on Climate Change, Agriculture and Food Security (CCAFS) of the Consultative Group on International Agricultural Research (CGIAR), Report No. 4 (2011), at 28.

nutritional needs.[32] Nonetheless, the high level emissions from the agricultural sector cannot be ignored, including the 74% of the worldwide total that originate in developing countries.[33] Despite agriculture's contribution to global emissions, the UNFCCC has largely excluded agriculture from the climate negotiations to date.[34] Mandatory emission reductions from the agricultural sector have been avoided for a number of reasons[35], but in particular there has been concern that mitigation targets could reduce agricultural productivity levels and have a negative impact on both livelihoods and food security in developing countries.[36]

In order to meet rising demand, estimates indicate that around 9.2 trillion USD should be invested in developing countries' primary agriculture and downstream industries from 2007-2050.[37] The sub-Saharan African agricultural sector alone is projected to require 940 billion USD over the same 40-year period in order to meet long-term demand for agricultural products, translating into around 21 billion USD annually.[38] Aside from the question of how such large funds will become available (ie.

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[32] FAO, *World agriculture: towards 2015/2030* (2002), at 2.

[33] Smith, P. et al., 'Agriculture', in *Climate Change 2007: Mitigation, Contribution of Working III to the Fourth Assessment Report of the IPCC*, Ch. 8 (B. Metz et al. eds., 2007), at 503. *See also* IPCC, Assessment Report 4 Working Group III, Figure 8.2, *Estimated historical and projected N_2O and CH_4 emissions in the agricultural sector of the ten world regions during the period 1990-2020* (showing a breakdown of agricultural emissions by region, GHG, and specific source). In contrast, comparing per capita emissions from agriculture on individual .5 to 1 hectare plots differs drastically from those of Annex I countries' populations: IPCC, *Per Capita Emissions figure*, at http://www.ipcc.ch/publications_and_data/ar4/wg3/en/figure-ts-4.html, last accessed 17 April 2013.

[34] Pye-Smith, C., *Farming's Climate-Smart Future: Placing Agriculture at the Heart of Climate-Change Policy*, The Technical Centre for Agricultural and Rural Cooperation (CTA) and the Research Program on Climate Change, Agriculture and Food Security of the CGIAR (CCAFS) (2011), at 23. Although agriculture sector emissions must be reported under the United Nations Framework Convention on Climate Change (UNFCCC), but as Land Use, Land Use Change and Forestry (LULUCF) emissions contributing to the Kyoto Protocol's reduction targets, they are mostly voluntary (except deforestation, afforestation and reforestation emissions and removals).

[35] For example, it is difficult to mandate mitigation from the agricultural sector under the climate change regime since it is difficult to measure and monitor the sector's emissions. Agriculture's emissions are spread over large amounts of land managed by many different producers using many different practices. It is different from other emitting industries, such as the energy sector – the latter has a certain number of installations that produce CO_2 emissions above a high threshold, technological updates can make predictable emission reductions in a linear fashion, and those reductions can be permanently cancelled. Although emission reductions have been shown from different agricultural practices, they are not predictable in amount, annual total, or permanence since natural systems may not show results for a number of years or the carbon stock may not be secure due to disturbances (eg. extreme weather events). For a discussion of uncertainties involved with livestock production and carbon sequestration potential, see Booker, K. et al., 'What can ecological science tell us about opportunities for carbon sequestration on arid rangelands in the United States?' (2013) 23(1) *Global Environmental Change*, pp.240-251.

[36] FAO, *Food Security and Agricultural Mitigation in Developing Countries: Options for Capturing Synergies* (2009), at 10-11.

[37] Schmidhuber, J., Bruinsma, J., and Boedeker, G., *Capital Requirements for Agriculture in Developing Countries to 2050*, FAO Expert Meeting on 'How to Feed the World in 2050' (2009), at 7-8.

[38] Much of this investment "will need to be frontloaded in the earlier years and decades" to support those stakeholders without the capital means to make the transition. Gledhill, R. et al., *Agricultural carbon markets:*

public and/or private investment), the way in which agricultural investment resources should be allocated needs to be considered. Investments could flow towards current methods of agricultural production or different methods, eg. which aim to increase sustainability or are more climate-friendly.

2.2 What is 'climate-smart' agriculture?

The FAO defines 'climate-smart agriculture' as "agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes GHGs (mitigation), and enhances achievement of national food security and development goals."[39] This simply means that different, more climate-friendly farming techniques could be used to grow agricultural products (including food crops, livestock, fuel, fibre, and raw materials).[40] Another way of understanding climate-smart agriculture as "an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change."[41]

Climate-smart agriculture is being discussed as a strategy to respond to climate change on the global level[42] because climate-smart agricultural practices do not focus on providing mitigation or adaptation benefits in isolation. These types of practices are said to have the potential to provide 'triple wins': 1) increased resilience to climate change, 2) reduced GHG emissions, and 3) improved food security.[43] Individually, these benefits are important for the following reasons:

- Agriculture is projected to be negatively affected by climate change, so adaptation is necessary[44];

Opportunities and challenges for Sub-Saharan Africa, PwC report prepared with support from the Rockefeller Foundation (2011), at 6.

[39] Lipper, L. et al., *"Climate-Smart" Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation*, Report for the FAO (2010), at ii, n.1.

[40] Climate-smart Agriculture, *Climate-Smart Practices*, at http://www.climatesmartagriculture.org/72612/en/, last accessed 24 June 2013.

[41] FAO, *Climate-Smart Agricultural Sourcebook*, Executive Summary (2013), at ix.

[42] See FAO, *Climate-smart agriculture for development*, http://www.fao.org/climatechange/climatesmart/en/, last accessed 27 July 2013; PwC, *Climate-Smart Agriculture*, http://www.pwc.co.uk/sustainability-climate-change/issues/climate-smart-agriculture.jhtml, last accessed 27 July 2013; Thünen-Institut, *Institute of Climate-Smart Agriculture*, http://www.ti.bund.de/en/startseite/institutes/climate-smart-agriculture.html, last accessed 27 July 2013; World Bank, *Climate-smart Agriculture and the World Bank: The Facts*, http://climatechange.worldbank.org/content/climatesmart-agriculture-and-world-bank-facts, last accessed 27 July 2013.

[43] Wollenberg, E. et al., *Actions Needed to Halt Deforestation and Promote Climate-Smart Agriculture*, CCAFS Policy Brief No. 4 (June 2011), at 4.

[44] IPCC, *Assessment Report 4 Synthesis Report* (2007), Section 3, citing Working Group II SPM examples in Table SPM.2.

- Agriculture is a major contributor to annual global emissions, requiring mitigation of emissions[45]; and
- Agriculture is also important to the issue of global food security, which could be threatened if productivity levels are affected by climate change.[46]

Therefore, a strategy that could simultaneously provide adaptation, mitigation, and food security benefits to agricultural production would be preferable to other strategies, eg. which cause trade-offs such as crop yield reductions in exchange for reduced emissions. Climate-smart agriculture could potentially help address the following issues:

- **Need for increased global food production:** Climate-smart agricultural practices' suggested potential to improve productivity and provide adaptation so that crops are more resilient to climate change could contribute to meeting the rising global demand for food products.
- **Need to manage the land wisely:** Climate-smart agriculture could potentially reduce the pressure to convert land (eg. forests) for agricultural use.
- **Political sensitivity of the agricultural sector:** Climate-smart agriculture would potentially be less controversial than other suggestions for reducing emissions from global agriculture given that one of the 'pillars' of climate-smart agriculture is improved food security.
- **Global support for sustainable agriculture:** Climate-smart agriculture can potentially contribute to global political commitments to increase sustainable agriculture whilst simultaneously presenting a strategy to address climate change.

Different techniques are available for ploughing the soil, fertilising crops, feeding livestock, storing and spreading manure, managing the land, and/or changing the way land is used.[47] Some of these different farming techniques may be better or worse than farmers' current practices in terms of their GHG emissions, resilience to climate change, or productivity levels. Examples of some climate-smart agricultural practices potentially relevant to Kenya's agricultural context are:

[45] Smith, P. et al., 'Agriculture', in *Climate Change 2007: Mitigation, Contribution of Working III to the Fourth Assessment Report of the IPCC*, Ch. 8 (B. Metz et al. eds., 2007), at 503.

[46] Meybeck, A. and Gitz, V., 'Module 1: Why Climate-Smart Agriculture, Forestry and Fisheries', in FAO, *Climate-Smart Agriculture Sourcebook* (2013), at 6.

[47] For a discussion on various farming techniques that can contribute to sustainable intensification, climate change resilience, and mitigate agriculture's effect on climate change, see Meybeck, A. and Gitz, V., 'Module 1: Why Climate-Smart Agriculture, Forestry and Fisheries', in FAO, *Climate-Smart Agriculture Sourcebook* (2013).

- Conservation agriculture, involving altered ploughing methods that reduce how much the soil is disturbed or turned over by the plough as well as leaving crop residue in the field, which can reduce soil erosion[48];
- Planting more resilient varieties of crops or practicing crop rotations, which could increase productivity and adaptation to climate change (drought or flood-resistance)[49];
- Agroforestry, intercropping with nitrogen-fixing legumes, and cover cropping enhances soil nutrients and leaves less soil exposed to wind and water erosion, which could increase productivity and adaptation to climate change[50]; and
- Fertilisation with livestock manure as well as increasing above and below-ground biomass can lead to more soil carbon sequestration, improve water retention, as well as replenish soil nutrients.[51] In turn, this can improve soil functionality and yields and reduce the need for high levels of chemical fertilisers, which could result in environmental trade-offs and cause emissions in their manufacture and application.[52]

Researchers in the global agricultural field have conducted field trials and experiments to determine the 'climate-smart' potential of many different farming techniques.[53] It has been determined that not every technique is appropriate for every soil, climate, landscape, or socio-economic situation.[54]

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[48] Pye-Smith, C., *Farming's Climate-Smart Future: Placing Agriculture at the Heart of Climate-Change Policy*, CTA and the CCAFS (2011), at 16-18. Soils contain an enormous amount of organic carbon (about 1500 [Gt]) – triple the amount contained in vegetation and double the amount in the atmosphere. Smith, P., 'Soils and climate change' (2012) 4 *Current Opinion in Environmental Sustainability*, pp.539-544, at 539. Conservation agriculture, or 'no-till' or 'reduced-till', means a method of planting where the plow does not turn over the soil as much to create a place where the seed will be dropped and therefore does not release as much carbon stored in the soil. Iowa State Extension, *Transition to No-till*, Iowa Learning Farms (September 2010). Available at http://www.extension.iastate.edu/NR/rdonlyres/82093D1A-557E-43D3-AE12-8CAF62C36985/135605/Transition_to_notill.pdf, accessed 17 June 2013.

[49] Azzu, N. and Redfern, S., 'Module 7: Climate-smart crop production system', in FAO, *Climate-Smart Agriculture Sourcebook* (2013), at 197.

[50] Pye-Smith, C., *Farming's Climate-Smart Future: Placing Agriculture at the Heart of Climate-Change Policy*, CTA and the CCAFS (2011), at 18.

[51] Bryan, E. et al., *Agricultural Management for Climate Change Adaptation, Greenhouse Gas Mitigation, and Agricultural Productivity: Insights from Kenya*, IFPRI Discussion Paper 01098 (2011), at 3, Table 1.1.

[52] *Ibid.* at 6-7. See also Smith, P., 'Soils and climate change' (2012) 4 *Current Opinion in Environmental Sustainability*, pp.539-544, at 541.

[53] See Smith, P. et al., 'Greenhouse gas mitigation in agriculture' (2008) 363 *Philosophical Transactions of the Royal Society*, pp.789-813, 791, Table 1. FAO, *Food Security and Agricultural Mitigation in Developing Countries: Options for Capturing Synergies* (2009), at 17-22; and, Kenya Agricultural Research Institute (KARI), *Crops for the Future*, Project Video, at http://www.youtube.com/watch?v=9tCwKQ0Q9k, last accessed 30 August 2013.

[54] Bryan, E. et al., *Agricultural Management for Climate Change Adaptation, Greenhouse Gas Mitigation, and Agricultural Productivity: Insights from Kenya*, IFPRI Discussion Paper 01098 (2011), at 7. See Smith, P. et al., 'Greenhouse gas mitigation in agriculture' (2008) 363 *Philosophical Transactions of the Royal Society*,

Therefore, decisions need to be 'location-specific' regarding which climate-smart agricultural practices are suitable. The Kenya Agricultural Research Institute (KARI) is one example of a potentially important actor in the process of determining which climate-smart agricultural practices are appropriate within Kenya.[55]

2.3 Climate-smart agriculture and REDD+

Expansion and exploitation of agricultural land threatens trade-offs in the form of deforestation, destruction of grasslands and wetlands, and loss of biodiversity.[56] The UNFCCC calls for action to reduce human pressure on forests through development and implementation of national strategies or action plans for 'reducing emissions from deforestation and forest degradation plus conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries' (REDD+).[57] Climate-smart agriculture could be incorporated into a country's REDD+ planning as one strategy to address agriculture's role as a driver of deforestation.

REDD+ finance could potentially reach local stakeholders implementing on-the-ground actions (eg. climate-smart agricultural practices) that contribute to REDD+ outcomes,[58] or it could be used to support national-level actions aimed at combating deforestation (eg. creating an enabling environment for climate-smart agriculture).[59] In addition, climate-smart agriculture could be encouraged through bilateral public funding. Developed countries could provide assistance for pilot projects, technological or institutional capacity building, research, extension services, or subsidisation of inputs (eg. new varieties of seeds, irrigation systems, seedlings for

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pp.789-813, at 795, Table 2. Non-livestock mitigation options are broken down by mitigation potential for various climate zones.

[55] KARI, at http://www.kari.org/homepage, last accessed 28 June 2013.

[56] The Prince's Charities, International Sustainability Unit, *What Price Resilience? Towards Sustainable and Secure Food Systems* (2011), at 16.

[57] *Cancun Agreements* (Decision 1/CP.16), 2010; Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, UN Doc. FCCC/CP/2010/7/Add.1, at 12-14, paras. 68-79, Appendix I. *See also* Robles, F.F., *Legal analysis of cross-cutting issues for REDD+ implementation: Lessons learned from Mexico, Viet Nam and Zambia*. Report prepared under the UN-REDD Programme (FAO 2013), at 10.

[58] For a discussion of PES schemes that contribute to halting deforestation in line with REDD+ implementation objectives, see Graham, K. (ODI) and Vignola, R. (CATIE), *REDD+ and agriculture: a cross-sectoral approach to REDD+ and implications for the poor*, Report for the REDD-net programme (2011), at 9-10. For a discussion of different options for distribution of REDD+ financing, see generally Angelsen, A. et al., *What is the Right Scale for REDD? The implications of national, subnational and nested approaches*, Centre for International Forestry Research (CIFOR) Brief No. 15 (2008).

[59] Graham, K. (ODI) and Vignola, R. (CATIE), *REDD+ and agriculture: a cross-sectoral approach to REDD+ and implications for the poor*, Report for the REDD-net programme (2011), at 5-14.

agroforestry), which may reduce pressure on forests from agriculture and thereby contribute to REDD+ implementation.[60]

2.4 Lessons regarding climate-smart agriculture from existing carbon farming projects

In addition to contributing to REDD+ implementation by reducing agriculture's role as a driver of deforestation, carbon farming projects using climate-smart agricultural practices can also generate emissions reductions directly from the land on which they are implemented. The emissions reductions can be verified and receive carbon credits, which can be sold on the voluntary carbon market (in the absence of a global trading scheme or compliance market acceptance of land use, land use change and forestry (LULUCF) credits).[61]

At present, carbon farming projects can be developed under various standards with verified methodologies. Some examples are the Verified Carbon Standard, Plan Vivo Standard, American Carbon Registry Standard, and The Gold Standard.[62] Non-governmental organisations (NGOs), private developers, intergovernmental organisations and funders, and companies are some of the actors involved in the different stages of the project, including: funding, design, development, training, verification, marketing, and evaluation.[63] For present purposes, it is worth noting the lessons learned from the various projects with respect to (1) uptake of climate-smart agricultural practices by local stakeholders, and (2) project design issues that could impede successful implementation.

2.4.1 Uptake of climate-smart agricultural practices by local stakeholders

Despite the benefits that climate-smart agricultural practices can provide[64], barriers to uptake could make farmers reluctant to adopt them, such as:

- lack of financing (particularly up-front financing to aid capital investments in the farm),
- lack of technical knowledge or capacity,
- discouragement resulting from possible short-term yield reductions,

[60] For an overview of development, funding (including from developed country donors), issues, and recommendations for carbon offset projects, see Peskett, L., Brown, J., and Schreckenberg, K., *Carbon Offsets for Forestry and Bioenergy: Researching Opportunities for Poor Rural Communities*, Overseas Development Institute (ODI), Final Report (May 2010).

[61] *Ibid.* at 3-4.

[62] Peters-Stanley, M. and Yin, D., *Manoeuvring the Mosaic: State of the Voluntary Carbon Markets 2013*, Report by Forest Trends' Ecosystem Marketplace and Bloomberg New Energy Finance (2013), at 83-86.

[63] *Ibid.* at 6-7.

[64] Smith, P. et al., 'Greenhouse gas mitigation in agriculture' (2008) 363 *Philosophical Transactions of the Royal Society*, pp.789-813, at 801-802, Table 5 (showing the estimated costs per tonne of CO_2-equivalent in USD for different mitigation options based on different agro-climatic zones and their mitigation benefits in Mt CO_2-eq per year).

- lack of risk management options (eg. insurance),
- tenure insecurity,
- social customs, and
- lack of access to, or difficulty with, new information dissemination technologies.[65]

Lessons about climate-smart agriculture have been identified from implementation of projects in Malawi, Viet Nam, and Zambia by the FAO-Economics and Policy Innovations for Climate-Smart Agriculture Programme (FAO-EPIC) and the European Commission.[66]

A practical issue which could prevent farmers from implementing climate-smart agricultural practices is the need to use materials on the farm for other purposes.[67] For example, conservation agriculture involves maintaining crop residue from former harvests on top of the soil to provide cover and enrich the soil's nutrients; however, farmers may need to use crop residues as livestock feed instead.[68]

Additionally, poor farmers might choose not to implement or maintain some climate-smart agricultural practices on their farms due to the delay between implementation of the practice and materialisation of the benefits.[69]

2.4.2 Project design issues that could impede successful implementation

The experience of various operational carbon farming projects (such as the Kenya Agricultural Carbon Project developed by the Swedish NGO Vi Agroforestry with support from the World Bank BioCarbon Fund) provides lessons about implementing climate-smart agriculture successfully[70]:

- ***What are farmers' priorities and which climate-smart agricultural practices will help accomplish those priorities?*** As noted by Johannes Woelcke of the World Bank's Agriculture and Rural Development Unit in the Africa Region, "Farmers will only adopt and maintain

[65] Meybeck, A. and Gitz, V., 'Module 1: Why Climate-Smart Agriculture, Forestry and Fisheries', in FAO, *Climate-Smart Agriculture Sourcebook* (2013), at 26. Campbell, B. et al., *Agriculture and Climate Change: A Scoping Report*, Meridian Institute (2011), at 23.

[66] FAO, *Farmers struggle to adopt climate-smart methods*, News Article (14 August 2013), at http://www.fao.org/news/story/en/item/181017/icode/, last accessed 30 August 2013.

[67] *Ibid.*

[68] *Ibid.*

[69] *Ibid.*

[70] World Bank Carbon Finance Unit, *Kenya: Agricultural Carbon Project*, at https://wbcarbonfinance.org/Router.cfm?Page=BioCF&FID=9708&ItemID=9708&ft=Projects&ProjID=58099, last accessed 29 August 2013. Project lessons generally discussed by Andersson, Arne, Mutua, Rachel Wangu, and Wekesa, Amos (Vi Agroforestry). Interviewed 10 April 2013 at Vi Agroforestry offices (Nairobi, Kenya).

practices if they realize increases in productivity and incomes."[71] To encourage farmers to adopt climate-smart agricultural practices, it is therefore important to consider what farmers need and/or want that current agricultural production is not delivering. Based on the responses (eg. higher crop yields, more income, resilience against crop losses), suitable climate-smart agricultural practices which could be selected.[72]

- ***How can existing structures be utilised to cut transaction costs?*** Carbon farming projects could be developed within existing structures for measurement, reporting and verification (MRV), extension services and training systems, and farmer organisations (eg. co-operatives or self-help groups).[73] Using existing structures could lower transaction costs in project development rather than creating new systems for every project.[74] By lowering transaction costs, the project could potentially benefit farmers with more carbon revenues and increase the likelihood they will continue using the climate-smart agricultural practices.[75]
- ***How can farmers be organised and supported to assist with successful implementation?*** Aggregating farmers into groups could aid successful uptake of climate-smart agricultural practices. Project developers could provide coordinated extension services and training on new farming techniques, which could increase farmer uptake if recommendations are delivered by a familiar, trusted source.[76] Additionally, group members can support each other in the implementation of climate-smart agricultural practices and hold each other accountable for contributing to the carbon farming project goals.[77]

[71] Woelcke, J., *More Than Just Hot Air: Carbon Market Access and Climate-Smart Agriculture for Smallholder Farmers*, SmartLessons (January 2012), at 2. Available at http://wbcarbonfinance.org/docs/Mor_ThanHotAir.pdf, accessed 2 April 2013.

[72] *Ibid.*

[73] *Ibid.* at 3.

[74] *Ibid.*

[75] *Ibid.*

[76] Andersson, Arne, Mutua, Rachel Wangu, and Wekesa, Amos (Vi Agroforestry). Interviewed 10 April 2013 at Vi Agroforestry offices (Nairobi, Kenya). Woelcke, J., *More Than Just Hot Air: Carbon Market Access and Climate-Smart Agriculture for Smallholder Farmers*, SmartLessons (January 2012), at 3. Available at http://wbcarbonfinance.org/docs/Mor_ThanHotAir.pdf, accessed 2 April 2013.

[77] Andersson, Arne, Mutua, Rachel Wangu, and Wekesa, Amos (Vi Agroforestry). Interviewed 10 April 2013 at Vi Agroforestry offices (Nairobi, Kenya).

3. AGRICULTURE AND REDD+ IN KENYA

3.1 Kenya's agricultural sector

Agriculture is a key component of Kenya's economy. Production of "industrial crops, food crops, horticulture, livestock, fisheries and forestry"[78] directly comprises 24% of the gross domestic product (GDP) and indirectly another 27%.[79] More than 65% of informal employment in rural areas is in the agricultural sector[80], and "women are responsible for 80 percent of paid and unpaid labour in food production, including staple crops."[81] *Vision 2030*, Kenya's economic development strategy for 2008-2030, highlights the importance of agriculture within Kenya.[82] It is targeted as one of the six key sectors that will help the Kenyan economy achieve a 10% GDP growth rate per year.[83]

The sector declined for many years due to low investment, mismanagement, collapse of agricultural institutions, and reduced emphasis on agricultural extension and research.[84] Addressing these issues, the *Strategy for Revitalizing Agriculture* prioritised the development of the sector in 2004.[85] The policy framework aimed to "improve agricultural productivity and farm incomes, while conserving the land resource base and the environment."[86] The current *Agricultural Sector Development Strategy*

[78] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 1. Industrial crops include tea, coffee, sugar cane, cotton, among others. *Ibid.* at 13. The main food crops in Kenya are "maize, rice, wheat, sorghum, potato, cassava, vegetables and beans." *Ibid.* at 12. Horticulture is growing rapidly in Kenya's agricultural sector, including "cut flowers, vegetables, fruits, nuts, herbs and spices." *Ibid.* at 13. Livestock production focuses primarily on "beef, dairy, sheep, goats, camel, poultry," swine and emerging livestock. *Ibid*. at 14.

[79] Government of Kenya, *National Climate Change Action Plan 2013-2017* (27 March 2013), at 4.

[80] *Ibid.*

[81] United States Agency for International Development (USAID), *Kenya: FY 2011-2015 Multi-Year Strategy* (2011), at 8: "Although all parts of Kenya are facing significant challenges, poverty density, food production, and density of malnourished children vary significantly across Kenya's agro-ecological zones and within the urban areas. The high rainfall zones – 11 percent of Kenya's land – produce 70 percent of its agricultural output. These high potential zones have attracted large populations, resulting in sub-division of land, decreasing productivity, and high densities of impoverished and malnourished Kenyans. Semi-arid regions produce 20 percent of Kenya's agricultural output. Traditionally these areas received less rainfall than high potential areas. Climate change is already evident in the increasingly erratic rainfall patterns. Yet this region offers significant potential for increases in agricultural output, if water management and harvesting, irrigation, and crop varieties can be improved. Lastly, Kenya's arid regions take up 68 percent of the land area, and produce 10 percent of Kenya's agricultural output, largely livestock. Although poverty and malnutrition rates are high in the arid regions, the population density is low, meaning that the total number of poor and malnourished Kenyans is relatively low in absolute terms when compared to high rainfall and semi-arid regions."

[82] Government of Kenya, *Vision 2030: The Popular Version* (2007), at 1.

[83] *Ibid.*

[84] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 2.

[85] *Ibid.* at 3.

[86] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 3.

(ASDS) for 2010-2020 recognises that public and private efforts are necessary to address the sector's development challenges, reduce poverty and increase food security.[87]

3.2 Kenyan agriculture and climate-smart agriculture

Given the negative projections of climate change impacts on agricultural productivity in Sub-Saharan Africa[88], climate-smart agricultural practices could potentially benefit the Kenyan agricultural sector. Kenya's crops are mostly rain-fed[89], so the higher temperatures, reduced water availability and more erratic rainfall projected to result from climate change could reduce productivity levels.[90] Additionally, climate change threatens to increase the frequency and intensity of natural disasters, which could cause significant crop losses.[91]

Interventions seeking to introduce 'climate-smart' agricultural practices could be used to target vulnerabilities in Kenya's agricultural sector, such as low crop productivity and land/environmental degradation (which could be worsened by climate change impacts)[92]. For example:

- Smallholder farmers (particularly those producing food crops for subsistence) could be highly vulnerable to natural disasters, projected to increase due to climate change, if their crop yields are lower than what is technically feasible[93] and additional crop losses occur.[94] Climate-smart agriculture could potentially provide adaptation and improve productivity through practices such as conservation agriculture, mulching/composting, manure fertilisation, and agroforestry, which help increase soil productivity, retain soil moisture and prevent soil erosion so that soil organic matter is not lost.[95]

[87] *Ibid.* at 7-8. Despite the high economic importance and national plans dedicated to agriculture in Kenya, food insecurity still affects a large proportion of the population.

[88] Boko, M. et al., 'Africa', in *Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the IPCC*, Ch. 9 (Parry, M.L. et al. eds., 2007), Section 9.4.4.

[89] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 10.

[90] IPCC, *Assessment Report 4 Synthesis Report* (2007), Section 3.

[91] *Ibid.*

[92] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 7, 9.

[93] *Ibid.* at 7. Low yields are identified as an issue on the regional scale (Africa) as well as for smallholders in developing countries worldwide in Godfray, H.C.J. et al., 'Food Security: The Challenge of Feeding 9 Billion People' (2010) 327 *Science*, pp.812-818, at 813.

[94] FAO, *Climate Change Adaptation and Mitigation in the Food and Agriculture Sector*, Technical Background Document from the Expert Consultation held on 5-7 March 2008, Rome, Italy, at 2. Total crop loss is a concern with regard to smallholder farmers' food security, additionally because they would most likely lack crop insurance or some form of safety net that would provide access to food or income lost through the crop failure. *Ibid*. at 4, 10.

[95] Lal, R., 'Soil Carbon Sequestration Impacts on Global Climate Change and Food Security', 304 *Science* (2004), pp.1623-1627, at 1624.

- Climate change is projected to increase the frequency and intensity of droughts[96], potentially increasing the risk that agricultural production on drylands could lead to more degradation and desertification.[97] Kenya's drylands, or arid and semi-arid lands (ASALs), constitute over 80% of the country.[98] Most high potential areas for agricultural production in Kenya are already fully exploited[99], so the Government has proposed extensive increases in irrigation to bring ASALs into production.[100] However, water resources may become increasingly scarce under climate change scenarios[101], and poor implementation of extensive irrigation can cause salinization which, in turn, reduces soil productivity.[102] Climate-smart agriculture could potentially contribute to long-term sustainable use of the land and environment through practices which can enhance: natural water retention (reducing the need for irrigation), soil organic matter (improving soil health and potentially productivity), and land cover (decreasing the risk of soil erosion).[103] Possible climate-smart interventions include conservation agriculture, agroforestry, intercropping with nitrogen-fixing legumes, crop rotations and switching to hardier crops/varieties, and improved grazing land management.[104] In addition, innovative water harvesting and management techniques[105] in conjunction with

[96] IPCC, *Assessment Report 4 Synthesis Report* (2007), Section 3. Available at http://www.ipcc.ch/publications_and_data/ar4/syr/en/spms3.html, accessed 28 April 2013.

[97] Government of Kenya, *National Action Programme: A Framework for Combating Desertification in Kenya in the Context of the United Nations Convention to Combat Desertification*, National Environment Secretariat (2002), at 11-12.

[98] *Ibid.* at 11.

[99] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility (August 2010), at 28.

[100] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 11, 33-34, 54-59.

[101] Boko, M. et al., 'Africa', in *Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the IPCC*, Ch. 9 (Parry, M.L. et al. eds., 2007), Section 9.4.4.

[102] Thomas, R. and Morini, S., *Management of Irrigation-Induced Salt-Affected Soils*, Joint brochure by the Centre virtuel de l'eau agricole et ses usages (CISEAU), IPTRID, and FAO, at ftp://ftp.fao.org/agl/agll/docs/salinity_brochure_eng.pdf, last accessed 28 June 2013. Please note that the term 'salinisation' could be spelled differently – 'salinization', 'salinisation', 'salinity' or 'salination'. All terms describe excessive build-up of salt in the soil, which could have a negative effect on soil health and productivity. *Ibid.*

[103] Lal, R., 'Soil Carbon Sequestration Impacts on Global Climate Change and Food Security', 304 *Science* (2004), pp.1623-1627, 1624-1625.

[104] Campbell, B. et al., *Agriculture and Climate Change: A Scoping Report*, Meridian Institute (2011), at 18-19. For examples of Kenya-specific changes in agricultural management techniques, see KARI, *Policy Learning Tour to FAO-KARI, SIDA and IFAD Funded Projects in Western Kenya*, Project Video by KARI and FAO-Kenya, at http://www.youtube.com/watch?v=xZPqShzXF2c&feature=youtu.be, last accessed 11 August 2013.

[105] For example, innovative water harvesting has been undertaken through the KARI project in Western Kenya, such as plastic-lined man-made ponds (also used for fish harvesting) and bunds or ditches to direct water flow and prevent soil erosion. *Ibid.*

capacity building and training could help provide resources for irrigation (as proposed in the ASDS[106]) and reduce negative unintended consequences from implementation.[107]

3.3 Agriculture in Kenya's REDD+ implementation

As it is currently structured, the R-PP contains strategy options which are compatible, or in some respects interchangeable, with climate-smart agricultural practices. For example, cover cropping, agroforestry, conservation tillage, crop residue and manure management all contribute to increasing soil fertility – a strategy option under the priority area of reducing pressure to clear forests for agriculture.[108] This policy-level focus on agriculture's relationship to Kenya's REDD+ implementation can be complemented by lessons learned from project-level examples, both discussed in this section.

3.3.1 Overview of Kenya's REDD+ 'strategy options'

Kenya's Readiness Preparation Proposal (R-PP)[109] identifies agriculture as an historical driver of deforestation in different forms:

- *Policy drivers related to agriculture:* allowing grazing in forest reserves during droughts, and encouraging cash crop production for export.[110]
- *Economic drivers related to agriculture:* conversion of woodland to agricultural use for large-scale commercial production of biofuel crops or other agricultural crops, clearing for agricultural expansion due to population pressure, rising agricultural product prices, subsidised inputs (fertilisers) and other incentives (tax exemptions for equipment).[111]

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[106] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 54-59.

[107] An unintended consequence of irrigation implementation could be salinisation of the soil. This occurs in "irrigated areas where low rainfall, high evapotranspiration rates or soil textural characteristics impede the washing out of the salts which subsequently build-up in the soil surface layers" and may severely affect soil fertility. European Commission Joint Research Centre, *Soil Themes: Soil Salinisation*, European Soil Portal – Soil Data and Information Systems, at http://eusoils.jrc.ec.europa.eu/library/themes/salinization/, last accessed 25 July 2013.

[108] *Ibid.* at 38.

[109] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility (August 2010), at 1. Under the Kenyan R-PP, "the scope for REDD+ activities will be on reducing further deforestation and degradation in the remaining forests and thereby reducing carbon emissions from these forests, but also, perhaps to a larger extent, on the 'plus' aspects of REDD+ including improving management of remaining forest resources and enhancing carbon stocks on degraded forest land as well as through reforestation and afforestation programs. All activities will be designed with a focus on co-benefits such as improving biodiversity and livelihoods of forest dependent peoples."

[110] *Ibid.* at 29.

[111] *Ibid.*

- *Other drivers related to agriculture:* clearing land for agriculture with fire.[112]

Kenya's REDD+ programme and future implementation will be developed through **'strategy options'** outlined in the R-PP, which refer to "various policies, measures and actions taken by public and private actors that are developed for the purpose of reducing emissions and increasing removals of carbon dioxide (CO2) in the land use sector."[113] The proposed strategy options are intended as 'early action' to test institutional, economic and legal actions and structures to include in the final National REDD+ Strategy.[114] Kenya's current strategy options are categorised under four 'priority areas':

1) Reducing pressure to clear forests for agriculture and other uses,
2) Promoting sustainable utilisation of forests,
3) Improving forest law enforcement and governance; and
4) Enhancement of carbon stocks.[115]

Below, possible entry points for climate-smart agricultural practices within relevant strategy options are identified.

3.3.1.1 Strategy options in the first priority area

The first priority area seeks to address agriculture as a driver of deforestation by "**reducing pressure to clear forests for agriculture**,"[116] proposing different strategy options to achieve this. At the institutional level, these measures are generally focused on increasing awareness about the effects of forest clearance, capacity building for Local Authorities on forest management, community forest management, and assisting the Kenya Forest Service to create and test a benefit-sharing system.[117] In addition, these measures also focus on fostering changes at the farm level, mainly in terms of agricultural management practices. The farm-level actions are aimed at increasing farm productivity and rural incomes[118].

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[112] *Ibid.* at 30.

[113] *Ibid.* at 35.

[114] *Ibid.* at 4-5, 37-41, 46.

[115] *Ibid.* at 37-41.

[116] *Ibid.* at 37-38.

[117] *Ibid.*

[118] They include: "encouraging farmers to take up intensive farming practices and soil fertility management that will enable them to produce more on existing farmland"; "encouraging commercial on-farm tree growing"; "encouraging livestock keepers to improve the quality of their livestock, reduce numbers, and implement increased management of grazing lands"; and "providing agricultural inputs to poor and vulnerable forest adjacent communities in line with the government's National Accelerated Agricultural Inputs Access Program (NAAIAR)." *Ibid.* at 38.

Details of the different strategy options discussed in the first priority area are discussed below.

1) Encouraging farmers to take up intensive farming practices and soil fertility management that will enable them to produce more on existing farmland[119]

Intensification increases the amount of crops or livestock grown on the same piece of land by planting more crops (eg. intercropping between rows with other plants) or achieving higher yields from individual crops (eg. from using new seed varieties, more fertiliser application or irrigation).[120] Increasing production on existing farmland could reduce pressure to expand production into forest areas. However, intensified practices can cause negative environmental and soil impacts[121] (eg. from increased fertiliser use) if they are not implemented in a sustainable way.

Two examples of climate-smart agricultural practices which could contribute to sustainable intensification and could be classified under this proposed strategy option are: 1) intercropping with nitrogen-fixing legumes[122] and 2) composting.[123] Both are "intensive farming practices" which support "soil fertility management" and could help Kenyan farmers "to produce more on existing farmland."[124] The potential adaptation, food security, and mitigation benefits of both intercropping and composting are listed here:

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[119] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility, at 38 (August 2010).

[120] Intensification is achieved by increasing cropping intensity or yield improvements. The former may involve shortening fallow periods or repeating crops year upon year that need to undergo crop rotations, which can cause soil degradation by continuously stripping nutrients. Graham, K. (ODI) and Vignola, R. (CATIE), *REDD+ and agriculture: a cross-sectoral approach to REDD+ and implications for the poor*, Report for the REDD-net programme (2011), at 3. Additionally, intensification through increasing cropping intensity is projected to only offer 16% of potential production increases for developing countries. FAO, *Food Security and Agricultural Mitigation in Developing Countries: Options for Capturing Synergies* (2009), at 15. The negative extension of intensification is that higher yields could perhaps entice people to expand into forests anyway to gain those higher yields on even more land. *Ibid.*

[121] For a good discussion of the environmental trade-offs that could occur from agricultural intensification, see Phelps, J. et al., *Agricultural intensification escalates future conservation costs*, Proceedings of the National Academy of Sciences of the United States of America, 110: 7601-7606.

[122] Planting two or more different crops simultaneously in the same field (eg. in alternating rows or among the rows), and with nitrogen-fixing legumes as one crop, the management technique is meant to replenish the nutrient balance of the soil. Bunning, S., Corsi, S., and Vargas, R., 'Module 4: Soils and Their Management for Climate-Smart Agriculture', in FAO, *Climate-Smart Agriculture Sourcebook* (2013), at 133.

[123] Using organic material, such as animal or plant waste, and allowing it to decompose through exposure to the air and controlled methods, such as mechanical mixing and aerating. *Ibid* at 120.

[124] *See* Lal, R., *World Soils and the Carbon Cycle in Relation to Climate Change and Food Security*, The Ohio State University (2012), at 16-17.

- **Adaptation benefits**: Adaptation to storms with heavy rainfall, which are projected to increase in frequency and intensity under climate change[125], could result from more soil cover and roots to prevent erosion. Drought resistance could be increased through building up soil organic matter[126] and soil cover for moisture retention.[127]
- **Food security benefits**: Intercropping could provide more food from the same plot (legumes are useful for livestock feed as well), whilst both composting and intercropping could increase crop yields via improved soil fertility.[128]
- **Mitigation benefits**: The amount of chemical fertilisers needed could be reduced since composting and legumes contribute nutrients to the soil, which could reduce GHG emissions from application and manufacture of the fertilisers.[129] Additionally, intercropping and composting can increase biomass both above and below the ground, supporting soil carbon sequestration.[130]

2) Encouraging commercial on-farm tree growing[131]

This proposed strategy option under the R-PP involves growing trees for commercial purposes (timber, firewood or charcoal production[132]), which could potentially reduce the pressure on forests for these reasons.[133] 'Commercial on-farm tree growing' is similar to 'agroforestry,' which is a

[125] Boko, M. et al., 'Africa', in *Climate Change 2007: Impacts, Adaptation and Vulnerability*, *Contribution of Working Group II to the Fourth Assessment Report of the IPCC*, Ch. 9 (Parry, M.L. et al. eds., 2007), Section 9.4.4.

[126] Organic matter within the soil composed of living microorganisms, fresh or partially decomposed residues, and well-decomposed/highly stable organic matter. United States Department of Agriculture (USDA), *Glossary of Terms: Soil Quality/Soil Health Terms*, Natural Resources Conservation Service, at http://soils.usda.gov/sqi/concepts/glossary.html, last accessed 30 August 2013.

[127] Lal, R., *World Soils and the Carbon Cycle in Relation to Climate Change and Food Security*, The Ohio State University (2012), at 16-17.

[128] Lipper, L. et al., *"Climate-Smart" Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation*, Report for the FAO (2010), at 1.

[129] Pimental, D. et al., 'Environmental, Energetic, and Economic Comparisons of Organic and Conventional Farming Systems' (2005) 55(7) *BioScience*, pp. 573-582, at 573. *See also* Smith, P. et al., 'Greenhouse gas mitigation in agriculture' (2008) 363 *Philosophical Transactions of the Royal Society*, pp.789-813, at 790-791.

[130] Campbell, B. et al., *Agriculture and Climate Change: A Scoping Report*, Meridian Institute (2011), 82-83.

[131] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility (August 2010), at 38.

[132] Mugo, F. and Ong, C., *Lessons from eastern Africa's unsustainable charcoal trade*, World Agroforestry Centre, Working Paper No. 20 (2006), at 6-7.

[133] Commercial tree growing could possibly generate additional income as well so that the need to expand agricultural production into forestland is reduced. World Bank, *Climate-Smart Agriculture: A Call to Action*, Joint Brochure, at http://www.worldbank.org/content/dam/Worldbank/document/CSA_Brochure_web_WB.pdf, last accessed 30 August 2013 (discussing growing trees on farms at p.4).

climate-smart agricultural practice.[134] Agroforestry is the act of growing trees, or woody perennials[135], on farms at different times and spatial relationships to the crops or livestock grown on the same land.[136] The World Agroforestry Centre maintains that there should be ecological and/or economic interaction between the different components in an agroforestry system.[137] Trees grown for agroforestry could also provide commercial benefits (timber, firewood, and wood for charcoal production[138]), but because they are planted specifically to interact with the other crops grown on the land, the commercial reason for growing trees is not the sole focus.

Agroforestry could also provide adaptation, food security, and mitigation benefits as outlined below.

- **Adaptation benefits**: Agroforestry can improve soils' water retention and moisture, which can improve resilience to droughts as well as floods – retained moisture can reduce the extent of negative impacts on the soil and crops from droughts, and it can also slow the rush of flood waters (through improved soil infiltration) that can cause soil erosion.[139]
- **Food security benefits**: Agroforestry can increase soil organic matter, which could potentially improve soil fertility and crop yields.[140]
- **Mitigation benefits**: Agroforestry can lead to increased above- and below-ground biomass for carbon sequestration, leaf litter which contributes to increased soil organic carbon, and improved water retention and soil moisture for reduced erosion during droughts as well as floods.[141]

[134] Lal, R., *World Soils and the Carbon Cycle in Relation to Climate Change and Food Security*, The Ohio State University (2012), at 17. FAO, *Climate-Smart Agriculture: Agroforestry*, at http://www.climatesmartagriculture.org/82058/en/, accessed 28 July 2013.

[135] Plants that continue growing and producing over the course of more than one year. For a good discussion of the development of the modern 'agroforestry' concept, see Ramachandran Nair, P.K., *An Introduction to Agroforestry*, World Agroforestry Centre (1993), Ch. 2.

[136] *Ibid.*

[137] *Ibid.*

[138] *Ibid.*

[139] Meybeck, A. and Gitz, V., 'Module 1: Why Climate-Smart Agriculture, Forestry and Fisheries', in FAO, *Climate-Smart Agriculture Sourcebook* (2013), at 14. *See also* Campbell, B. et al., *Agriculture and Climate Change: A Scoping Report*, Meridian Institute (2011), at 11, 16.

[140] Meybeck, A. and Gitz, V., 'Module 1: Why Climate-Smart Agriculture, Forestry and Fisheries', in FAO, *Climate-Smart Agriculture Sourcebook* (2013), at 14.

[141] Smith, P. et al., 'Greenhouse gas mitigation in agriculture' (2008) 363 Philosophical Transactions of the Royal Society, pp.789-813, at 791, Table 1.

3) Encouraging livestock keepers to improve the quality of their livestock, reduce numbers, and implement increased management of grazing lands[142]

The proposed strategy option to implement increased management of grazing lands seeks to reduce pressure for agricultural expansion into forest areas due to land degradation from over-grazing and over-exploitation. Increased grazing land management is a climate-smart agricultural practice that involves reducing grazing pressure with smaller herds and/or rotational grazing, where the frequency and timing of grazing matches with pasture growth rates.[143]

Grazing land management can potentially result in adaptation, food security and mitigation benefits as outlined below.

- **Adaptation benefits**: Grazing land management can allow grass and plants to regenerate, which would increase soil cover and help reduce soil erosion during the droughts and floods projected to increase with climate change. Increasing grazing land cover could help ensure food is available for livestock under climate change scenarios.[144]
- **Food security benefits**: Improved grazing land management could ensure continued food resources for the livestock and potentially lower herd losses, which could help reduce food insecurity for humans dependent on the livestock.[145]
- **Mitigation benefits**: In addition to fewer methane emissions if herd sizes are reduced, mitigation benefits could be obtained through improved grazing land management that allows grass and other plants to regenerate.[146] Grazing lands that are over-exploited are at higher risk of degradation and soil erosion because there are fewer roots to hold the soil in place, and soil loss can cause emissions as soil organic carbon is simultaneously lost.[147]

[142] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility (August 2010), at 38.

[143] Gerber, P. et al., 'Module 8: Climate-Smart Livestock', in FAO, *Climate-Smart Agriculture Sourcebook* (2013), at 220.

[144] Steinfeld, H. et al., *Livestock's Long Shadow: Environmental Issues and Options*, The Livestock, Environment and Development (LEAD) Initiative (FAO 2006), at xxi. Available at ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e00.pdf, accessed 27 June 2013.

[145] *Ibid.*

[146] Smith, P. et al., 'Greenhouse gas mitigation in agriculture' (2008) 363 *Philosophical Transactions of the Royal Society*, pp.789-813, at 793-794.

[147] Tapio-Bistrom, M.L., Bogdanski, A., and Runsten, L., 'Module 2: Managing Landscapes for Climate-Smart Agricultural Ecosystems', in FAO, *Climate-Smart Agricultural Sourcebook* (2013), at 58-59, Case Study 2.1.

4) Providing agricultural inputs to poor and vulnerable forest adjacent communities in line with the government's National Accelerated Agricultural Inputs Access Program (NAAIAR)[148]

One of the reasons forest-adjacent communities might expand agricultural production into forests is due to low yields on existing agricultural land caused by lack of sufficient inputs.[149] This proposed strategy option is aimed at combating the problem of lack of access to inputs and low productivity in order to reduce pressure on forests for agricultural expansion. However, some inputs that can increase crop productivity on existing agricultural land may simultaneously cause emissions and environmental trade-offs.[150] Chemical fertilisers are one example. Therefore, there are climate-smart agricultural practices which can change or substitute for a portion of agricultural inputs to potentially reduce negative environmental trade-offs whilst still maximising productivity.[151]

The inputs which could contribute to the adaptation, food security, and mitigation goals of climate-smart agriculture and reduce pressure on forests as part of Kenya's REDD+ implementation are:

- **Adaptation benefits**: Providing access to inputs, such as resilient seed varieties or different crops, chemical fertilisers (with corresponding training and extension services for proper application), and irrigation systems that could provide yield stabilisation or even increases under climate change conditions.[152]
- **Food security benefits**: Inputs, such as manure, mulch, compost, resilient seed varieties, intercropping of nitrogen-fixing legumes, and water harvesting for irrigation, may increase crop yields.[153] This can help ensure more food for subsistence or farm income from marketing and sales of surplus agricultural products, as well as contribute to fewer emissions from deforestation (relieving pressure to expand into forests to produce more crops).[154]
- **Mitigation benefits**: Providing inputs, such as seeds for intercropping legumes or agroforestry seedlings for on-farm trees, would allow for increased above- and below-ground

[148] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility (August 2010), at 38.

[149] Scherr, S.J. and McNeely, J.A., 'Biodiversity conservation and agricultural sustainability: towards a new paradigm of "ecoagriculture" landscapes' (2008) 363 *Philosophical Transactions of the Royal Society*, pp.477-494, at 478.

[150] *Ibid.*

[151] Smith, P. et al., 'Greenhouse gas mitigation in agriculture' (2008) 363 *Philosophical Transactions of the Royal Society* (2008), pp.789-813, at 790-791.

[152] FAO, *Food Security and Agricultural Mitigation in Developing Countries: Options for Capturing Synergies* (2009), at 18, Table 2.2.

[153] *Ibid.*

[154] Meybeck, A. and Gitz, V., 'Module 1: Why Climate-Smart Agriculture, Forestry and Fisheries,' in FAO, *Climate-Smart Agriculture Sourcebook* (2013), at 29.

biomass on agricultural land, which could potentially contribute to soil carbon sinks.[155] Additionally, household use or sales of firewood, charcoal, and timber from a farmer's land could reduce deforestation emissions from existing forests.[156]

3.3.1.2 Strategy options in the second priority area

The second priority area of REDD+ strategy options relevant to agriculture is "**promoting sustainable utilisation of forests**."[157] Higher demand for biomass or fuelwood for energy purposes could put pressure on forests and result in their unsustainable use.[158] Agroforestry, a climate-smart agricultural practice, is proposed as a REDD+ strategy option under Kenya's R-PP to address this issue of unsustainable use of forests.[159] Farmers could grow and extract wood from the farm for firewood, charcoal, and timber (both for household use or for sale), which could decrease pressure on forests for these purposes and thereby increase sustainable utilisation of forests.[160] Agroforestry as a strategy option could therefore contribute to REDD+ implementation by potentially reducing emissions from deforestation and forest degradation.

3.3.1.3 Strategy options in the third priority area

The third priority area of REDD+ strategy options relevant to agriculture is "**enhancement of carbon stocks**," which proposes "to increase carbon stock in existing forests and to encourage new forest establishment, reforestation of degraded and deforested areas, and expansion of trees on farms."[161] Specific REDD+ strategy options within this priority area that relate directly to farms include:[162]

- Tree planting campaigns and support to provision of high quality germplasm to farmholdings,
- Farm forestry extension, and

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[155] FAO, *Food Security and Agricultural Mitigation in Developing Countries: Options for Capturing Synergies* (2009), at 21.

[156] Graham, K. (ODI) and Vignola, R. (CATIE), *REDD+ and agriculture: a cross-sectoral approach to REDD+ and implications for the poor*, Report for the REDD-net programme (2011), at 15.

[157] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility (August 2010), at 39.

[158] *Ibid.*

[159] *Ibid.*

[160] Meybeck, A. and Gitz, V., 'Module 1: Why Climate-Smart Agriculture, Forestry and Fisheries', in FAO, *Climate-Smart Agriculture Sourcebook* (2013), at 14.

[161] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility (August 2010), at 41.

[162] *Ibid.*

- Support to the Government of Kenya (GoK) target to plant 10% of land with trees . . . in line with the Vision 2030 objectives and the Agriculture [Farm Forestry] rules that require a minimum of 10% of agriculture land to be under trees (note: repealed by the Crops Act 2013).

These strategy options are aimed at increasing woody biomass resources on farms in order to reduce the pressure on forests for fuel, construction materials, and income-generating actions. Decreased deforestation and forest degradation could contribute to the priority area's objective of "enhancement of (forest) carbon stocks."[163]

3.3.2 Project-level examples of agriculture's potential role in REDD+ implementation

The actions carried out under carbon farming projects have the potential to improve farms' food production, natural resources (land, water, biodiversity), resilience to adverse climate conditions (drought, flood), and economic viability.[164] These improvements in farming operations may reduce the pressure to expand agricultural operations into forests and undermine REDD+ implementation. Therefore, REDD+ implementation could benefit from carbon farming projects that reduce agriculture's role as a driver of deforestation. Mitigation of agricultural emissions and the potential for project participants to gain additional income from carbon credit sales would be co-benefits.

There are already several carbon farming initiatives in Kenya (please refer to **Annex 8** for a list of forest carbon projects in Kenya). They provide examples of various types of agricultural actions which could contribute to REDD+ implementation - for example:

- carbon farming projects developed by NGOs and/or the private sector;
- agricultural development projects by international and national organisations and funders;
- capacity-building or demonstration projects by collective organisations (eg. farmer co-operatives) on altered farming techniques; and
- public-private partnerships testing schemes that could aid agricultural development.

Lessons drawn from each type of action are discussed below.

[163] *Ibid.*

[164] For multiple examples of benefits resulting from carbon projects involving land, water and forestry, see Lipper, L. et al., *"Climate-Smart" Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation*, Report for the FAO (2010).

3.3.2.1 Carbon farming project developed by a NGO

Carbon farming projects could benefit REDD+ implementation – the different agricultural management practices (provided under the project methodology) could result in improved productivity and climate change adaptation, which could reduce pressure to clear forests for agriculture. One example of a carbon farming project is implemented by Vi Agroforestry, a Swedish NGO, that is working with farmers in Western Kenya, on the *Kenya Agricultural Carbon Project*.[165] Vi Agroforestry has a 30 year history of working to increase local farmers' awareness, capacity, and extension services pertaining to tree planting, environmental work, organisational development, market-oriented production, financial services, and climate actions.[166] The World Bank's BioCarbon Fund is the designated buyer for the carbon credits generated from the Kenya Agricultural Carbon Project's measured and verified emission reductions.[167]

In collaboration with the World Bank, Vi Agroforestry developed the first soil carbon methodology for the Kenya Agriculture Carbon Project, which was verified and validated by the Verified Carbon Standard (VCS).[168] The "Sustainable Agriculture Land Use Management" (SALM) methodology is designed to measure the carbon storage potential on agricultural land from SALM practices compared to a business as usual (BAU) scenario.[169] Vi Agroforestry representatives stated that caution was exercised in developing the soil carbon methodology.[170] Prior to the carbon project, the organisation provided awareness raising, training, and extension services focused on SALM practices to the local farmers, which were aimed at contributing to increased agricultural productivity, farmer income, and sustainability of natural resource use.[171] Therefore, the extensive farmer network collaborating with Vi Agroforestry on this project (approximately 60,000 farmers) was familiar with the organisation's extension services and suggested changes in agricultural management.[172] In line with the farmers'

[165] Vi Agroforestry, *What we do: Carbon Offsetting*, http://www.viagroforestry.org/what-we-do/carbon-credit/, last accessed 26 June 2013.

[166] Vi Agroforestry at http://www.viagroforestry.org/, last accessed 26 June 2013.

[167] Vi Agroforestry, *What we do: Carbon Offsetting*, at http://www.viagroforestry.org/what-we-do/carbon-credit/ (last accessed 26 June 2013).

[168] *Ibid;* see further, World Bank, *Projects & Operations: Kenya Agricultural Carbon Project*, http://www.worldbank.org/projects/P107798/kenya-agricultural-carbon-project?lang=en, last accessed 26 June 2013.

[169] Verified Carbon Standard (VCS), *VM0017 Adoption of Sustainable Agricultural Land Management, v1.0*, at http://v-c-s.org/methodologies/VM0017, last accessed 26 June 2013.

[170] Andersson, Arne, Mutua, Rachel Wangu, and Wekesa, Amos (Vi Agroforestry). Interviewed 10 April 2013 at Vi Agroforestry offices (Nairobi, Kenya).

[171] *Ibid.*

[172] *Ibid.*

priorities, economic, food security, and resource sustainability improvements were the primary, long-term benefits intended to result from the SALM practices.

Many SALM practices can also be considered climate-smart agricultural practices (eg. conservation agriculture, agroforestry, terracing, cover crops, water harvesting and precision irrigation).[173] SALM practices used at the project-level not only contribute to increased crop productivity and climate adaptation, but also lower emissions from agricultural production.[174] Therefore, Vi Agroforestry was able to develop a carbon farming project around the practices farmers were already implementing, which presented the potential for carbon market financing as an additional benefit from the SALM practices.[175]

Vi Agroforestry wanted to avoid setting unrealistic expectations regarding additional income flow to farmers from the sale of carbon credits generated by the project.[176] Therefore, the connection between SALM practices and carbon payments was introduced only when the initial carbon credit sale proceeds materialised.[177] Vi Agroforestry representatives stressed that it was important to manage expectations in this way to avoid discouragement and abandonment of practices (which are additionally beneficial to the farmers for food security and adaptation) if no extra funds are received.[178] Carbon project proceeds could fail to materialise if, for example, carbon prices drop or a buyer cannot be found.[179]

3.3.2.2 Agricultural development projects by international and national organisations and funders

On-the-ground projects aimed at agricultural development and improving rural households through sustainable land and water management, increased food production, and environmental conservation

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[173] Lipper, L. et al., *"Climate-Smart" Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation*, Report for the FAO (2010), at 3 (highlighting "high production, intensified, resilient, sustainable, and low-emission" agricultural practices which farmers can transition into using for their farming operations).

[174] Andersson, Arne, Mutua, Rachel Wangu, and Wekesa, Amos (Vi Agroforestry). Interviewed 10 April 2013 at Vi Agroforestry offices (Nairobi, Kenya).

[175] *Ibid.*

[176] *Ibid.*

[177] *Ibid.*

[178] *Ibid.*

[179] For a discussion of lessons learned from carbon project implementation regarding private sector financing, see Peters-Stanley, M., *REDD+ Finance: Private Lessons for the Public Sphere*, Ecosystem Marketplace, at http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=9912&section=news_articles&eod=1, last accessed 30 August 2013.

have the potential to contribute to REDD+ implementation in Kenya. Improving food security and adaptation capacity on existing farmland could reduce pressure to clear forests for agricultural use. International and national organisations and funders have established projects in Kenya which are aimed at agricultural development.[180] Partnering with KARI, the FAO and SIDA-funded pilot project called *Strengthening capacity for climate change adaptation on sustainable land and water management in Kenya* provides rural agricultural actors with capacity building and training on agricultural adaptation practices, such as water harvesting and agroforestry.[181] Harvesting of rainwater and run-off into constructed ponds enables fish farming and crop irrigation.[182] Sustainable land and water management (SLWM) practices (eg. conservation agriculture with crop residue management), and agroforestry on cropland and along field borders, can provide higher soil nutrient content, less soil erosion, and increased water retention and infiltration.[183] These practices can cut costs for farmers and provide tree resources (for construction materials, firewood, food, and fodder) that can contribute to positive 'crop-tree-livestock integration.'[184]

IFAD and other partners of FAO are assisting communities in Western Kenya with food and horticultural crop irrigation through projects, such as the "Sidindi Watershed Project" and the "Anyiko Rice Irrigation Scheme."[185] Projects are aimed at increasing food security as well as improving food value chains through local processing and packaging of farm products, rather than farmers simply selling raw materials for less value.[186] The irrigation strategies under the projects are intended to increase soil and land productivity, enhance resilience to climate change, and reduce downstream flooding and damage to agricultural activities.[187] Water harvesting through constructed ponds as well as mulching for improved soil moisture are two strategies described by one of the

[180] KARI, *Policy Learning Tour to FAO-KARI, SIDA and IFAD Funded Projects in Western Kenya*, Project Video by KARI and FAO-Kenya, at http://www.youtube.com/watch?v=xZPqShzXF2c&feature=youtu.be, last accessed 24 June 2014.

[181] *Ibid.*

[182] *Ibid.*

[183] *Ibid.*

[184] Statement by Barrack O. Okoba, Coordinator, Soil and Water Management and Conservation Agriculture Research – KARI, in KARI, *Policy Learning Tour to FAO-KARI, SIDA and IFAD Funded Projects in Western Kenya*, Project Video by KARI and FAO-Kenya, at http://www.youtube.com/watch?v=xZPqShzXF2c&feature=youtu.be, last accessed 24 June 2014.

[185] KARI, *Policy Learning Tour to FAO-KARI, SIDA and IFAD Funded Projects in Western Kenya*, Project Video by KARI and FAO-Kenya, at http://www.youtube.com/watch?v=xZPqShzXF2c&feature=youtu.be, last accessed 24 June 2014.

[186] *Ibid.*

[187] *Ibid.*

project's beneficiaries.[188] These practices can potentially increase agricultural production from existing farmland and/or provide additional income to farmers from value-added processing and packaging; both could potentially reduce the need to expand agricultural production into forests.

3.3.2.3 Collective organisation providing capacity building and demonstration actions for its members

REDD+ implementation could benefit from farmers' organisations assisting their members with climate adaptation and improved crop or livestock production strategies, as well as potentially securing higher prices for their agricultural products. An example of a collective organisation that is providing capacity building and demonstration actions for its members on climate change adaptation and livestock productivity is Mukurwe-Ini Wakulima Dairy Limited (Wakulima). Wakulima is a 100% farmer-owned company structured and operated similarly to a farmer co-operative.[189] Between 6,000 active to 20,000 overall members have shares in Wakulima, so the dairy collects and sells around 40,000 litres of milk per day[190] (in contrast, each member has an average of two cows that produce two litres each per day).[191] Coordinator Gerald Warui emphasised the difference in bargaining power between individuals with low quantities of milk to offer and collective farmer organisations with pooled milk resources, noting that the latter can command higher prices from buyers.[192]

In discussing the general issues faced by Wakulima's farmers, Mr. Warui pointed to the large downturn in milk productivity experienced in 2009-2010.[193] Kenya suffered an extreme drought that year resulting in less fodder for the dairy cows, to which the dairy attributed the steep decline in milk production by its members' livestock.[194] The dairy recognises that climate change may increasingly affect production; therefore, Wakulima participates in field days with county extension services to communicate adaptation strategies to its members.[195] Wakulima also organises demonstration farms,

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[188] Statement by George Ouma, Farmer, Sidindi Watershed Project, in KARI, *Policy Learning Tour to FAO-KARI, SIDA and IFAD Funded Projects in Western Kenya*, Project Video by KARI and FAO-Kenya, at http://www.youtube.com/watch?v=xZPqShzXF2c&feature=youtu.be, last accessed 24 June 2014.

[189] Mukurwe-Ini Wakulima Dairy Limited, at http://mukurwe-iniwakulima.kbo.co.ke/home, last accessed 27 June 2013.

[190] Warui, Gerald (Mukurwe-ini Wakulima Dairy Ltd). Interviewed 12 April 2013 at Wakulima Dairy offices (Mukurwe-ini, Kenya).

[191] *Ibid.*

[192] *Ibid.*

[193] *Ibid.*

[194] *Ibid.*

[195] *Ibid.*

with external financial assistance, to educate its members (eg. how different feeding methods could improve dairy production as well as help with adaptation, such as drying and storing coriander leaves and making silage for future drought periods).[196]

Co-operatives have established communication networks (eg. notice boards at the dairy, posters on pick-up and delivery trucks) and access to large groups of producers; therefore, these collective organisations could facilitate dissemination of recommendations for agricultural management. Adaptation or climate resilience strategies aimed at ensuring livestock feed is available even during extreme weather events could simultaneously decrease the incentive to clear forests for grazing.[197] Therefore, this adaptation strategy for livestock production could also benefit REDD+ implementation. In addition, farmer co-operatives can potentially secure higher prices for their members.[198] Adequate market prices can reduce the need to expand into forests to compensate for non-economically viable production from existing farmland.

3.3.2.4 Public-private partnership testing a strategy that could aid agricultural development

Agricultural development strategies, such as risk management schemes, can help small-scale farmers cope with climate change impacts and reduce the need to expand agricultural production into forests, thereby benefiting REDD+ implementation. The Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ – the German International Development Agency) works on adaptation awareness raising and training for on-the-ground actors as well as governmental capacity building and policy support in Kenya.[199] One of GIZ's projects is to develop a training manual for smallholder farmers on small-scale insurance; the manual is intended to support the work of the public-private partnership (PPP) between Syngenta's foundation, the Kenyan Ministry of Agriculture and the German Independent Labour Party (UAP).[200] The PPP is developing a small-scale index insurance scheme based on measured rainfall and area-specific crop models.[201]

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[196] *Ibid.*

[197] Calvosa, C. et al., *Livestock and Climate Change*, IFAD Livestock Thematic Papers: Tools for project design (2009), at 6.

[198] FAO, *Agricultural Cooperatives: Key to feeding the world*, Publication for World Food Day, 16 October 2012, at http://www.fao.org/fileadmin/templates/getinvolved/images/WFD2012_leaflet_en_low.pdf, last accessed 28 August 2013.

[199] Jacobi, Petra (GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH). Interviewed 11 April 2013 at GIZ offices (Nairobi, Kenya).

[200] *Ibid.*

[201] *Ibid.*

Small-scale insurance schemes offer potential adaptation benefits to farmers. Crop insurance provides a safety net for major crop losses resulting from extreme weather conditions[202], which are projected to increase under climate change scenarios.[203] Small-scale crop insurance could also benefit REDD+ implementation. Having a safety net against food insecurity and income loss could reduce pressure for smallholder farmers to expand agricultural production into forests to compensate for losses on existing farmland. Private (product development) and public (government-backed schemes) investment in innovative schemes for agricultural development could help reduce agriculture's role as a driver of deforestation, but it should be noted that designing small-scale insurance for Kenyan smallholder farmers has been complicated to date (due to small plot sizes and weather variability within very short distances of the weather monitoring stations).[204]

4. REGULATORY FRAMEWORK APPLICABLE TO CLIMATE-SMART AGRICULTURE IN KENYA

4.1 Importance of understanding how policies, laws and regulations could apply

Farms implementing climate-smart agricultural practices in Kenya would need to comply with the basic rules applicable to all other forms of agricultural practices. For example, the Environmental Management and Co-ordination Act requires hillside management to prevent soil erosion and loss of biodiversity[205], and the National Environment Management Authority (NEMA) issued rules on soil erosion prevention and management to avoid soil fertility loss (ie. salinisation from over-irrigation).[206] Additionally, it is important to assess how requirements may overlap with other rules or result in unintended consequences without additional policy or regulatory support. For example, the Water Resources Management Rules, under the Water Act, prioritise water allocation to subsistence irrigation.[207] This could affect compliance with the NEMA rules on soil management to avoid soil fertility loss if users are not aware of how to manage irrigation (eg. due to inadequate extension support) and/or permit limitations are not enforced.

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[202] Commodity Risk Management, Agriculture and Rural Development, and World Bank, Lilongwe, *Index-Based Weather Insurance for Smallholder Farmer Credit in Malawi*, Background Reading for Stakeholder Planning Meeting, 28-29 January 2007, at http://capacity4dev.ec.europa.eu, last accessed 28 August 2013.

[203] Boko, M. et al., 'Africa', in *Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*, Ch. 9 (Parry, M.L. et al. eds., 2007), Section 9.4.4.

[204] Twomlow, Stephen (International Fund for Agricultural Development). Interviewed 11 April 2013 at United Nations Campus Recreation Annex (Nairobi, Kenya).

[205] *Environmental Management and Co-ordination Act* 1999/Revised 2012, arts. 47, 50.

[206] *Agriculture, Fisheries and Food Act* 2013 (Government of Kenya), art. 23.

[207] *Water Resources Management Rules* 2007 (Government of Kenya), art. 53.

4.2 Policy support for climate-smart agriculture

Several existing policies support the principles of climate-smart agriculture; namely, the *Agricultural Sector Development Strategy*, *National Food and Nutrition Security Policy*, *Vision 2030*, *National Climate Change Response Strategy*, and *National Climate Change Action Plan*. Outlined below are the different ways in which some of Kenya's policies support food security, adaptation, and mitigation actions from the agricultural sector.

4.2.1 Food Security

The *Agricultural Sector Development Strategy* (ASDS) points to the challenges facing the agricultural sector – low productivity levels, declining forest cover, unused land for crop production, lack of market efficiency or access for agricultural products, and lack of value addition to gain better prices for products.[208] Numerous challenges were also identified in the *National Food and Nutrition Security Policy* (FNSP) as concerns for Kenya's future food security, including: smallholder farmers' lack of access to fertilisers, which could reduce crop yields; reductions of food stocks; high global food prices; and rising rates of diet-related diseases.[209] Climate change is noted as a primary concern due to its projected negative effects on crops and livestock.[210]

In response to potential climate change impacts, the FNSP calls for "[a]daptation interventions that enhance farming communities' resilience to climate change induced effects" in order to achieve the policy's food security objectives.[211] The ASDS also targets these challenges by emphasising the importance of: increased production (through expansion of irrigation); higher yields; better environmental management; and focused tree planting on farms.[212] Kenya's development strategy, *Vision 2030*, emphasises the agricultural sector's role in Kenya's economic development and food security,[213] implementing the flagship project "Fertiliser Cost-Reduction Initiative" to increase

[208] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 7.

[209] Government of Kenya, *National Food and Nutrition Security Policy* (2011), at 3-4.

[210] *Ibid.* at 3.

[211] *Ibid.*

[212] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 16, 27-28 (referencing the internationally accepted standard of 10% nation-wide tree cover).

[213] Office of the Prime Minister, Ministry of State for Planning, National Development and Vision 2030, *Sessional Paper on Vision 2030* (2012), at 123, 126.

farmers' access to fertiliser inputs.[214] By aiming to increase access to fertilisers, the project's objective is to increase agricultural production and enhance food security.[215]

4.2.2 Mitigation and adaptation

The *National Climate Change Response Strategy* (NCCRS) lays out the objectives for adaptation and mitigation action in Kenya as a framework for the *National Climate Change Action Plan*. The NCCRS recognises the importance and vulnerability of the agricultural sector and prioritises it "for quick and immediate action, while simultaneously providing explicit measures for addressing climate change in Kenya and defining criteria to track effectiveness of such measures."[216] Separate sections in the NCCRS propose adaptation and mitigation actions, which relate to climate-smart agriculture. For example, the adaptation section for 'Agriculture, Horticulture and Food Security' calls for:

- community-based adaptation strategies, such as enhanced dissemination of early warning system projections and information;
- financial and technical support to reintroduce indigenous and drought-tolerant crops into production[217];
- promotion of irrigated agriculture;
- land degradation avoidance through better soil management techniques;
- conservation agriculture;
- diversification of rural livelihoods;
- creation of linkages with development partners for enhanced technology transfer;
- agricultural research into climate change resilient crop varieties;
- an innovative small-scale insurance scheme;
- enhanced agricultural extension services;
- integrated pest management methods to respond to shifting diseases and pests; and
- improved post-harvest storage to prevent food losses.[218]

The mitigation section of the NCCRS explicitly recognises that "[a]lthough emissions from the agricultural sector in Kenya are quite low and are considered to be 'survival emissions'[219], some

[214] Kenya Vision 2030, *Flagship Projects: Fertiliser Cost-Reduction Initiative*, at http://www.vision2030.go.ke/index.php/pillars/project/Economics/33, last accessed 28 August 2013.

[215] *Ibid.*

[216] Government of Kenya, *National Climate Change Response Strategy* (2010), at 44.

[217] Labelled the Orphan Crops Programme, this includes food crops such as cassava, millet, sorghum, and sweet potatoes. *Ibid.* at 50.

[218] *Ibid.* at 50-51.

mitigation actions in this sector are also adaptation measures and should be promoted as a matter of priority."[220] The five mitigation measures the NCCRS suggests for adoption in the agricultural sector are:

1) agricultural technology for increased production and reduced emissions;
2) waste management (eg. manure digesters for energy production);
3) reduced tillage for lower methane from termites and mulching to control weeds;
4) intercropping on private land with crops and agroforestry (specifically avoiding encroachment into natural and reserve forests); and
5) organic farming with manure and crop residue as fertilisers.[221]

The NCCRS prioritises agricultural research to determine locally appropriate strategies for adaptation and mitigation actions, of which biotechnology and use of indigenous knowledge in conventional production are mentioned.[222] Renewable energy production using agricultural waste products is also included as a research priority, including coffee husks and used tea leaves, to reduce dependence on other forms of energy production.[223]

The *National Climate Change Action Plan* (NCCAP) was developed to continue implementation of the NCCRS, with information and recommendations to "inform national development and policy decisions in all sectors of the economy" updated on a five-year basis aligning with national planning and budgetary processes.[224] The NCCAP was developed through a consultative process led by an inter-ministerial Task Force under the Ministry of Environment and Mineral Resources (MEMR), and Seven Thematic Working Groups contributed expertise to the different sections of the NCCAP.[225] The NCCAP identifies national "policies, plans, strategies and initiatives that provide a supportive framework for implementing climate change responses" – some of which have direct implications for agriculture.[226]

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[219] Also referred to as 'necessary' emissions, the term 'survival emissions' here refers to the necessity of agricultural actions for food production even though they produce GHG emissions. *See* Banuri, T. et al., 'Setting the Stage: Climate Change and Sustainable Development', in *Climate Change 2001: Contribution of Working Group III to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*, Ch. 1 (Opschoor, H. and Parikh, K. eds., 2001), Section 1.3.1.

[220] Government of Kenya, *National Climate Change Response Strategy* (2010), at 62.

[221] *Ibid.* at 62-63.

[222] *Ibid.* at 78-79.

[223] *Ibid.* at 79.

[224] Government of Kenya, *National Climate Change Action Plan* (2013), at 7.

[225] *Ibid.* at 21.

[226] *Ibid.* at 10-11.

The NCCAP provides direct support for climate-smart agriculture as part of national adaptation. Table 5.1 on Priority Adaptation Actions per Sector explicitly includes the promotion of climate-smart agriculture in Kenya as objective, and allocates 15 billion KSh to its implementation.[227] The NCCAP also includes condensed results from the Adaptation Technical Analysis Report (ATAR) for the agricultural sector, involving development of inputs and geographically specific climate resilience strategies.[228] In particular, two of the ATAR's proposed actions should be noted:

- Explore alternative financial instruments for promoting adaptation, eg. Payment for Environmental Services, carbon finance; and
- Mainstream climate resilience into agricultural finance and financial mechanisms for adaptation eg. credit, grants, subsidies, import duty, support up-scaling of successful mechanisms.[229]

4.2.3 Policy options to address agriculture's impact on the environment

The 2012 *National Environment Policy* specifically mentions the "need for harmonization of sectoral policy instruments with the EMCA [Environment Management and Coordination Act] and the Constitution" and lists agriculture as one of the policies needing to be harmonized.[230] The *National*

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1) *The National Policy for the Sustainable Development of Northern Kenya and other Arid Lands*: This policy was created by the former Ministry of State for the Development of Northern Kenya and Other Arid Lands (ministerial consolidation followed the recent presidential election in March 2013). It recognized the importance of pastoralism in Northern Kenya and emphasizes investment for development of the ASALs (ie. infrastructure, economy, human capital).

2) *The National Disaster Management Policy 2009*: Provides a framework for disaster management, disaster risk reduction and reduction of vulnerability for communities and ASALs, which would benefit agriculture as a sector dependent upon the natural environment.

3) *The Kenya Forestry Master Plan 1995-2020*: The Plan led to development of the Forests Act of 2005 and the Forest Policy of 2007 (noting that the Forest Policy 2014 updates the 2007 version, and the Forests Act is likely to be revised).

4) *The National Environment Action Plan Framework (2009-2013)*: The challenges identified in this policy for agriculture and its effect on the environment are an "early warning system on drought, development of a national land use policy, control pollution from agricultural practices, regulation on introduction of Genetically Modified Organisms (GMOs), and appropriate land management" (p.14). The Biosafety Act is aimed at addressing the GMO challenge (Article 18(1)), but the early warning systems, national land use policy, and land management are still being formulated, as seen in the recent NCCAP (2013) call for "promotion of drought tolerant crops, water harvesting, integrated soil fertility management, insurance schemes . . . providing farmers and pastoralists with climate change-related information, and mainstreaming climate change into agricultural extension services" (p.32).

[227] Government of Kenya, *National Climate Change Action Plan* (2013), at 60.

[228] *Ibid.* at 58.

[229] *Ibid.* at 58-59.

[230] Government of Kenya, *National Environment Policy* (2012), at 9.

Environment Policy also describes agriculture's role as a threat to ASALs ecosystems, as well as Kenya's land and soil.[231]

The *National Environment Policy* proposes actions to combat degradation of the ASALs, including: creation and implementation of an Integrated Land Use Master (Development) Plan; flood and river water harvesting; promotion of integrated natural resource management; and efficient adaptation measures for resource management.[232] In response to the land and soil issues, the *National Environment Policy* outlines that the government needs to implement the Constitution and *National Land Policy* in a sustainable way, ensure sustainable agricultural use, and develop a *National Soil Conservation Action Plan* to maintain soil fertility.[233] These responses to identified environmental impacts from agricultural production in Kenya demonstrate support for adaptation and increased food security strategies, eg. the proposed adaptation measures for resource management, water harvesting, and sustainable agricultural use of land and soil.[234]

4.3 Legislative framework applicable to climate-smart agriculture in Kenya

Numerous laws apply to the Kenyan agricultural sector. The first subsection presents agriculture-specific laws, and the second subsection discusses other sectoral laws generally applicable to agricultural actions, which could potentially apply to climate-smart agricultural actions.

4.3.1 Agriculture-specific legislation

4.3.1.1 Crops Act 2013

The Crops Act 2013 is an important piece of new legislation for the agricultural crops sector in Kenya, establishing sustainable and environmentally friendly production as the standard for all land cultivation.[235] It outlines the role of County governments in implementing national policies and laws, including the responsibility for soil and water conservation[236], as well as the duties of the Agriculture,

[231] *Ibid.* at 16.

[232] *Ibid.*

[233] *Ibid.* at 16-17.

[234] *Ibid.* at 13-14, 16-18.

[235] *Crops A*ct 2013 (Government of Kenya), art. 4.

[236] *Ibid.* at art. 6: "(1) Pursuant to the Fourth schedule of the Constitution—(a) the Authority, on behalf of the national government, shall be responsible for licensing and charging of levies and breeder royalties on all scheduled crops on condition that the total sum of the levies charged by the Authority shall not exceed ten per centum of the gate value of the produce; (b) the county governments will implement the national government policies to the, extent that the policies relate to the county and in particular shall be responsible for—(i)

Fisheries and Food Authority (the Authority).[237] The provisions requiring farmland users to cultivate and make the land economically productive in a "sustainable and environmentally friendly manner" could support uptake of climate-smart agriculture because climate-smart agricultural practices are intended to increase productivity whilst supporting sustainable agriculture.[238] County governments' responsibility for soil and water conservation would be applicable to climate-smart agriculture in the same way it would apply to other forms of agricultural production, but climate-smart agricultural practices could make it easier for farmers to meet established soil and water conservation standards because climate-smart agricultural practices are intended to reduce impacts on natural resources.

The Commodities Fund provides financial support to growers for farm inputs and operations, which could apply to climate-smart agriculture because the adoption of some climate-smart agricultural practices involves new or different inputs.[239] The Authority can establish programmes that provide growers with incentives, such as "affordable farm-inputs including quality seeds, planting materials and market linkage."[240] This type of programme could be particularly relevant to climate-smart agriculture because it refers to quality seeds and planting materials, which some climate-smart agricultural techniques use for implementation.

Below are some of the key provisions that relate to the Kenyan agricultural sector and that could be relevant to climate-smart agriculture:

- Art. 3 – The Act aims to increase the growth and development of agriculture with a focus on improving productivity, farmer and rural incomes, harnessing investments, agribusiness efficiency, and exports.[241] To accomplish this, the Act aims at reducing regulation and bureaucracy, taxes, institutional overlap, as well as increasing competitiveness, diversification of crops and agricultural markets, and private investment in crop agriculture.[242]
- Art. 4 – Land administration is to be guided by principles, such as that "land owners and lessees of agricultural land, being stewards, have the obligation to cultivate the lands they

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development of crops grown within the county; (ii) plant disease control; (iii) markets; (iv) cooperative societies within the county; (v) soil and water conservation. (2) In order to achieve the objects and purposes of this Act, it is the duty of the national and county governments to provide an enabling environment for the development of the crop subsector. (3) The national and county governments shall determine and promote the implementation of agricultural policies and measures in a manner designed to promote, support and enhance productivity in the crop subsector").

[237] *Ibid.* at art. 8.

[238] *Ibid.* at art. 4(b).

[239] *Ibid.* at art. 10.

[240] *Ibid.* at art. 12.

[241] *Ibid.* at art. 3.

[242] *Ibid.*

own or lease and make the land economically productive in a sustainable and environmentally friendly manner."[243]

- Art. 6(1)(b)(v) – County governments are responsible for implementing national policies, and for soil and water conservation, within their areas.[244]
- Art. 8 – This provision broadly encompasses the different functions of the Authority[245] that aim to develop the multiple different crops grown in Kenya with policies, market support, transportation, research, biodiversity collaboration on genetically modified organisms, farmer training programs, product inspection and grading, food security, value addition, industry agreements and payment stipulations.[246]
- Arts. 9 and 10 – A Commodities Fund is established "to provide sustainable, affordable credit and advances to farmers" for "a) farm improvement; b) farm inputs; c) farm operations; d) price stabilization; and e) any other lawful purpose approved by the Authority."[247]
- Art. 11 – This provision sets forth the process for the Cabinet Secretary and the Agriculture, Fisheries and Food Authority to determine areas of the country suitable for particular crop production.[248] It includes public participation and the devolved control of the County governments to identify crops suitable for their areas. However, the development of a structured agricultural land use plan for the Country is limited by the final sub-clause in stating that "(6) Despite the provisions of this section, a person may grow any scheduled crop on any part of Kenya."
- Art. 12 – Provides for the Agriculture, Fisheries and Food Authority to establish rules and programmes to ensure incentives and facilities in the areas of credit assistance and guarantee, affordable farm inputs, technical and infrastructure support, fertiliser cost-reduction investment, pest and disease control, post-harvest facilities and technologies, and tax exemptions.[249]

[243] *Ibid.* at art. 4.

[244] *Ibid.* at art. 6.

[245] Created under the *Agriculture, Fisheries and Food Act* 2013.

[246] *Crops A*ct 2013 (Government of Kenya), art. 8.

[247] *Ibid.* at art. 10.

[248] *Ibid.* at art. 11.

[249] *Ibid.* at art. 12.

4.3.1.2 Farm Forestry Rules 2009

The Farm Forestry Rules were established under the Agriculture Act (repealed[250]) for the purpose of "promoting and maintaining farm forest cover of at least 10 per cent of every agricultural land holding and to preserve and sustain the environment in combating climate change and global warming."[251] The Rules specifically require all farms to comply with the 10% minimum tree cover[252], and inspectors are authorised to enter farms and determine whether this amount has been met.[253] This mandatory forestation on farms would have an effect on and potentially support implementation of climate-smart agriculture, particularly agroforestry. Implementing agroforestry in order to fulfil the 10% minimum requirement could also contribute to the farm's soil health for potentially improved agricultural productivity.

The Farm Forestry Rules were highlighted as being potentially problematic for the development of carbon projects on "The International Small Group Tree Planting Program" (TIST) project website.[254] TIST is a forest carbon project developed by the United States Agency for International Development (USAID) in conjunction with the Clean Air Action Corporation and the Institute for Environmental Innovation.[255] The project has been certified by the VCS.[256] Farmers are encouraged to plant trees on their farms, for which GHG emission reductions are measured, verified and validated, and carbon credits are issued for sale on the voluntary carbon market.[257] The project website referred to the Rules as posing "potential future hurdles for carbon validation and verification" and undermining any "reforestation effort that tries to use carbon credits as a financial tool."[258] The concern is that the 10% minimum tree cover required under the Farm Forestry Rules could complicate the establishment of project baselines (ie. BAU scenarios) as well as exclude farmers from participating in carbon projects

[250] *Agriculture, Fisheries and Food Authority Act* 2013 (Government of Kenya), art. 45.

[251] *Farm Forestry Rules* 2009 (Government of Kenya), art. 2.

[252] *Ibid.* at art. 5.

[253] *Ibid.* at art. 6.

[254] USAID-Kenya, *TIST: The International Small Group Tree Planting Program*, at http://kenya.usaid.gov/programs/environment/1573, last accessed 29 August 2013.

[255] *Ibid.*

[256] VCS, *The VCS Project Database*, at https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=1&t=1, last accessed 30 August 2013.

[257] USAID-Kenya, *TIST: The International Small Group Tree Planting Program*, at http://kenya.usaid.gov/programs/environment/1573, last accessed 29 August 2013.

[258] *Ibid.*

if the tree cover on their land is below the 10% minimum.[259] More information and analysis is needed regarding potential issues with project-level validation and verification in relation to the provisions of the Farm Forestry Rules.

4.3.1.3 Agriculture, Fisheries and Food Authority Act 2013

This Act established the Agriculture, Fisheries and Food Authority with advisory, oversight and regulatory power.[260] The Cabinet Secretary for agriculture was delegated the authority to prescribe rules for good management of agricultural land and the crops which may be grown on different lands.[261] The Cabinet Secretary may prescribe national guidelines for certain actions as well in order to conserve the soil or prevent soil erosion.[262] For example, guidelines may be issued "requiring, regulating or controlling – (i) afforestation or re-afforestation of land; (ii) the drainage of land, including the construction, maintenance or repair of drains, gullies, contour banks, terraces and diversion ditches; (iii) salination, acidification and saltification of soil."[263] Such guidelines could apply to climate-smart agriculture because:

- afforestation of land could be implemented using the climate-smart agricultural practice of agroforestry;
- land management practices, such as terracing and water harvesting, to prevent soil erosion can be defined as climate-smart agricultural practices because they provide adaptation, mitigation, and productivity benefits[264]; and
- actions to improve soil health, or avoid negative productivity effects from poor soil conditions such as salinisation, could involve climate-smart agricultural practices (eg. changing crop varieties, crop rotations, intercropping with nitrogen-fixing legumes, conservation agriculture, and use of manure fertiliser).

[259] By setting a minimum tree cover percentage for each plot of farmland, those farmers below the 10% are legally required to increase to a higher amount. Reforestation and emissions reductions on land below the 10% minimum would therefore not be able to demonstrate 'additionality', ie. reductions that would not have happened in the absence of the project. Remote interview (via email) with Charlie Williams of the Clean Air Action Corporation, 6 September 2013.

[260] *Agriculture, Fisheries and Food Authority Act* 2013 (Government of Kenya), art. 3.

[261] *Ibid.* at art. 22.

[262] *Ibid.* at art. 23(1)(b).

[263] *Ibid.*

[264] Bryan, E. et al., *Agricultural Management for Climate Change Adaptation, Greenhouse Gas Mitigation, and Agricultural Productivity: Insights from Kenya*, IFPRI Discussion Paper 01098 (2011), at 3-5, Table 1.1.

Article 40 is important in terms of climate-smart agriculture because it requires consultation with Kenya's farmer organisations before policies/regulations affecting the agricultural sector are made, which could include policies/regulations directed at or supporting climate-smart agriculture.[265]

4.3.1.4 Kenya Agricultural and Livestock Research Act 2013

The Kenya Agricultural and Livestock Research Organisation was established under this Act in order to "promote, streamline, co-ordinate and regulate research in crops, livestock, marine and fisheries, genetic resources and biotechnology in Kenya" as well as crop and livestock diseases, and to "expedite equitable access to research information, resources and technology and promote the application of research findings and technology in the field of agriculture."[266] This research organisation and the actions prescribed under its mandate would be relevant to climate-smart agriculture in Kenya because climate-smart agricultural practices are 'location-specific.'[267] Research would need to determine which practices are the most appropriate in terms of, *inter alia*, potential adaptation, mitigation, and food security benefits, the local climate, access to inputs, and the equipment farmers have or would need for different practices.

4.3.1.5 Agricultural Development Corporation Act 1965/revised edition 2012

The Agricultural Development Corporation was designed to promote production of key inputs for Kenyan agriculture, such as seeds and livestock breeds, as well as other activities to develop agriculture.[268] This could be applicable to climate-smart agriculture in terms of the adaptation, mitigation, and food security objectives of climate-smart farming techniques. Adoption of more resilient, different seed varieties is identified as a climate-smart agricultural practice[269]; therefore, development of adaptive seed varieties or livestock breeds that increase productivity and provide

[265] *Agriculture, Fisheries and Food Authority Act* 2013 (Government of Kenya), art. 40 ("(1) For purposes of ensuring effective participation of farmers in the governance of the agricultural sector in Kenya, there shall be close consultation with all registered farmers' organisations in the development of policies or regulations and before the making of any major decision that has effect on the agricultural sector").

[266] *Kenya Agricultural and Livestock Research Act* 2013 (Government of Kenya), art. 5(1).

[267] Bryan, E. et al., *Agricultural Management for Climate Change Adaptation, Greenhouse Gas Mitigation, and Agricultural Productivity: Insights from Kenya*, IFPRI Discussion Paper 01098 (2011), at 6. Smith, P. et al., 'Greenhouse gas mitigation in agriculture', 363 *Philosophical Transactions of the Royal Society* (2008), pp.789-813, at 795, Table 2.

[268] *Agricultural Development Corporation Act* 1965, revised ed. 2012 (Government of Kenya), art. 12.

[269] Bryan, E. et al., *Agricultural Management for Climate Change Adaptation, Greenhouse Gas Mitigation, and Agricultural Productivity: Insights from Kenya*, IFPRI Discussion Paper 01098 (2011), at 3-5, Table 1.1.

mitigation co-benefits under the Act would be potentially relevant to climate-smart agriculture in Kenya.[270]

4.3.2 General legislation

4.3.2.1 Constitution of Kenya 2010

The Constitution provides the basic framework for land ownership, use, rights and responsibilities in Kenya.[271]

Pertinent to climate-smart agriculture are the provisions mandating 1) land use planning[272], 2) sustainable exploitation of natural resources and the equitable sharing of benefits from such exploitation[273], and 3) a commitment to increase the national tree cover to 10%[274]:

1) The land use planning provisions provide the basis for creating a land use plan that divides a certain area of land into sections and allocates the land uses which can be conducted in

[270] The Seeds and Plant Varieties Act (1972/Revised 2012) is another law applicable to seeds in Kenya, regulating "production, processing, testing, certification, and marketing of seeds" in order to prevent sale of 'deleterious' seeds, control the production of new varieties, and create measures to prevent cross-pollination between plants derived from certain types of seeds (arts. 3, 11-16). Potentially, the seeds developed under the regulations of this law could be utilised for climate-smart agricultural practices or farming techniques.

[271] *Constitution* 2010 (Government of Kenya), **art. 60**: "(1) Land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable, and in accordance with the following principles-- (*a*) equitable access to land; (*b*) security of land rights; (*c*) sustainable and productive management of land resources; (*d*) transparent and cost effective administration of land; (*e*) sound conservation and protection of ecologically sensitive areas; (*f*) elimination of gender discrimination in law, customs and practices related to land and property in land; and (*g*) encouragement of communities to settle land disputes through recognised local community initiatives consistent with this Constitution. (2) These principles shall be implemented through a national land policy developed and reviewed regularly by the national government and through legislation." *Ibid.* at **art. 61**: "(2) – Land in Kenya is classified as public, community or private", and **arts. 62-69** which provide further detailed rights and responsibilities corresponding with the different land classifications.

[272] *Ibid*, art. 66: Any land may be regulated for land use planning, among other things, and "Parliament shall enact legislation ensuring that investments in property benefit local communities and their economies."

[273] *Ibid*, art. 67: The National Land Commission is given the power to manage public land for the national and county governments, recommend a national land policy, advise on a national land title registration programme, initiate investigations into present or historical land injustices, and monitor land use planning throughout Kenya.

[274] *Ibid*, art. 69: The State is required to "ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits." Also, it shall "work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya", "encourage public participation in the management, protection and conservation of the environment", protect biodiversity, "eliminate processes and activities that are likely to endanger the environment", and "utilise the environment and natural resources for the benefit of the people of Kenya." These State responsibilities are accompanied by the duty of all people to cooperate in the protection and conservation of the environment and "ensure ecologically sustainable development and use of natural resources".

those sections, including agricultural uses.[275] Climate-smart agricultural actions would need to be conducted in accordance with the established land use plan.

2) The requirement to sustainably exploit and utilise natural resources would support climate-smart agriculture because climate-smart agricultural actions assist the implementation of sustainable agriculture by addressing potential climate change effects.[276] Any sharing of the accrued benefits from climate-smart agricultural actions in relation to sustainable use of resources would need to be equitable.[277]

3) Lastly, the provision requesting that the national tree cover should be increased to 10% supports implementation of the climate-smart agricultural practice of agroforestry on farms to contribute to the goal.[278]

4.3.2.2 Land Act 2012

The Land Act 2012 established the National Land Commission, which is responsible for the administration of public land in Kenya.[279] This includes identification of "ecologically sensitive areas" and taking action "to prevent environmental degradation and climate change" in those areas.[280] The provision would support climate-smart agriculture, albeit on public lands instead of private farms, because climate-smart agricultural practices aim to reduce the impacts of climate change and agricultural production on land, soil, water, and other natural resources.

Incentives for communities and individuals to invest in income generating natural resource conservation programmes are authorised as one of the possible rules and regulations the Commission must adopt for "sustainable conservation of land based natural resources."[281] It is possible that carbon

[275] *Ibid*, arts. 66-67.

[276] *Ibid*, art. 69.

[277] *Ibid.*

[278] *Ibid.*

[279] *Land Act* 2012 (Government of Kenya), art. 8.

[280] *Ibid.* at art. 11 ("Conservation of ecologically sensitive public land: (1) The Commission shall take appropriate action to maintain public land that has endangered or endemic species of flora and fauna, critical habitats or protected areas. (2) The Commission shall identify ecologically sensitive areas that are within public lands and demarcate or take any other justified action on those areas and act to prevent environmental degradation and climate change. (3) Notwithstanding subsection (2) the Commission shall consult existing institutions dealing with conservation").

[281] *Ibid.* at art. 19. Art. 19 – The Commission must "make rules and regulations for the sustainable conservation of land based natural resources", including "incentives for communities and individuals to invest in income generating natural resource conservation programmes" (eg. climate-smart agricultural projects), measures for communities to co-manage forests and other resources to which they have customary rights, and measures for benefit sharing with affected communities.

farming projects implemented with climate-smart agricultural practices could qualify as income-generating natural resource conservation projects (a more extensive legal review would be necessary to determine whether "programmes" has a special meaning or set of requirements in Kenyan law which might exclude projects utilising climate-smart agriculture).

4.3.2.3 Environmental Management and Co-ordination Act 1999/revised edition 2012

Generally, the Environmental Management and Co-ordination Act (EMCA) establishes the overarching standards for environmental protection within Kenya to be maintained through regulations and processes (eg. Environmental Impact Assessments, or EIAs).[282] Particularly relevant to climate-smart agriculture are the guidelines and measures which the National Environment Management Authority must issue for sustainable use of hilly terrains.[283] The guidelines and measures "shall include those relating to – (a) appropriate farming methods, and (c) measures to curb soil erosion.[284]

Climate-smart agriculture means that farming techniques or methods would be employed that increase sustainable use of the land, including hillsides, as well as curb soil erosion, such as agroforestry, cover crops, and conservation agriculture.[285] In addition to satisfying the statutory objective to protect hilly terrains through more sustainable use, such climate-smart agricultural practices could also potentially provide adaptation to extreme weather events (eg. roots and soil cover preventing intense rainfall from washing away soil), mitigation through more above- and below-ground biomass and less soil erosion, and increased productivity through better soil health.[286]

4.3.2.4 Forests Act 2005

The current Forests Act from 2005 provides the general structure for forestland governance in Kenya.[287]

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[282] *Environmental Management and Co-ordination Act* 1999/Revised 2012, Preamble.

[283] *Ibid.* at art. 47.

[284] *Ibid.*

[285] Bryan, E. et al., *Agricultural Management for Climate Change Adaptation, Greenhouse Gas Mitigation, and Agricultural Productivity: Insights from Kenya*, IFPRI Discussion Paper 01098 (2011), at 3-5, Table 1.1.

[286] *Ibid.*

[287] *Forests Act* 2005 (Government of Kenya), Preamble.

The current Act defines "farm forestry" as "the practice of managing trees on farms whether singly, in rows, lines, boundaries, or in woodlots or private forests."[288] Private forests include farm forestry (a term simply indicating privately owned forests which are established specifically on farmland), and if the private owner registers the forest, technical advice on forestry practices and conservation as well as loans from the Forest Management and Conservation Fund for development of the forest are available.[289] This provision regarding farm forestry could be applicable to climate-smart agriculture because trees on-farm can be grown using the climate-smart agricultural practice of agroforestry, which is supposed to interact with the crops growing on the land rather than being solely to derive resources from the trees (timber, fuel, firewood, and construction materials).[290]

4.3.2.5 Water Act 2002

The Water Act 2002 governs the "management, conservation, use and control of water resources" and how rights are obtained to use water resources.[291]

The Act is relevant to climate-smart agriculture because permits are required for use of water resources, which would apply to irrigation carried out in the form of a climate-smart agricultural practice.[292]

4.3.2.6 Water Resources Management Rules 2007

Subsidiary legislation under the Water Act, the Water Resources Management Rules, establish that subsistence irrigation is a priority when allocating water for irrigation.[293] The allocation of water for irrigation must also "be guided by crop water requirements in the area and the efficiency of water use."[294] These rules are applicable to climate-smart agriculture because implementation of irrigation

[288] *Forests Act* 2005 (Government of Kenya), art. 3.

[289] *Ibid.* at art. 25.

[290] Ramachandran Nair, P.K., *An Introduction to Agroforestry*, World Agroforestry Centre (1993), Ch. 2.

[291] *Water A*ct 2002 (Government of Kenya), Preamble.

[292] *Ibid.* at art. 25 - "(1) A permit shall be required for any of the following purposes: (a) any use of water from a water resource, except as provided by section 26; (b) the drainage of any swamp or other land; (c) the discharge of a pollutant into any water resource; (d) any purpose, to be carried out in or in relation to a water resource, which is prescribed by rules made under this Act to be a purpose for which a permit is required. (2) Nothing in this section applies to the purposes of a state scheme under this Part".

[293] *Water Resources Management Rules* 2007 (Government of Kenya), art. 53.

[294] *Ibid*, at art. 53.

as a climate-smart agricultural practice would be subject to allocation requirements as would other farming techniques.

4.3.2.7 Biosafety Act 2009

Genetically modified organisms (GMOs) are regulated in Kenya under the Biosafety Act 209; it restricts use or release of GMOs into the environment to circumstances in which formal approval has been obtained.[295] Proponents of GMO believe that modified seeds increase crop productivity, improve resilience to climate change and enhance mitigation of emissions via more efficient and better seed varieties.[296] Nonetheless, the use of GMO inputs is regulated and restricted. Therefore, other farming techniques exhibiting similar principles would be important to consider in addition to the possible use of GMOs. Potentially, climate-smart agricultural practices aimed at addressing food security, adaptation and mitigation could serve as viable alternatives to using GMO seeds in the Kenyan agricultural sector.

4.3.2.8 Energy Act 2006

The Energy Act promotes the use of crops for purposes other than food (ie. fuel); there is some debate regarding whether this could have an impact on food security in Kenya.[297] It promotes growing trees on farms for biomass energy production, but in the form of "fast maturing trees" and "commercial woodlots."[298] This would likely exclude the climate-smart agricultural practice of agroforestry due to the types of trees planted (eg. varieties intended to provide woody biomass resources efficiently rather than interact with crops growing on the farmland).[299]

Carbon credit trading is another specific action outlined in the Act which may be used to promote development and use of renewable energy.[300] This could include climate-smart agricultural practices

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[295] *Biosafety A*ct 2009 (Government of Kenya), art. 18-21.

[296] Mtui, G.Y.S., 'Involvement of biotechnology in climate change adaptation and mitigation: Improving agricultural yield and food security' (2011) 2(13) *International Journal for Biotechnology and Molecular Biology Research*, pp. 222-231; and, AfricaAdapt, *GMOs or local crops for climate change adaptation in Africa?*, Policy Brief (August 2012). Available at http://www.africa-adapt.net/media/resources/850/africaadapt_policy_brief_gmo-vs-local-seeds.pdf, accessed 17 June 2013.

[297] *See* Edame, G. et al., 'Climate Change, Food Security and Agricultural Productivity in Africa: Issues and policy directions' (2011) 1(21) *International Journal of Humanities and Social Science* (2011), pp.205-223, at 210.

[298] *Energy A*ct 2006 (Government of Kenya), art. 103.

[299] Ramachandran Nair, P.K., *An Introduction to Agroforestry*, World Agroforestry Centre (1993), Ch. 2.

[300] *Energy A*ct 2006 (Government of Kenya), art. 103.

as one of the options for different farming techniques to produce renewable energy sources under a carbon credit trading system.

4.3.2.9 Co-operative Societies Act 2005/revised edition 2012

The Co-operative Societies Act establishes the legislative structure for co-operatives in Kenya, which are common within the agricultural sector for the collective organisation of farmers' products for sale, processing, distribution, and marketing.[301] Distribution of co-operative proceeds to the members provides an established benefit-sharing mechanism[302], which could provide an example for carbon farming initiatives using climate-smart agricultural practices.

4.3.2.10 Societies Act 2008

Societies may be formed for a lawful purpose and registered as a "club, company, partnership or other association of ten or more persons."[303] This formal structure is another way Kenyan farmers may organise and establish rules within a collective group as to how they will act and pool their resources.[304] This could be relevant for climate-smart agriculture projects because it provides a way in which many farmers can collaborate on an issue. For example, over 60,000 farmers are participating in the Vi Agroforestry Kenya Agriculture Carbon Project – smaller groups had to be established at the local level in order to provide support, joint training and technical capacity building on successful SALM practices.[305]

[301] For further information on co-operatives in Kenya, although statistics on the current number of co-operatives are slightly out-of-date, please see International Labour Organization (ILO), *Cooperative Facility for Africa: Kenya*, at http://www.ilo.org/public/english/employment/ent/coop/africa/countries/eastafrica/kenya.htm, last updated 13 August 2009.

[302] Payments to members are in the form of "dividends" – a "member's share of the surplus of the society which is divided amongst its members, calculated by reference to the proportion which that member's share capital bears to the total share capital of the society." *Co-operative Societies Act* 2005, revised ed. 2012 (Government of Kenya), art. 2.

[303] *Societies Act* 2008 (Government of Kenya), arts. 2, 4, 9, 19.

[304] Described in terms of practical implementation and usefulness by Peter Gitika of the Kenya National Federation of Agricultural Producers (KENFAP). Gitika, Peter (Kenya National Federation of Agricultural Producers). Interviewed 13 April 2013 in Kiambu, Kenya.

[305] Andersson, Arne, Mutua, Rachel Wangu, and Wekesa, Amos (Vi Agroforestry). Interviewed 10 April 2013 at Vi Agroforestry offices (Nairobi, Kenya).

4.3.2.11 Micro and Small Enterprises Act 2012

The Micro and Small Enterprises Act "provide[s] a legal and institutional framework for the promotion, development and regulation of micro and small enterprises."[306] The Micro and Small Enterprises Authority must stimulate technology transfer and research, market development, and access to credit and capacity building for micro and small enterprises through the Micro and Small Enterprises Development Fund (the Fund) created in the Act.[307] The Act defines "farm enterprises"[308] as a form of micro and small enterprise, which could be relevant to climate-smart agriculture in Kenya as a type or size of farm that could implement climate-smart agricultural practices and potentially access technology transfer, research, product markets, capacity building and credit through the Fund.

4.3.2.12 SACCO Societies Act 2008

This Act governs the licensing and oversight of 'savings and credit co-operative' (SACCO) societies, which receive deposits[309] and issue loans to their members (upon demonstration of ability to repay and securing the loan with a guarantor's endorsement or collateral).[310] Smallholder access to credit could be relevant to climate-smart agriculture because some climate-smart agricultural practices involve switching to a different farming technique that requires new inputs or equipment (which could require financing).[311] Alternatively, financing may be necessary during the gap between start-up and the payment for carbon credits generated from a climate-smart agricultural project.

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[306] *Micro and Small Enterprises Act* 2012 (Government of Kenya), arts. 3.

[307] *Ibid.* at arts. 46-53.

[308] *Ibid.* at art. 2, '"farm enterprise" includes micro and small scale agricultural, livestock and fishing enterprises.'

[309] *SACCO Societies Act* 2008 (Government of Kenya), art. 23.

[310] *Ibid.* at art. 33.

[311] For example, crop rotations, switching to more resilient varieties of seeds, and agroforestry may all involve new types of inputs, in addition to the capital requirements for building water harvesting structures and irrigation equipment. Capital grants and seedlings may be provided (as in the "Strengthening capacity for climate change adaptation on sustainable land and water management in Kenya" by the FAO and SIDA), *source:* KARI, *Policy Learning Tour to FAO-KARI, SIDA and IFAD Funded Projects in Western Kenya*, Project Video by KARI and FAO-Kenya, at http://www.youtube.com/watch?v=xZPqShzXF2c&feature=youtu.be, last accessed 24 June 2014. Alternatively, farmers could invest in inputs and equipment for their businesses with access to credit (complicated in traditional financing structures, such as commercial private banks, by their potential lack of collateral and high risk assessment of default), *source:* Warui, Gerald (Mukurwe-ini Wakulima Dairy Ltd). Interviewed 12 April 2013 at Wakulima Dairy offices (Mukurwe-ini, Kenya).

4.4 Issues for climate-smart agriculture arising from the current regulatory framework

Kenya's agricultural policy framework provides strong support for climate-smart agriculture, but potentially conflicting provisions of national legislation and policy could limit successful implementation of climate-smart agriculture. The Energy Act's emphasis on woody biomass for energy purposes may conflict with the Crops Act and FNSP's emphasis on food production. If production of crops for food is reduced in favour of using more land to produce bioenergy crops, food security could be negatively impacted. Then, if expansion of agricultural production into forestland results in order to compensate for lower food production on existing farmland (under bioenergy crop production), the energy policy initiative could actually work against efforts to prevent deforestation and forest degradation.

The Crops Act requirement that agriculture be conducted in an environmentally sustainable way, supporting implementation of climate-smart agriculture, could be undermined by the flagship project "Fertiliser Cost-Reduction Initiative" in *Vision 2030* if increased access to fertiliser is not accompanied by application training and extension support. The agricultural sector in Kenya is generally supported by the *National Agricultural Sector Extension Policy*[312] and the *National Agricultural Research System Policy*[313], which could contribute to the identification of effective climate-smart agricultural interventions as well as the support and training of local stakeholders for adoption and implementation of climate-smart agricultural practices. Lack of knowledge and capacity regarding application, timing or quantity of agricultural inputs, such as fertiliser and irrigation, could contribute to negative soil quality.[314] Declining soil health could lead to land degradation, which could lower yields and again result in agricultural expansion into forests to compensate for lost agricultural production on existing degraded lands.[315]

The 10% target for tree cover under the Constitution, the Forest Conservation and Management Bill 2014, and Farm Forestry Rules, reiterated in national policies such as *Vision 2030*, the NCCRS and the NCCAP, all have the potential to support the increase of trees on farms.

[312] Government of Kenya, *National Agricultural Sector Extension Policy* (2012).

[313] *Ibid.*

[314] Smith, P. et al., 'Greenhouse gas mitigation in agriculture' (2008) 363 *Philosophical Transactions of the Royal Society*, pp.789-813, at 790-791.

[315] For an example of a Brazilian case study in which soil improvements helped increase yields and reduced deforestation rates, see Kissinger, G., Herold, M., and de Sy, V., *Drivers of Deforestation and Forest Degradation: A Synthesis Report for REDD+ Policymakers*, Lexeme Consulting (2012), at 22-23.

The ASDS mission is to develop "an innovative, commercially-oriented and modern agricultural sector"[316], which would be supported by the *National Agribusiness Strategy* and the *National Biotechnology Awareness Strategy*.[317] The new Kenya Agricultural and Livestock Research Act aims to promote research in genetic resources and biotechnology[318], which the Biosafety Act and Seeds and Plant Varieties Act are intended to regulate. The NCCRS stated that biotechnology might reduce emissions through different seed varieties.[319] However, widespread use of GMO seeds could potentially conflict with the mitigation potential promoted by climate-smart agricultural practices since more synthetic fertiliser might also be used to make the GMO seeds perform optimally (which would contribute more emissions and potential environmental degradation).[320] On the other hand, GMO's potential to produce higher yields and climate-resilient varieties would contribute to the climate-smart agriculture principle of food security (prioritized in the FNSP) and adaptation.[321] Potentially conflicting or contrasting objectives, strategies, requirements and other issues within the Kenyan regulatory framework that could apply to or support implementation of climate-smart agriculture need to be considered by the various stakeholders.

In general, climate-smart agriculture is supported by the Kenyan regulatory framework and appears to have a conducive environment for uptake with increased focus on research, extension, training, technical capacity building, access to and improved use of inputs, dedicated climate adaptation and mitigation incentives, and access to credit. Nonetheless, there are some national policies and laws that could work against the implementation of environmentally sustainable climate-smart agricultural practices. In particular, the strategies for agribusiness and biotechnology promote increased mechanisation, chemical use and potentially large-scale investment in the sector. In the absence of coordinating regulations and safeguards, conflicts could arise between large-scale commercial

[316] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 6.

[317] Government of Kenya, *National Agribusiness Strategy* (2012). The Government of Kenya, *National Biotechnology Awareness Strategy* (2008) was adopted for the period of 2008-2013 in order to increase awareness as to the 'proper handling' and safeguards which are claimed to reduce the detrimental effects of biotechnology use. *See* Otunge, D., 'Kenya launches national biotechnology awareness strategy', *Crop Biotech Update*, 3 October 2008, at http://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=3215, last accessed 26 June 2013.

[318] *Kenya Agricultural and Livestock Research Act* 2013 (Government of Kenya), art 5.

[319] Government of Kenya, *National Climate Change Response Strategy* (2010), at 62-63.

[320] Pimental, D. et al., 'Environmental, Energetic, and Economic Comparisons of Organic and Conventional Farming Systems' (2005) 55(7) *BioScience*, pp. 573-582, at 573. *See also* Smith, P. et al., 'Greenhouse gas mitigation in agriculture' (2008) 363 *Philosophical Transactions of the Royal Society*, pp.789-813, at 790-791.

[321] However, the sustainability of this adaptation has been questioned if there is consequential loss of biodiversity from use of GMOs. *See* FAO and Platform for Agrobiodiversity Research, *Biodiversity for Food and Agriculture: Contributing to food security and sustainability in a changing world*, Outcomes of an expert workshop, 14-16 April 2010 in Rome, Italy (2011), at 18-22.

enterprises and smallholder farmers, with the potential to reduce food security (eg. if the emphasis is to shift away from food crops).

4.5 Institutional support for climate-smart agriculture

Various institutions would be relevant to the adoption and implementation of climate-smart agriculture in Kenya, providing cooperation and support in the development and coordination of research, policy making, planning, and monitoring and evaluation of climate-smart agriculture's implementation.

The Ministry of Agriculture, Livestock and Fisheries (MoA) would be responsible for matters related to climate-smart agriculture given that it is an agricultural strategy proposing different farming techniques for producing crops, livestock, and even fish (eg. innovative water harvesting ponds that can also be used for fish farming).[322] Different aspects of climate-smart agriculture would be relevant for different departments within the Ministry, for example, the Department of Livestock would be a key player in determining ways in which livestock feed could be improved or supplemented and/or how breeds of livestock could be improved. Such research findings achieved in collaboration with other institutions, such as KARI and the International Livestock Research Institute (ILRI), would be important information for the Technical Department on Extension and Training to disseminate to the livestock farmers.[323]

The former Ministry of Agriculture and Rural Development established a climate change unit, which began "developing a policy on mainstreaming climate change within the sector, with climate change adaptation pilot projects being implemented in various parts of the country."[324] Potentially, both the policy-making and adaptation pilot projects under this initiative are relevant to climate-smart agriculture because 1) climate-smart agriculture incorporates climate change considerations into and via different farming techniques, and 2) climate-smart agricultural practices could be used in the climate change adaptation pilot projects.

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[322] For an example of dual water harvesting and fish production, please refer to the "Sidindi Watershed Project" discussed above in Section 4.3.2. *See also* Bryan, E. et al., *Agricultural Management for Climate Change Adaptation, Greenhouse Gas Mitigation, and Agricultural Productivity: Insights from Kenya*, IFPRI Discussion Paper 01098 (2011), at 37.

[323] Ministry of Agriculture, Livestock and Fisheries, *Technical Department: Extension and training*, at http://www.kilimo.go.ke/index.php?option=com_content&view=section&layout=blog&id=21&Itemid=25, last accessed 27 August 2013.

[324] Government of Kenya, *National Climate Change Action Plan* (2013), at 13, 56.

An important institution for the agricultural sector and the Ministry of Agriculture, Livestock and Fisheries is the Agricultural Sector Coordination Unit (ASCU). The ASCU's mandate is to coordinate action between different Ministries that involves the development of the agricultural sector[325], which would include climate-smart agriculture. Research, evaluation, design, and adoption of climate-smart agricultural practices could involve inter-ministerial decision-making (eg. regarding target resources, such as soil, water, and forests; stakeholders; and, incentives) between, for example, the Ministry of Environment, Water and Natural Resources, Kenya Forest Service, and/or the Ministry of Energy and Petroleum.[326] Climate-smart agricultural practices are aimed at the development of the agricultural sector since climate-smart agriculture can potentially increase productivity and build resilience against climate change. Therefore, the ASCU would be the coordinating actor for inter-ministerial action on climate-smart agriculture.

The Ministry of Environment, Water and Natural Resources (MEWNR) will likely assume the responsibilities of the former Ministry of Environment and Mineral Resources (MEMR) regarding climate change coordination.[327] The Climate Change Secretariat under the MEMR is responsible for all climate change activities, including climate-smart agricultural practices, within the institutional framework to develop the "policy, legal and institutional arrangements underpinning REDD+ strategies and measures to be implemented."[328] NEMA, also established under the MEMR, is one of the agencies responsible for emissions trading in Kenya, so it would be important for future carbon credit trading from carbon farming projects.[329] The Regional Development Authorities (RDAs) discussed in the ASDS "are mandated to reverse development disparities" between regions in Kenya through resource mobilisation, including water for irrigation, and investment in their respective regions. RDAs would be important actors to consider in the development and expansion of climate-smart agricultural practices, such as innovative water harvesting, precision irrigation, and agroforestry.[330]

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[325] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 84-85. See generally: Agricultural Sector Coordination Unit (ASCU), *About Us*, at http://www.ascu.go.ke/about%20us-ascu.cfm, last accessed 26 June 2013.

[326] Ministry of Environment, Water and Natural Resources (MEWNR), *Department of Environment and Natural Resources*, at http://www.forestryandwildlife.go.ke/, last accessed 28 August 2013.

[327] Ministry of Environment and Mineral Resources (MEMR), *About the Ministry*, at http://www.environment.go.ke/?s=Ministry+of+Environment%2C+Water+and+Natural+Resources, last accessed 26 June 2013.

[328] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility (August 2010), at 8.

[329] National Environment Management Authority – Kenya (NEMA), *About DNA*, http://www.nema.go.ke/index.php?option=com_content&view=category&id=100&Itemid=598.

[330] Government of Kenya, *Agricultural Sector Development Strategy 2010-2020* (2010), at 23.

One of the projects under implementation by the Kenya Forest Service (KFS) is the "Innovative Approaches towards Rehabilitating the Mau Ecosystem Project."[331] A component of this project focuses on building sustainable livelihoods of the communities within the project area, partly through "improvement of agricultural productivity," to reduce their dependency on deforestation of the surrounding forests.[332] If such productivity could be achieved using climate-smart practices, it provides an example of an initiative administered by the KFS that could support REDD+ implementation.

It appears possible that several institutions could assist with implementation of climate-smart agriculture, but they would first need a clear vision of which types of practices to promote in order to help their local constituents make informed management decisions. For example:

- The 27 Agricultural Training Centres across Kenya "provide intensive short-term training to farmers and stakeholders in agriculture through practical learning and demonstrations."[333] This is important for dissemination of climate-smart agriculture practices;
- Agriculture Technology Development Centres "develop, test, customize and offer appropriate agricultural technology to farmers," which would be a key player in increasing the local climate-smart agricultural practices, inputs and technologies[334]; and
- Agriculture Mechanisation Stations enable small-scale farmers to access machinery they may not be able to afford to purchase, offering "tractor hire and earth moving equipment at subsidized rates."[335] New equipment developed through targeted research and existing equipment identified as necessary for implementation of climate-smart agricultural practices could be subsidised and provided for small farmers. The research findings and equipment would need to be supported by the widespread, improved extension services envisioned under the *National Agricultural Sector Extension Policy* for effective implementation.[336]

Providing an example of a failure to coordinate policies across different government agencies, the *National Agribusiness Strategy* stated that there is an unstable policy environment for the agribusiness subsector, stating that "different ministries, departments and agencies have their own agribusiness

[331] Kenya Forest Service (KFS), *Innovative Approaches towards Rehabilitating the Mau Ecosystem Project*, at http://www.kenyaforestservice.org/iarm/, last accessed 29 August 2013.

[332] *Ibid.*

[333] Ministry of Agriculture Office of the Permanent Secretary (Government of Kenya), *Ministry of Agriculture at a Glance* (2008), at 10. Available at http://www.kilimo.go.ke/kilimo_docs/pdf/moa_at_glance.pdf, accessed 4 April 2013.

[334] *Ibid.*

[335] *Ibid.*

[336] Government of Kenya, *National Agricultural Sector Extension Policy* (2012), at 24.

agendas. They are rarely co-ordinated. This results in duplication, wastage of resources and inefficiencies. Interference in markets driven by political motives also contributes significantly to uncertainties and market distortion.[337] Such a lack of coordination is problematic for companies, investors, farmers, and research institutions because of the lack of a clear indication of what the government will do, how it will do it, whether investments will be protected, or whether implementation will be abandoned. In demonstrating the problems potentially caused by a lack of institutional coordination, the example also highlights the generally important role that institutions play in developing, implementing, and monitoring policy. Institutions would be important actors in the development and integration of climate-smart agricultural practices within the Kenyan agricultural landscape and regulatory framework, and sufficient inter-ministerial coordination would be necessary to avoid inefficient or ineffective implementation.

5. CONCLUSION

Agriculture's role as a driver of deforestation in Kenya needs to be addressed, despite the importance of the sector for the national economy and acknowledging that millions of smallholder subsistence farmers depend on agriculture for subsistence needs and income. In the context of REDD+, Kenya's R-PP has acknowledged these conflicting concerns whilst emphasising 'early-action' strategy options to reduce pressure on forests from agriculture. It is possible that some of the proposed actions could be implemented in the form of climate-smart agricultural practices, which would aim to achieve the intended emissions reductions from deforestation/forest degradation whilst simultaneously increasing food security and climate change adaptation. Indeed, some of the strategy options in Kenya's R-PP are already compatible with or use actions that can be identified as climate-smart agricultural practices.

Kenya has the option to include climate-smart agricultural actions in it National REDD+ Strategy. The R-PP emphasises that the proposed REDD+ strategy options should build on existing policy and measures, rather than developing a new initiative.[338] If Kenya decided to include climate-smart agriculture as part of its National REDD+ Strategy, the following issues would need to be considered:

- Which climate-smart agriculture practices are appropriate to Kenya's agricultural, ecological, stakeholder, and financial context;
- Whether the national institutions, policies, and laws are coherent and supportive of the adoption of such practices;

[337] Government of Kenya, *National Agribusiness Strategy* (2012), at 6.

[338] Government of Kenya, *Revised REDD Readiness Preparation Proposal Kenya*, Submitted to the Forest Carbon Partnership Facility (August 2010), at 37.

- Which aspects of Kenya's natural resource base should be prioritised and protected from pollution, unsustainable use, and climate change; and
- Where within the landscape these practices are desirable and how to deal with other competing land uses.

Broadly speaking, the regulatory policy framework is supportive of climate-smart agriculture, containing policies aimed at addressing food security in addition to climate change adaptation and mitigation. In particular, the national climate change policies specifically target agriculture as a sector which needs to build resilience and increase efficiency to contribute fewer emissions per product or per hectare (eg. the NCCAP allocated a large budget to increasing adoption of climate-smart agriculture in Kenya). Kenya's agriculture-specific laws also provide a conducive environment for the uptake of climate-smart agricultural practices due to their increased focus on research, extension, training, technical capacity building, access to and improved use of inputs, and dedicated climate adaptation and mitigation incentives. It should be noted, however, that it could be possible for conflicts between some agricultural and cross-sectoral laws and regulations to occur, due to different objectives or overlapping priorities in natural resource use and agricultural sector development. Inter-ministerial coordination between Ministries relevant to agriculture would help to reduce the possibility for conflict.

If REDD+ implementation under the Ministry of Environment, Water and Natural Resources is to include the promotion of climate-smart agriculture, further review of the relevant laws and options for institutional coordination between the different government agencies involved in the agricultural sector would be required. Given the contribution that climate-smart agriculture could make to both the *Vision 2030* agenda and potentially REDD+ outcomes, it is perhaps a good time to consider the topic in more depth.