

Agriculture Negotiations at the UNFCCC

What to be pursued for East African Community Member States' interests?



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Abbreviations

AMCEN	African Ministerial Conference for the Environment
APA	Ad Hoc Working Group on the Paris Agreement
ASAL	Arid and Semi-Arid Land
CAADP	Comprehensive Africa Agriculture Development Programme
CGIAR	Group of International Agriculture Research
CDM	Clean Development Mechanism
CMA	Conference of Parties serving as Meeting of the Parties to the Paris Agreement
COP	Conference of Parties
CUTS	Consumer Unity and Trust Society
EAC	East African Community
EU	European Union
FAO	Food and Agriculture Organization
KIPPRA	Kenya Institute for Public Policy Research and Analysis
GHG	Green House Gas
IPCC	Intergovernmental Panel on Climate Change
IFPRI	International Food Policy Research Institute
KP	Kyoto Protocol
LDCs	Least Developed Countries
LULUCF	Land Use, Land Use Change and Forestry
NAP	National Adaptation Plan
NDCs	Nationally Determined Contributions
PA	Paris Agreement
PPP	Public Private Partnership
REDD	Reducing Emission from Deforestation and Forest Degradation
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SDM	Sustainable Development Mechanism
UNFCCC	United Nations Framework Convention on Climate Change

Overview of Agriculture Negotiations at the UNFCCC

1. Brief history of UNFCCC agriculture negotiations

The history of agriculture negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) started to gain traction at the Seventeenth Conference of Parties (COP17), held in 2011 in Durban, South Africa. For the very first time, at this COP, Parties allowed the Subsidiary Body for Scientific and Technological Advice (SBSTA) to have agriculture as one of its agenda items at its thirty-sixth session (SBSTA36). Consequently, this allowed for COP 17 to be recognized as the first COP where agriculture made its formal entry into the UNFCCC negotiations¹.

At SBSTA38, in June 2013, Agenda Item 9 on Issues relating to agriculture. The in-session workshop focused on the current state of the scientific knowledge on how to enhance the adaptation of agriculture to the impacts of climate change at the same time promoting rural/sustainable development, the productivity of agricultural systems and food security in all countries, particularly in developing countries, whilst taking into account the diversity of agricultural systems, the differences in scale as well as possible adaptation co-benefits.

At SBSTA39, November 2013, Agenda Item 10 on Issues relating to agriculture². In the presentations and discussions, workshop participants highlighted the importance of considering the impacts of climate change on agriculture and food security in the context of adaptation, economic growth and sustainable development, whilst taking into account the diversity of agricultural systems and possible adaptation co-benefits. They also highlighted the interlinkages between adaptation and the need to further advance scientific knowledge in the agriculture sector, whilst taking into consideration financing, technology transfer and capacity-building needs, as well as enhancing cooperation, the sharing of experiences and the exchanging of information.

At SBSTA40, June 2014, Agenda Item 8 on issues relating to agriculture. The in-session workshop centred on the current state of the scientific knowledge on how to enhance the adaptation of agriculture to climate change impacts at the same time promoting rural/sustainable development, the productivity of agricultural systems and food security in all countries, particularly in developing countries, whilst also taking into account the diversity of the agricultural

¹ [Decision 2/CP.17 Paragraph 75, 76, 77](#)

² [UNFCCC \(2014\)](#) and [Report of SBSTA29](#) Paragraph 57-60.

system, the differences in scale as well as possible adaptation co-benefits³.

At SBSTA42, June 2015, Agenda Item 5 on issues relating to agriculture⁴. The in-session workshop focused on the important role of the assessment of risks and the vulnerability of agricultural systems, whilst taking into account particular vulnerabilities of agriculture to climate change impacts and its central role in ensuring food security in different climatic conditions. Parties also highlighted the importance of, inter alia, exploring the potential for synergies amongst existing processes under the Convention, the facilitation of assessment of risks, the vulnerability of agricultural systems to different climate change scenarios, and the sharing of knowledge /information on good practices.

At SBSTA43, December 2015, Agenda Item 6 on issues relating to agriculture⁵. At this session, the SBSTA continued its consideration on a) The identification of adaptation measures, whilst taking into account the diversity of agricultural/indigenous knowledge systems, the differences in scale as well as possible co-benefits, the sharing of experiences in research/development and on the ground activities, including socioeconomic, environmental and gender aspects; b) The identification and assessment of agricultural practices and technologies that enhance productivity in a sustainable manner, food security/resilience, whilst considering the differences in agro-ecological zones and farming systems, such as grass/cropland practices.

At SBSTA44, May 2016. Agenda Item 5 on issues relating to agriculture.⁶ At this in-session workshop, Parties highlighted the important role of identifying effective and

context-specific adaptation measures in agriculture and noted that successful adaptation in agricultural systems will require the identification of suitable adaptation measures at regional, national and local points, whilst taking into account diversity, context-specific systems, indigenous knowledge and possible co-benefits.

At SBSTA45, November 2016, Agenda Item 7 on issues relating to agriculture⁷. In the exchange of views that took place at the workshop, Parties highlighted the important role of practices/technologies, they also emphasized the diversity of agricultural systems and the importance of agriculture in economic development. Parties also highlighted the importance of, inter alia, exploring the processes under the Convention in relation to identifying value-adding elements that might contribute to advancing issues relating to agriculture.

At SBSTA46, May 2017, Agenda Item 5 on issues relating to agriculture⁸. On May 9th 2017, the secretariat received a submission from Egypt on behalf of the Group of 77 (G77) and China. Due to this, the secretariat was also requested to issue a conference room paper containing the submission. At SBSTA47, November 2017, the body continued to consider issues relating to agriculture, whilst taking into account Parties' deliberations and progress made from SBSTA46.

³ [UNFCCC \(2014\)](#) and [Report of SBSTA40](#) Paragraph 81-90.

⁴ [Report of SBSTA42](#) Paragraph 25-27.

⁵ [FCCC/SBSTA/2014/2](#) and [Report of SBSTA43](#) Paragraph 19-20.

⁶ [UNFCCC \(2016\)](#) and [Report of SBSTA44](#) Paragraph 28)

⁷ [UNFCCC \(2016\)](#) and [Report of SBSTA45](#) Paragraph 33-36.

⁸ [UNFCCC \(2017\)](#) and [Report of SBSTA46](#) Paragraph 37-40.

2. Highlights of the UNFCCC agriculture negotiations from COP17 to COP23⁹

Relating to modalities, work programmes and functions under *Issue #1: The Modalities for implementation of the outcomes of the five in-session workshops on issues related to agriculture and other future topics that may arise from this work*:

Parties recommended that the amount of EUR 35,000 will be required to organize a pre-session workshop before SBSTA47 and SBI47 in order to further the work on this agenda item.

Issue #2: Methods and approaches for assessing adaptation, adaptation co-benefits and Resilience:

During the workshops, Parties highlighted the importance of identifying co-benefits in order to better prioritize resource allocation and ensure the sustainability of adaptation measures. Such co-benefits could provide an independent economic stream, improve environmental outcomes, enhance productivity and increase resilience to environmental shocks.

Parties recommended conducting and funding research in areas such as crop variety improvement, climate/extreme weather impacts, crop sensitivity, resilience to extreme weather conditions, the impact of climate change on pests/diseases, the use of remote sensing and crop modelling in order to evaluate the impact of climatic variations on crops and develop tools that can support weather- and climate-related decision making.

Additionally, the workshop underscored the importance of adaptation and noted that

adaptation should include traditional, gender-specific and cross-scale knowledge in order to allow people different choices. The importance of transferring knowledge from place to place in order to make adaptation more effective was also highlighted, including the enhancement of adaptive capacity to provide wise advice in highly contextual and diverse circumstances. In terms of both policy and practice, the importance of information that will accelerate learning and scale up effective adaptation was also highlighted.

Parties also recommended that the assessment of the implications of the choice of metrics is an important process and this should be linked to and dependent on the consideration by Parties of the third commitment period of the Kyoto Protocol.

Issue #3: Improved soil carbon, soil health and soil fertility under grassland and cropland as well as integrated systems, including water management.

During the workshops on this agenda item, Parties emphasized that in the absence of effective adaptation measures, climate change impacts can lead to the degradation of agricultural systems, loss of herbaceous cover and increased soil erosion, as well as increased GHG emissions.

Several Parties also noted that their adaptation activities in many cases have mitigation co-benefits, sometimes to the extent that it would be difficult to categorize them as focusing entirely on mitigation or adaptation.

Issue #4: Improved nutrient use and manure management towards sustainable and resilient agricultural systems

Matters related to this were discussed mainly by examples from developed countries, including EU Member States. This emphasised how the region has so far made efforts to address issues of nutrient and manure use that will ensure sustainable

⁹ See Annex A for details of issues, discussions and recommendations.

resilience in the agricultural system by the implementation of EU climate policy, for instance.

Issue #5: Improve livestock management system

Country specific cases were discussed relating to livestock management. In the context of Africa, examples of how the region has been tackling the issues of livestock included amongst others crop diversification, integrated soil, water, livestock and rangeland management. From India, the case focused, amongst other approaches, on the application of technologies with regard to fertilizer use, closed system practices for aquaculture and cooling systems for livestock. Canada's example of how it is addressing this issue was also featured in the discussion to include the improvement of livestock breeding and feeding practices, which had contributed to lowering of GHG emissions.

Issue #6: Socio-economic and food security dimensions of climate change in the agricultural sector

Under this agenda item, Parties focused on the issues related to and noted the importance of the adaptation of value chains and on-farm systems that promote social and environmental co-benefits and recommended that any decision implemented should allow for more good decisions to be made in the future regarding socio-economic and food security dimension in the agriculture sector (i.e. becoming more aware of the interlinkages and impacts existing in those domains).

The discussions, recommendations and highlights from the previous agenda items as presented above led to the adoption of the "*Koronivia Joint Work on Agriculture*" at COP23, where Parties requested that both the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI) should jointly address issues related to agriculture through workshops, expert meetings, working with constituted bodies

under the Convention and taking into consideration the vulnerabilities of agriculture to climate change¹⁰. The COP invited submissions on this issue by Parties and observers by March 2018 for the consideration of the in-session workshop to be held in April-May, 2018.

The Koronivia joint work on agriculture would in the coming days and months centre on discussions related to agriculture and its contribution to climate change solutions through adaptation and mitigation measures. Parties and observer submission on issues relating to agriculture, will be due by March 2018, for consideration of SBSTA 47.

The Koronivia joint work on agriculture would, therefore, focus on, inter alia: the assessment of adaptation, adaptation co-benefits and resilience; improved soil carbon; health and fertility; improved nutrient use; manure management; improved livestock management system; socio-economic and food security dimensions of climate change. The COP further requested the Subsidiary Bodies (SBs) to report on progress and outcomes of work at COP26.

3. Implications of Koronivia Decision on East Africa Community Member States

Following the COP23 Decision that requested Parties and Observers to make submission on the six agenda items under the Koronivia joint work on agriculture by March 2018, Parties may decide to use at their discretion different forms or approaches including, but not limited to consultative dialogues, round tables, workshops, the use of experts (internal, external or both) from relevant ministries, departments and agencies and/or the use of

¹⁰ Report of SBSTA 47, [Draft Decision-/CP23](#) and [Draft Conclusion proposed by Chair COP23](#)

external experts (consultants) in order to coordinate inputs for submission.

In the light of this, like in the past, many countries in East Africa could use the approach of national consultative workshops, which are spearheaded by the lead ministry (it could be the ministry of environment or the corresponding government body, which has been created by the country to interface with the UNFCCC). These meetings brought together relevant government ministries, department and agencies as well as other non-state (party) stakeholders (academia, non-governmental organization, civil society, private sector, research institutions etc.), to engage in a consultative manner in order to produce inputs for the country's submission to the UNFCCC. The use of such consultative approaches has in the past proven to be reflective of the interests of both party and non-party stakeholders at the national level.

However, the foreseeable challenge for developing countries to meet the deadline for the submission of their views and inputs could be inadequate resources, especially finance, that will allow for the facilitation of such consultative meetings at the national level. Also, there exist inadequate time to convene the meetings and there also exist the limited or unavailability of key experts in drafting inputs that would reflect the varying interest of all stakeholders.

The future negotiations under agriculture after COP23 provides a mixed basket of challenges and opportunities for developing country parties.¹¹ Firstly, it will bring greater focus on

implementing climate actions in the sector as opposed to only focusing on the scientific and technical aspects of the negotiation process. This thus expands the scope of recommendations that countries can make to the COP. However, the modalities of this proposed collaboration remain similar to the process undertaken by SBSTA, i.e. convening workshops and expert meetings. Secondly, the Koronivia Joint Work on Agriculture offers an opportunity for the agricultural development community to coordinate and consolidate experiences and information that will support each of the focal areas.

Furthermore, the COP23 decision on agriculture provided opportunities for EAC Member States and stakeholders in the region to share their views on the elements, which are to be included in the next session of the subsidiary bodies in April-May 2018. Hence, this presents an opportunity for countries and observer organizations to air their views on a number of issues outlined in the six-agenda items of the Koronivia Joint Agriculture discussion.

However, whilst the six Koronivia Agenda item list excludes several key areas for climate action in agriculture that are critical for many developing countries, such as agroforestry, aquaculture, stress tolerant varieties, climate information services, and weather index-based agricultural insurance etc., the words "starting with but not limited to" on the discussion item indicates an opening that can make way for other priority topics.

¹¹ Dhanush, D., Bruce, C., Wollenberg, L., Osana, B., Dwit, S., Loe, S., and Huyer, S. (2017) Astep forward

in agriculture at the UN Climate talk –Koronivia joint work on agriculture

Tackling Climate Threats on EAC Socio-Economic Development & Food Security: What is needed?

1. Impacts of Climate Change & Challenges to Food Security

Countries in the East African Community continue to experience increasing climate variability, while exhibiting high physical sensitivity to climate change. The region continues to experience a higher trend in warming with increases in temperature predicted to range between 1.8-4.3° C, which is higher than the 1980-99 mean by 2100.¹² It is also predicted that future impacts of climate change would lead to a larger percentage of precipitation increased by 2-25mm in a number of countries in the region (Ethiopia, Kenya, Rwanda, Tanzania, and Uganda)¹³. All these changes would, therefore, have major impacts to agriculture and general food security in the region. For instance, the Kenyan arid and semi-arid lands (ASALs) have been predicted to experience a temperature increase between 1.5° and 2.5°C by 2020. This would likely

result into temperature stress to crops, an increase in pests/diseases, and high levels of evapotranspiration.¹⁴ The impacts in East Africa are therefore anticipated to result in a range of direct and indirect impacts on agriculture including food security, which is manifested by the decline of food production and hunger. For instance, the world bank, 2011 recognizes that climate change will be a significant driver of malnutrition in East Africa, and that frequent droughts and storms will wreak greater devastation whilst rising sea levels will ruin fertile farmland as changing rainfall patterns will deplete harvests¹⁵. In Kenya alone, severe droughts have interrupted rainfall patterns, leaving behind serious consequences such as harvest failure, deteriorating pasture conditions, decreased water availability and livestock losses.

According to the 2013 Intergovernmental Panel on Climate Change (IPCC) report, all the four dimensions of food security (food availability, access, utilization, and stability) are potentially affected by climate change

¹² Antwi, A. (2013). Climate Change and Food Security: An overview about the issue.

¹³ Nzuma J.M, Radeny M, Kinyangi J, Cramer .L, (2014). A Review of Agricultural, Food Security, Food Systems and Climate Change Adaptation Policies, Institutions and Actors in East Africa. CCAFS Working Paper no. 82. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org

¹⁴ Makokha- Odera. M., Thomas, T.S., Waithaka, M. Kyotalimye. M. (2013): East African agriculture and climate change: A comprehensive analysis. *International Food Policy Research Institute* (IFPRI):<http://www.ifpri.org/cdmref/p15738coll2/id/127931/fileaname/128142.pdf>

¹⁵ Kabubo-Mariara and Kabara. M, (2015): Climate Change and Food Security in Kenya: *Environment For Development. Discussion paper series 5.*

in turn, affecting the incomes of rural households.¹⁶ Also, food prices, food storage/ transportation and markets are also impacted by climate change (IPCC WG2 AR5 Ch 7). These impacts will be high in areas where low yields go hand in hand with poverty and in areas where households are highly depended on rain-fed agriculture such as in Sub Saharan Africa.

With increasing populations, food needs are projected to also increase. The Food and Agriculture Organization (FAO) projects that under a global population of 9 billion people, by 2050, the food demands are anticipated to increase by 70 percent. In addition, the “IPCC predicts that, by 2050, crop yields in Sub-Saharan Africa will have declined by 14% (rice), 22% (wheat) and 5% (maize); it also predicts decreased food availability by 500 calories less (a 21% decline) per person in 2050 and a further increase in the number of malnourished children by over 10 million - a total of 52 million in 2050 in Sub-Saharan Africa alone”.

In addition, sub-Saharan Africa has the highest proportion of food insecure people.¹⁷ Estimates put the regional average of 26.8% of the population to be undernourished in 2010-2012, whilst general food insecurity is approximated at 50%. In East Africa, poverty, the dependence on rain-fed agriculture, weak infrastructure (both soft and hard) as well as limited provision of safety nets are some of the factors that contribute to their vulnerability (Olila and Wasonga, 2016, CUTS, 2014).

The East African Community in recognition of the impacts of climate change on food security developed the EAC Food Security Action Plan 2010 – 2015. The plan makes mention of climate change impacts by acknowledging that “the region is frequently affected by food shortages and pockets and hunger despite the huge potential and capacity to produce sufficient food for consumption and export (East African Community Secretariat, 2010 in Olila and Wasonga, 2016). Similar findings are echoed by Antwi (2013), who

notes that the changes in agricultural production will have major impacts on food security in East Africa, and this will be specifically manifested in reduced yields that will affect food supply. He further notes that all forms of agricultural production will also negatively interrupt livelihoods and the capacity to access food.

Despite increasing evidence that climate change impacts food security, there is now a need for clear evidence on how to address such impacts. Such findings would thus go a long way in augmenting the various initiatives that have been developed in order to address climate change and food insecurity in the region. This study would also be key in designing policy measures for averting catastrophes, which are related to the impacts of climate change on food security.

1.1. Impacts on key aspects of food security

Food availability

Availability of agricultural products is affected by climate change directly through its impacts on crop yields, pests/diseases, soil fertility, water-holding properties and indirectly through its impacts on economic growth, income distribution and agricultural demand. By 2080, agricultural output in developing countries may decline by 20 percent due to climate change, whilst output in industrial countries is expected to decrease by 6 percent. Also due to climate change, yields in developing countries could further decrease by 15 percent on average by 2080.¹⁸ IPCC 2014 notes that many studies covering a wide range of crops in many regions show the negative impacts of climate change to be more common than positive impacts. Climate change also threatens the biodiversity of animal and plant species. Many plant and animal species that form a bulk of food for the rural population could be affected as plant and animal species struggle to adapt to climate change¹⁹. “Increasing temperatures

¹⁶ Challinor, A.J., Watson, J., Lobell, D.B., Howden S.M. Smith, D.R., Chhetri, N. (2014) :A meta-analysis of crop yield under climate change and adaptation. *Nature Climate Change* volume 4, pages 287–29.

¹⁷ FAO, (2010): “*Climate-Smart Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation*.” Food and Agriculture Organization of the United Nations (FAO).

¹⁸ FAO. 2008. *Climate Change and Food Security: A Framework Document*. Rome, Italy: FAO

¹⁹ Nyasimi, M. D. Amwata, L. Hove, J. Kinyangi, and G. Wamukoya (2014): *Evidence of Impact: Climate-smart agriculture In Africa*. CCAFS working paper no. 86. CGIAR Research Program on Climate Change and Food Security

and changes in precipitation are also very likely to reduce cereal crop productivity” IPCC 2014 WG2.

From the above analysis, it is clear that climate change does impact food availability and food/crop yields. This has, therefore, led to the increasing use of models in understanding climate change impacts on food availability.

Key findings show that the impacts of long rains would be more adverse than short rains. This is because high rainfall is key for increased productivity, but excessive rains are equally harmful. The right temperature on staple crops in East Africa are key during the critical growth periods such as the planting period, where wrong temperatures could slow down plant growth. For instance, in East Africa under maize production, model predictions by the International Food Policy Research Institute (IFPRI) show significant reductions in annual rainfall in areas neighbouring Lake Victoria, with no changes in Rift valley and a promising situation for the Coast, eastern and ASAL regions of Kenya. The Models similarly show increased rainfall in areas like Turkana, all this hence do have significant impacts on the production of major staples. Climate simulations using temperature and rainfall therefore show that “that climate change will adversely affect food security, with up to 69% decline in yields by the year 2100, with major impacts on crops like Maize while drought resistant crops like sorghum show positive response to climate change impacts”.

Recent findings on the impacts of climate change on food security have been well outlined by a study by KIPPRA and Clim Dev Africa, on using crop models in East Africa (Mukhala et al., 2017). The models that mainly projected impacts of climate change on Maize yields show that in Kenya, the country will experience a negative change in yield except for the Eldoret areas, whilst Kakamega does not show significant changes in yield. Whilst in Tanzania, major maize planting areas like Tanga, Dodoma and Shinyanga indicated a positive change in yield of between 24 per cent and 178 per cent, whilst the central plateau, southern and

western highlands of Mbeya showed a decline in maize yield of between -2 per cent and -10 per cent. In Uganda, all selected locations indicated positive changes of between 3 per cent and 85 per cent except the Kabale and Mbarara locations. In Burundi, compared to the baseline all selected locations indicated a decrease in yield with corresponding percentage change of between 25 per cent and 64 per cent, except for the Musinga area. Rwanda, similarly showed a positive yield increase with positive change except that the Gikongoro and Kigali areas that showed no trend²⁰.

As a result, it is evident that models predicted yield gains in areas that have not been previously able to cultivate crops such as maize. These are areas that previously were too dry for successful maize production. This, therefore, implies that new areas might become available for the cultivation of staples and presents an opportunity to explore new growing areas (Makokha Odera et al. 2013).

Food access

The changing climate has been hypothesized to be a major contributor to food price volatility, and this will affect the ability of most households due to their inability to afford food (“Vulnerability of households to reduced food access will depend on their channel of food access”), IPCC 2014. Physical, economic, and social access to food is affected negatively by climate change as agricultural production declines, food prices rise, and purchasing power decreases. Poor smallholder farmers’ ability to purchase will be further exacerbated by the low profits of agriculture, which will be caused by the absence of well-functioning markets. The Functionality of markets under climate extremes could be destabilized by climate change extremes in many rural areas as well (Prakash et al., 2011). The low expenditures on food could be due to diversion of incomes to non-food expenditure such as health or the loss of farm labour due to climate extremes.²¹

CCAFS. Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.

²⁰ Mukhala, E., Maingi N.W., and Ngaina J.N. (2017): A Synthesis of the Impact of Climate Change on Agricultural Production

Systems in the East African Community Region. KIPPRA Working Paper No. 26 2017

²¹ Carter, M.R and Lybbert, T.J, (2012): Consumption versus asset smoothing: testing the implications of poverty trap theory in Burkina Faso. *Journal of Development Economics Vol 99 Pg (255-264)*.

Furthermore, a decline in agricultural productivity will certainly lead to increased food imports, which will lead to high food prices that most families cannot afford (Nyasimi et al 2014).

Effects on food utilization

“Climate change impacts on utilization may come about through changes in consumption patterns in response to shocks, as well as changes in the nutritional content of food” IPCC 2014 FS. There is also growing evidence on climate and health dynamics that climate change will cause a statistically significant proportion of stunted growth in children in Sub Saharan Africa. Child malnutrition (using stunting indicators) projections by 2050 for four regions in sub-Saharan Africa, taking into consideration food and non-food (socioeconomic) causes, shows an increase in the prevalence of stunting to be between 31 to 55%.²² Projections by demographic of 2025 for Mali and Kenya, shows approximately 250,000 suffering stunting, nearly 200,000 being malnourished and 100,000 being anaemic if the climate change impacts continue by 2020.²³

A common practice by poor rural households in East Africa is rationing consumption and prioritizing calorie rich but nutrient poor foods.²⁴ All these strategies of reduction in diet quality or amount of food consumed magnified by pre-existing vulnerabilities could lead to devastating related health problems. Biologically, climate change will impact on the composition of nutrients in food items, this will be evident in grains where the protein content will be lowered due to elevated temperature and Co2 levels.²⁵ In terms of food safety, plant derived mycotoxins remain a key issue, “the impacts of climate change on mycotoxins

could be region-specific in the longer term; temperatures may increase sufficiently to eliminate certain mycotoxin-producing species from parts of the tropics, but in colder tropical regions and temperate zones, infections may increase.”²⁶ Last but not least, climate change poses threats to food utilization through effects on human health and the spread of diseases in geographical areas.

A typical case for East Africa is by the fact that maize is a major staple and accounts for a significant proportion of daily calories per capita in Burundi (13.1 percent), Ethiopia (19.5 percent), Kenya (33.3 percent), Tanzania (25.7 percent), and Uganda (9.3 percent). A projected reduction in maize production would therefore imply a reduction in the utilized nutrients (Makokha-Odera et al 2013). In Kenya alone, pessimistic model scenarios show that the impacts of climate change on major staples would imply a reduction in the kilocalories per capita available to each person in Kenya, this is also attributed to the doubling in price of the main staples with a low level of income rise.

2. Addressing Climate Change Impacts on Food Security

The impacts of climate change to the food security sector calls for adaptation measures to be undertaken, such measures need not to compromise the country targets on reducing GHG while increasing food security. In addition, the adaptation measures need to take account of the diversity of the agricultural systems, indigenous knowledge and the differences in implementation scales. As we develop adaptation

²² Porter, J.R., L. Xie, A.J. Challinor, K. Cochrane, S.M. Howden, M.M. Iqbal, D.B. Lobell, and M.I. Travasso, 2014: Food security and food production systems. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 485-533.

²³ Niang, I., O.C. Ruppel, M.A. Abdrabo, A. Essel, C. Lennard, J. Padgham, and P. Urquhart, (2014): Africa. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects.* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1199-1265.

²⁴ Herrero et al., (2010): Smart Investments in Sustainable Food Production: Revisiting Mixed Crop-Livestock Systems. *Science* 327, 822.

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1028.299&rep=rep1&type=pdf>

²⁵ Hatfield, J.L., Boote K.J., Kimball. B.A, Ziska, L.H. Izaurralde, R.C., Ort. D., Thomson,. A.M, and Wolfe, D.W. (2011). Climate impacts on agriculture: Implications for crop production. *Agron. J.* 103:351–370. doi:10.2134/ agronj2010.0303.

²⁶Cotty, J.P and Jaime-Garcia.R, (2007): Influences of climate on aflatoxin producing fungi and aflatoxin contamination. *International Journal of Food Microbiology; Volume 119, Issues 1–2, Pages 109-115.* <https://doi.org/10.1016/j.ijfoodmicro.2007.07.060>.

measures, it is important to recognize that National government and communities are already responding, not only to climate change impacts but also to other challenges hence the need to build on available knowledge base to build the adaptive capacity. Key adaptation strategies would entail; investments that focus on efficient water resource use, soil and land management. This would entail practices such as crop and livestock breeding, soil fertility management, conservation agriculture, water storage infrastructure and water harvesting, soil fertility management and technologies aimed at reducing post-harvest losses. Additional practices include; Integrated pest and disease management for agriculture enhanced insurance packages and financing for reducing farmers' risks and support to climate information services. There is also need for increased investment opportunities for integrating farmers into the global value chains. Practices aimed at increasing food security need also to consider mitigation benefits, key practices that could enhance food security with mitigation benefits include; Promotion of zero grazing animal husbandry, Production of improved livestock feed, Enhancement of manure management through the practice of composting, Development of short season rice varieties, Management of watersheds for the preservation of hydrological cycles, Promotion of bio-fertilizers and organic manure ²⁷.

2.1 Climate Smart Agriculture

The recognition of the need for triple win of adaptation, mitigation and sustainable development in agriculture led to the concept of climate smart agriculture (CSA). FAO defines CSA as “agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes GHGs (mitigation), and enhances achievement of national food security and development goals” (FAO 2012). Understanding how to enhance positive feedbacks between mitigation, adaptation, and sustainable development (e.g. win-win and triple win interventions) while minimizing potential trade-offs between them need to be an essential part of planning for and pursuing climate-resilient food systems, ²⁸ Due to the multisectoral

nature of food security, developing a functional linkage between adaptation and mitigation calls for the need to set up functional coordinating structures (Nyasimi et al., 2014), this would entail creating a platform for exchanging information among researchers, policy makers and farmers.

2.2 Climate Smart Food Supply Chains

There exist a number of food supply chains that ensure both local, national regional and global food security is met. To understand how the supply chains function, it is critical to map out where and how the consumed food is being produced. The food supply chain can be divided into four main segments that entail flows from upstream to downstream. The four main segments include; “(1) farm input supply chains, which are “upstream” of farms; (2) the farm segment, which forms approximately half of the full costs and value added of food supply chains in developing countries; (3) the “midstream” segment consisting of processing, wholesale, and transport; and (4) the “downstream” segment consisting of retailing (stores and restaurants). In addition, in terms of food origin, today the great majority of the food consumed is purchased from rural-urban, rural-rural, and urban-rural supply chains. This shows the diversity and transformation of supply chains to ensure food security.

It is also evident that supply chains have transformed rapidly in structure such as the rise of supermarkets and large processors to meet urbanization demands. We also note a transformation in product composition – with a concurrent shift in diets towards processed foods, fresh foods, and non-grain products such as milk, meat, fish, fruits, and vegetables. There has also been transformation in terms of conduct with basic changes in food processing and transport technology, and with the rise of standards and contracts. The diversity and transformation of supply chains imply lots of disruption in case of climate change impacts, but also could imply increase greenhouse gases. On the other side, the diverse supply chains could present an opportunity for

²⁷ UNFCCC SUBSTA Session 39 (Warsaw 11th to 16th Nov 2013): Item number 10 issues relating to agriculture.

²⁸ Branca, G, N. McCarthy, L. Leslie and C. J. Maria, (2011): Climate-smart agriculture: *IPCC A Synthesis of Empirical Evidence of Food Security*

enhanced adaptive capacity in case of climate change impacts.

It therefore remains a priority to the food supply chain actors to reduce vulnerability of agricultural systems to climate change, this would entail strengthening adaptive capacity by improving the livelihoods of the poor and allowing agriculture to fully play its role in ensuring food security. Also, in response to the changing climate, food supply chains need to reduce greenhouse gas emissions that contribute to global warming. It is evident that the agricultural sector has considerable potential for emissions reductions while at the same time playing its important role in poverty reduction and food security. To avoid the extra burden to rural farmers in adopting mitigation, absolute greenhouse gas reduction need to be considered in terms of the whole supply chain, this would imply that at the producer level most strategies would address adaptation with mitigation benefits, as mitigation is mainly adopted downstream where agriculture processing takes place.

3. Challenges to Address Climate Impacts in Food Sectors

Farmers' attitude

A major problem in the EAC is on addressing farmers' attitude towards uptake of new practices, a number of measures exist at the research level, and however uptake of practices remains a challenge.

Climate change research concentrating on sensitivity rather than response actions

Although there are a number of studies on climate change in the EAC, most studies tend to concentrate on understanding sensitivity rather than identifying resilient adaptation measures.

²⁹ UNFCCC SUBSTA 36 session (bonn 14th -25th May) 2012, item number 9 on issues relating to agriculture.

Predominance of traditional practices

In East Africa, most farming households who are small holder farmers mainly undertake farming based on their cultural practices anchored on indigenous knowledge. This implies the hardships in taking up new practices.

Land tenure

The land tenure arrangements are key to deciding on what adaptation practices have to be undertaken, in areas with less permanence of land ownership most investments that require heavy infrastructural support will always be avoided.

Markets and trade

Markets remain a key driver to uptake of practices, some of the drought resistant varieties are less marketable, this makes it difficult for farmers to take up such.

Policies and institutional fragmentation

A major challenge in EAC is that policies and institutions addressing climate change and those addressing food security are anchored under different ministries or departments. This makes it difficult in developing all-embracing policies.

Human capital and access to productive resources

In the EAC, women are the predominant actors in the food security sector and are equally heavily impacted by climate change, however their access to resources required for adaptation is a challenge.

4. Possible Ways Forward

To enhance food security amidst the changing climate East Africa through member countries and the African group through the SUBSTA ²⁹, ³⁰ submissions propose

³⁰ UNFCCC SUBSTA 44th Session (Bonn 16th -26th May, 2016) issues relating to agriculture.

a number of actions that need to be addressed as follows;

Vulnerability assessments

In most EAC countries, assessment of Climate Change impacts and mitigation potential to Current and projected impacts on food security remain unclear. A major proposed action is the need for assessments of Climate Change Impacts and Mapping of Vulnerability to Food Insecurity under Climate Change, this would then support the mapping of adaptation practices that strengthen household food security while ensuring improved livelihoods. There is also need to build capacity nationally for continuous monitoring of climate change impacts.

Institutional arrangements

For addressing climate change impacts to food security, this is also key, and therefore countries need to consider how the existing and emerging institutions in the agriculture sector could support food security systems in the face of a changing climate. The food security sector will need to link with other UNFCCC processes where necessary by drawing lessons on stakeholder arrangements from other related processes such as REDD plus and LULUCF. Also adaptation measures that could open up opportunities for total transformational changes, with critical implications on planning, local and national planning, financing, governance, policy frameworks, and institutions value chain development, economic incentives, research and database development, and knowledge processes.

Policy

It is evident that even with climate change, communities could potentially thrive, however their probability of success would be greatly enhanced with a supportive policy environment. We do appreciate that governmental and non- governmental actors in East African countries have instituted policies and programs aimed at increasing agricultural productivity, improving food security and enhancing adaptation to climate change, however this will need to be augmented by clear implementation and monitoring plans while ensuring that place based impacts are addressed accordingly. Key policy recommendations could entail the need to develop policies that safeguard

agriculture against the adverse effects of climate change in order to alleviate food insecurity in East Africa. This would entail efforts that ensure climate change mitigation is also given much more priority in policy planning as it is being done for adaptation, especially in the most vulnerable populations. Other policy efforts would include increased awareness on impacts of climate change on food security, continuous climate change monitoring while ensuring intensified early warning systems. Other policy recommendations include; The need to consider technological improvements for food security, for instance, “The International Model for Policy Analysis of Agricultural Commodities and Trade results, which takes into consideration technological improvements, projects an increase of around 80 percent in maize yield between 2010 and 2050, which seems to be a large enough increase to meet in-country demand for maize” (Nyasimi et al., 2014). There is also need for learning and transmitting knowledge systems to be matched to the increasing technology improvements at regional level, where mobile use has greatly improved.

GHG measurement

As we produce food to feed the growing populations in the EAC, GHG emissions are likely to increase. This increasingly calls for Climate Change mitigation actions in the food Sector. However, the approach to mitigation should have adaptation and sustainable development benefits as shown through the CSA approach, and should not negatively impact on food security. There is therefore an increasing need to establish guidelines to identification of mitigation actions in the food sector, taking cognizance of the national circumstances. There also exists a major gap in mitigation assessments; there is therefore need for developing more evidence on mitigation measurement and estimation of greenhouse gas removals. For this to be effective, EAC countries will need to consider sharing relevant information on greenhouse gas inventory and emission estimations.

Identification of Adaptation Measures in Agricultural systems

For a transformative agriculture in the EAC, the adaptation measures need to also directly contribute to food security, employment and supply of industrial raw materials. There is also an urgent need to identify key

socio-economic, technical and institutional barriers to sustainable adoption of the identified mitigation and adaptation practices.

Research

A number of research efforts aimed at addressing climate change and food security exist, this includes for instance; efforts, by the Consultative Group of International Agriculture Research (CGIAR), FAO and the respective country level National Research organisations. Emerging evidence from such studies needs to be disseminated for rapid uptake and scale up. However, research adopting a PPP (public private partnership) model would imply an ease of support by the private sector. The identification of research priorities need to be relevant to research and technology developments needed at the country level.

Knowledge management

There is also need to ensure that current knowledge regarding climate change adaptation and mitigation in the food security sector is adequately utilized for decision making at national, sub-national and farm level, should be a key objective. This would then call on the need for a compilation, assessment and sharing of knowledge especially regarding agricultural production and productivity, seasonal variability of rainfall, climate adaptation and mitigation technologies as well as land degradation. In addition, indigenous knowledge systems need to be integrated in the knowledge development process. Enhanced research on climate change and food security also calls for accelerated generation of data and evidence to support the required response actions.

Capacity development

Capacity development remains key to development and implementation of adaptation and mitigation measures in the food security sector, identification of ways to support capacity building that may entail; information sharing, education and training of all relevant stakeholders on adaptation and mitigation in the food security sector is important. Capacity needs assessments of key institutions working in climate change and food security aspects need to be undertaken to enhance their role in development and implementation of climate resilient food systems,

practices and technologies. This would also entail increased capacity in the development and promoting the use and dissemination of knowledge products, guidelines, tools and models for climate change Adaptation and Mitigation in the food Sector.

Technologies

There exist diverse technologies that could make food systems to remain resilient to the impacts of climate change, however the identification of appropriate technologies and practices need to be appropriate to the specific conditions and existing social economic settings. A number of technologies exist to support mitigation and adaptation actions in the food security sector; this would mainly include the technologies that have withstood the test of time at the farmers' level and have been implemented longer like conservation agriculture that has been widely used in countries like Zambia. There is also need to increasingly develop incentives that encourage greater research into development of new innovations for agriculture and food security. Avenues for sharing such practices with a wide range of stakeholders also needs to be developed and should be more focused at the farmer level. Amongst the EAC countries, where farming is dominated by small holder farmers with high levels of illiteracy, calls for a versatile agriculture extension system that would facilitate identification and sustainable adoption of the practices.

Funding

A major gap to implementation of adaptation and mitigation measures for improved food security is a mere lack of funding; there is therefore need to identify possible sources of support and access to those possible sources of funding for the EAC countries. There is also need for the developed financial investments to support the strengthening of alternative agricultural (crop and livestock) value chains, while clearly outlining the roles associated with private and public-sector players. Investment similarly needs to support infrastructural development that ensures inclusive participation of rural and urban communities. Funding should also promote new advances in technology development and associated knowledge and capacities on major investments in renewable energy, food processing, soil and water conservation and improved agronomic practices among others.

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Taking Forward EAC Agricultural-Related Interests under UNFCCC

The main six agenda items in the Koronivia joint discussion are worth pushing forward with by the EAC negotiators. There are also critical issues relating to agriculture in EAC which were not listed in the Koronivia agenda item but these are critical issues that the EAC negotiators can push forward to be included in the agriculture negotiations at UNFCCC. These include agroforestry, aquaculture, stress tolerant varieties, climate information services and weather index-based agricultural insurance. The push for the inclusion of all these agenda items in addition to those six already provided in the Koronivia agenda is anchored on *Article 4, Article 9, Article 10 and Article 11* of the Paris Agreement. The provisions in these Articles create the basis for what the EAC negotiators should push for in the coming UNFCCC agriculture negotiations.

Specifically, a push calling for decisive practical actions to take forward the decisions on agriculture is urgently needed. Translating decisions into actions on the ground at local, national and regional levels through the effective implementation of the relevant provisions in the Paris Agreement and in the NDCs as well as calling for international support of the developed countries by the developing countries will greatly enhance the resilience of the agriculture sector to the impacts of climate change and its contribution to reducing the GHG emissions locally and globally. The EAC Member States had clearly stated in their NDCs what is required to implement their NDCs and Paris Agreement³¹ and the place of agriculture is central in the EAC Member States' NDCs. Effective

implementation of actions is anchored on many factors domestically and internationally including the support to developing countries by developed and other Annex I countries.

1. Ways to promote Socio-economic dimension and food security in EAC

Climate actions in agriculture in EAC Member States are not only about technical interventions, but also about supporting social and institutional structures that increase the resilience of smallholders and help achieve food security. The capacity of women and youth to adapt to climate variability, for example, is restricted by lack of access to capital, limited land ownership and access, and limited participation in decision making in households and communities. In the context of increased urban migration, these gender and youth gaps take on increasing significance. At the village level, approaches such as climate-smart villages are promising, and are currently being scaled up in India and Nepal³². The UNFCCC financial architectures and mechanisms and other international and regional organizations can support several initiatives currently identified in the EAC NDCs and help to scale up such initiatives especially the climate smart agricultural practices in the region.

³¹ Ogallah, S. (2016) Accounting Guidance for Nationally Determined Contributions: Priorities for East African Community (EAC) Member States 2. CUTS International, Geneva. 26 pp

³² Dhanush, D., Bruce, C., Wollenberg, L., Osana, B., Dwit, S., Loe, S., and Huyer, S. (2017) A step forward in agriculture at the UN Climate talk –Koronivia joint work on agriculture

Technology

Food security need not only to be considered in terms of the new innovations, but we have seen several cases, even from Kenya where indigenous technology is being integrated in rainfall predictions, there is similarly a lot of indigenous knowledge in East Africa, that could support food security. Such knowledge need to be tapped and disseminated to a diverse stakeholder for support.

Matters related to gender inclusivity

The capacity of women and youth to adapt to climate variability, for example, is restricted by lack of access to capital, limited land ownership and access, and limited participation in decision making in households and communities. In the context of increased urban migration, these gender and youth gaps take on increasing significance. The recent UNFCCC conference in Bonn approved the need to develop a gender action plan, this implies that as countries in East Africa develop such plans, clear actions that deal with increased participation of women and youths in agriculture and matters food security need to be addressed. Similarly, the process need to not only identify barriers to women and youth participation, but also need to deal with issues of gender equity and empowerment while ensuring a balance between all the gender types. This will avoid aspects of gender over empowerment that could again lead to disempowerment of the boy child.

Piloting social-economically inclusive climate change adaptation and mitigation initiatives

The Local Adaptation Plans, country level (NAP) National Adaptation Plans and the NDC (Nationally Determined contributions) are requirements by the UNFCCC that give a hedge to the East African community to plan interventions especially in agriculture that ensure socio-economic aspects are well catered for. For instance, the Kenya NAP is very clear on ensuring the agriculture sector carries out a vulnerability assessment, such need not only to entail

biophysical aspects, but to also interrogate on the impacts of climate change on key social and economic pillars. Similarly, implementation of such plans need to be socio-economically inclusive, for instance approaches such as climate-smart villages are promising, and are currently being scaled up in Kenya, Tanzania India and Nepal³³. The climate smart model works on empowering community on both social, ecological and biophysical aspects.

Financial mechanisms

The UNFCCC financial architectures and mechanisms and other international and regional organizations can support several initiatives currently identified in the EAC NDCs. Processes such as the GEF funding similarly need to ensure that the developed projects do address socio-economic issues. Especially considering the socio-cultural architecture of the communities where the initiatives are being implemented.

Communication by the UNFCCC

Initially key organs in the UNFCCC process especially the IPCC, has been keen at bringing out the physical and biophysical aspects, with less attention being given to social aspects that includes institutions, this is a key social area that the UNFCCC processes needs to consider as an adequate enabler for implementation of key processes like the Paris agreement at country and local level.

Domestication of UNFCCC processes

Most Countries in the EAC are in the process of domesticating key actions from the UNFCCC process, this implies policies and frameworks being developed and implemented, however such policies need to consider the interplay between formal and informal processes that are anchored within the community social systems³⁴. This implies that such processes will need to develop mechanisms for integration of existing informal processes anchored on community rules, cultural aspects, social collectivism among others.

³³ Dhanush, D., Bruce, C., Wollenberg, L., Osana, B., Dwit, S., Loe, S., and Huyer, S. (2017) A step forward in agriculture at the UN Climate talk –Koronivia joint work on agriculture

³⁴ Nancy Rapando (2017): STEPS working paper (Draft)

2. Any other ways to further interest of EAC countries on agricultural matters.

The EAC will need further organization of the key teams in order to push for the East African Community agenda. This would take several avenues both at home and during the UNFCCC processes. The indicative and suggested actions below would help to achieve this objective.

Develop evidence for Koronivia work program

Countries are now seeking robust evidence for presentation, discussion and consideration through the work program, the EAC countries will now need to work together and seek robust evidence on resilient adaptation actions in the sector for support towards scale up. This could entail use of evidence-based modelling work, where scenarios are developed based on existing climate change challenges to the agriculture sector in East Africa.

Representation of East Africa as a block

It is evident that African group could be existing as a block, however we may also need the regional bodies to powerfully participate as a block, the East Africa mainly has the “powerful countries” thinking of negotiating as countries in the African block, however there is more meaning if EAC thinks of negotiating agriculture as a block due to similar farming practices and related agro-ecological zones.

Policy

The East Africa community policy sector has been able to develop a climate change policy, however among the East African countries, only Kenya has a clear framework and strategy of integrating climate change into agriculture through the climate smart agriculture framework and strategy. For better leadership, integration of climate change in the agriculture sector will need similar steps where a climate smart agriculture framework by the EAC would be developed, with clear institutional and implementation frameworks for member countries.

Integrating/Linking regional and UNFCCC processes

In East Africa, agriculture has been well defined through the Malabo Declaration and the Comprehensive Africa Agriculture Development Programme (CAADP) processes, where member countries are supposed to develop a number of provisions from the process. Addressing climate change stands out as a key strategy in the CAADP/Malabo declaration. In Domesticating the CAADP/Malabo Declaration, there is need for East African Countries through their CAADP compact to be clear on how the countries would support climate change interventions in the agriculture sector. Such provisions will need to be shared with the UNFCCC processes for consideration especially for support in terms of finance and technology.

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Annex 1: Main outputs from UNFCCC discussions (pre-Koronivia decision) on Agriculture

Koronivia Agenda Items	Workshop Information	Relevant discussion points related to the Koronivia Agenda item	Types of Information
<p>a) Modalities for implementation of the outcomes of the five in-session workshops on issues related to agriculture and other future topics that may arise from this work</p>	<p>SBSTA 45. Marrakech, 7–14 November 2016.</p> <p>Workshop on the identification of adaptation measures, taking into account the diversity of the agricultural systems, indigenous knowledge systems and the differences in scale as well as possible co-benefits and sharing experiences in research and development and on-the-ground activities, including socioeconomic, environmental and gender aspects.</p>	<p>-[...]a key objective of the work of the SBSTA on agriculture should be the sharing and development of sound scientific and technical information to help Parties to make informed decisions on approaches and actions in agriculture that could increase food security and promote, within a sustainable development framework, synergies between agricultural productivity, adaptation and mitigation objectives.</p> <p>-[...] the SBSTA should be the key body to facilitate the provision of technological support to Parties.</p> <p>-[...]SBSTA could also play a role in ensuring that the specificities of the agriculture sector are properly addressed under all Convention processes, including the linkages with food security, socioeconomic benefits and synergies between adaptation and mitigation.</p> <p>-Developing countries added that these linkages continue to be the key priority for the SBSTA in its work, in the light of the particular vulnerabilities of the agriculture sector and its relationship with food security, poverty eradication and the livelihoods of millions of farmers.</p> <p>(FCCC/SBSTA/2016/INF.5)</p>	<p>Institutional/ role of members & UNFCCC</p> <p>Support to be provided to specific UNFCCC Members</p> <p>Substantial issues / Issue focus</p>
<p>b) Methods and approaches for assessing adaptation,</p>	<p>SBSTA 45. Marrakech, 7–14 November 2016.</p>	<p>- [...]the SBSTA should continue its technical and scientific work relating to adaptation on the basis of the objective, principles and provisions of the Convention in the following areas: the impact of climate change on pests and diseases and weed distribution; obtaining germ plasm adapted to thermal and water stress; the</p>	<p>Institutional/ role of members & UNFCCC</p>

<p>adaptation co-benefits and resilience</p>	<p>Workshop on the identification and assessment of agricultural practices and technologies to enhance productivity in a sustainable manner, food security and resilience, considering the differences in agro ecological zones and farming systems, such as different grassland and cropland practices and systems.</p>	<p>development and transfer of new technologies; and sharing knowledge on adaptation practices that increase productivity in a sustainable manner and contribute to food security.</p> <p>-EU Common Agricultural Policy includes the implementation of measures aimed at ‘greening’ as well as cross-cutting measures to reduce emissions, including voluntary schemes to incentivize farmers to carry out new, innovative and sustainable practices containing elements of adaptation and mitigation and other co-benefits (e.g. water quality, increased biodiversity and resilience).</p> <p>- Adaptation should include work towards co-benefits, including those relating to ecosystems, biodiversity, water availability and efficiency, which in many cases lead to mitigation. They emphasized the need to find local solutions that contribute to the global climate solution through the use of technology, knowledge transfer and capacity-building, which are all important to ensuring sustainable and resilient agricultural systems.</p> <p>- Financial resources and support should be made available to developing countries to address agricultural climate change adaptation and promote co-benefits in order to ensure the achievement of food security and resilience goals. In particular, the support mechanisms should include: (1) research, development and transfer of technology; (2) financing and budget tracking; (3) assistance with the implementation of pilot projects and scaling up successful strategies to the national level; and (4) capacity-building with a strong emphasis on monitoring, reporting and verification, climate policy integration, improving human resources, methodologies and metrics.</p> <p>- [...] a number of existing forums and initiatives under and outside the Convention are able to facilitate the identification of agricultural adaptation practices and technologies in Africa. In particular, the Africa Adaptation Initiative involves enhancing climate information services, strengthening policies and institutions, supporting the implementation of concrete adaptation activities on the ground and increasing the flow of finance and investment to support the implementation of adaptation programmes and projects. Enhancing climate information services under the initiative includes the assessment of the types of climate information that are needed to inform decision-making. The initiative also includes the enhancement of the institutional and policy frameworks needed to advance the provision of and access to climate information, including the improvement of early warning system infrastructure at the regional and subregional levels and capacity-building.</p> <p>- Potential role of the SBSTA in the context of issues relating to agriculture, which could include work relating to: (1) the exchange of information on efficient water management and irrigation systems; (2) the assessment of ecosystem-based approaches for adaptation and participatory and gender-responsive approaches to climate action; (3) on- and off-farm practices and technologies, together with approaches to landscape-level management, including interaction among various sectors; (4) providing access to integrated technologies for the control of climate change induced pests and diseases; (5) exchange of information and knowledge on adaptation practices and technologies and climate information services; (6) climate-informed agricultural insurance; (7) capacity-building; and (8) the identification of innovative technologies and know-how for distribution through technology transfer mechanisms and international collaboration.</p> <p>-Fundamental role of national and international institutions in the provision of knowledge and information that could foster the identification, validation, assessment and adoption on the ground of technologies and practices related to climate resilience as well as the enhancement of adaptive capacity and productivity. Parties noted the</p>	<p>Substantial issues / Issue focus (country example, regional case study)</p> <p>Support to be provided (technical, financial, capacity building, etc)</p>
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		<p>importance of research focused on the identification of agricultural practices for adaptation that also reduce the contribution of agriculture to climate change.</p> <p>(FCCC/SBSTA/2016/INF.6)</p>	
	<p>SBSTA 45. Marrakech, 7–14 November 2016.</p> <p>Workshop on the identification of adaptation measures, taking into account the diversity of the agricultural systems, indigenous knowledge systems and the differences in scale as well as possible co-benefits and sharing experiences in research and development and on-the-ground activities, including socioeconomic, environmental and gender aspects.</p>	<p>- [...] wide scope for collaboration among Parties to identify and implement adaptation measures that take into account local, national and regional circumstances, while adding that there are also many opportunities to draw and share lessons from the experiences of different Parties in this regard. In their view, the SBSTA needs to address a number of issues in order to assist developing countries in the areas covered by this workshop, including: (1) access to information, experience, tools and technology for real-time monitoring and data management related, inter alia, to early warning systems, vulnerability assessment and contingency plans; (2) strengthening national systems for collecting, analysing and disseminating risk and vulnerability data and information; (3) enhancing expertise on climate-related pests and diseases as well as the use of appropriate control and management methods; (4) providing assistance to governments and communities for implementing adaptation measures in response to the effects of extreme weather events; (5) providing support for the establishment of accessible regional climate databases and for research on addressing climate change impacts on agriculture, including assessments of potential economic impacts; and (6) providing means of implementation, including finance, technology transfer and capacity-building, to developing countries for the assessment of the risk and vulnerability of agricultural systems to different climate change scenarios at the regional, national and local levels, in the context of the commitment of developed countries to provide finance, technology transfer and capacity-building support to developing countries for adaptation.</p> <p>- An overview of the Association of Southeast Asian Nations (ASEAN) member States' priorities for scaling up adaptation measures within the region. They include: the creation of an evidence base through pilot implementation of climate-resilient agricultural practices; scaling up successful models for predicting impacts of climate change and promoting climate resilience; the development of effective approaches to providing climate information services for smallholder farmers; the integration of research on the marketability and competitiveness of stress-tolerant crop varieties into adaptation strategies; and funding, capacity-building and technical assistance for the ASEAN Climate Resilience Network member countries. [...] Activities in facilitating implementation may include supporting cooperation and knowledge-sharing among Parties and relevant observer organizations on planning, finance, governance, policy frameworks, achieving scale through innovative approaches, enhancing gender equity and social inclusion, and research and knowledge systems.</p> <p>- The best approaches to adaptation are usually context specific and addressed at the appropriate scale. Indigenous peoples and farmers in Australia have built up experience in adapting to extreme weather events, including severe drought and floods. Australia has domestic processes in place in order to identify adaptation opportunities, including an adaptation framework and a national climate resilience adaptation strategy.</p> <p>-Successful adaptation in agricultural systems requires the identification of suitable adaptation measures at appropriate scales, while taking into account the diversity and specific contexts of the systems. Adaptation measures can include risk management, national and local planning, financing, economic incentives, climate services, research and knowledge systems and the strengthening of extension services.</p>	<p>Institutional/ role of members & UNFCCC</p> <p>Substantial issues / Issue focus (country example)</p> <p>Support to be provided (technical, financial, capacity building, etc)</p> <p>Specific needs to be addressed</p>

		<p>- [...] the importance of the pilot implementation of climate- resilient agricultural practices. On the basis of experience with such pilots, best practice models for adaptation in agriculture can be developed and used for scaling up implementation. Besides the collection of data and evidence in pilot implementation, many Parties highlighted the importance of research and development in the area of adaptation in agriculture. One Party explained that this means conducting and funding research in areas such as crop variety improvement, climate and extreme weather impacts, crop sensitivity and resilience to extreme weather conditions, the impact of climate change on pests and disease, the use of remote sensing and crop modelling to evaluate the impact of climatic variation on crops and developing tools to support weather- and climate-related decision- making. A Party added that marketability and other value chain aspects need to be integrated into research on the competitiveness of stress-tolerant varieties. Another Party added that this also involves sharing information and experience with industry and provincial agricultural departments.</p> <p>(FCCC/SBSTA/2016/INF.5)</p>	
	<p>SBSTA 43. Paris, 30 November to 11 December 2015.</p> <p>Report on the workshop on the assessment of risk and vulnerability of agricultural systems to different climate change scenarios at regional, national and local levels, including but not limited to pests and disease.</p>	<p>-[...] importance of the Convention processes for sharing knowledge, building capacity and providing guidance, menus, concepts, methods, tools and measures by which to conduct national or regional assessments in developing countries, including China, through the provision of funds and technology. [...] suggesting the following further activities under the Convention to this end: (1) organizing regular training sessions and workshops within the framework of the Nairobi work programme on impacts, vulnerability and adaptation to climate change (NWP), or national adaptation programmes to build the capacity of developing countries; (2) considering setting up regional adaptation centres to localize support and conduct research which could create a regional knowledge hub and provide expertise on vulnerability assessment and risk management, and adaptation in the agricultural sector; and (3) reviewing national and regional assessments in developing countries which could offer valuable experiences and lessons for developing countries, including China, and help to identify the gaps and priority areas for developing methodologies, tools, finance, technologies and capacities.</p> <p>- The relevant processes under the Convention that could facilitate the assessment of risk and vulnerability of agricultural systems under different climate change scenarios at local, regional and national levels, including NWP for the dissemination of knowledge through methods such as regional workshops; the national adaptation plans (NAPs) to support the formulation and implementation of adaptation strategies; and capacity-building.</p> <p>- China elaborated on the existing practices and approaches relating to the monitoring of climate change and use of integrated impact models to obtain relevant vulnerability indicators appropriate to China's conditions. The panellist emphasized the importance of localized modelling tools and transdisciplinary analysis that involves, inter alia, a dialogue between policymakers and scientists.</p> <p>- The potential role of the Convention to assist Parties in downscaling climate scenarios and in developing multi-layered risk and vulnerability maps for different climatic events in order to enhance resilience by strengthening risk management approaches. These Parties also noted the importance of assisting developing country Parties in improving the data needed to run models that predict climate change impacts on yields of important crops, animal production, water availability and soil erosion among others (i.e. integrated assessment of climate change impacts on food security).</p>	<p>Institutional/ role of members & UNFCCC</p> <p>Substantial issues / Issue focus (country example)</p> <p>Specific needs to be addressed</p>

		<p>- The importance of increasing the adaptive capacity of agriculture to deal with the adverse effects of climate change. It was noted that adaptation is important because climate change could induce situations that would not allow the restoration of past production conditions. Many Parties emphasized the important role of risk and vulnerability assessments in their adaptation strategies, scenarios and plans. Parties also highlighted the importance of considering the interests of smallholders, marginal farmers and indigenous communities as well as the role of poor people, women and youth in climate-resilient agriculture.</p> <p>- The risk assessment process enabled the identification of reduced water availability and soil productivity as the two primary threats to their agriculture systems. Soil degradation, in particular, could decrease the soil's ability to support agricultural production and carbon storage. In this context, a Party expressed the opinion that soil protection is an adaptation action that also benefits mitigation. A group of Parties proposed to identify co-benefits of adaptation, including socioeconomic and environmental ones.</p> <p>-A Party indicated that adaptation is one of the key priorities in its national development strategies given that it is a developing country. This Party further noted that projects focusing on assessing vulnerabilities and identifying options to build resilience in smallholder agricultural systems are eligible for funding by the Adaptation Fund.</p> <p>(FCCC/SBSTA/2015/INF.7)</p>	
	<p>SBSTA 43. Paris, 30 November - 11 December, 2015.</p> <p>Report on the workshop on the development of early warning systems and contingency plans in relation to extreme weather events and their effects such as desertification, drought, floods, landslides, storm surge, soil erosion, and saline water intrusion.</p>	<p>-The potential role of the Convention in facilitating the sharing of knowledge and information on good practices and lessons learned in climate change-related Early Warning Systems (EWS), contingency planning, risk and vulnerability assessment, tools and approaches to downscale climate models for extreme weather events as well as use of appropriate control and management methods for climate-related pests and diseases, while taking into account diversity in agriculture systems.</p> <p>- EU adaptation strategy is linked to the European Climate Adaptation Platform and serves as a knowledge hub for supporting the development of adaptation policies and decision-making. The EU Common Agricultural Policy contains elements of climate risk management, including mutual funds to address the impacts of adverse climatic events such as floods, droughts, plant diseases or pest infestations on farmers.</p> <p>-To facilitate the development of EWS and contingency plans, [...] Brazil noted the importance of: the intensification of the acquisition and use of information, including on land use; risk zoning; the identification of key vulnerabilities; the adaptation of production systems for their economic, social and environmental sustainability; and technology transfer. Furthermore, Brazil explained that the risk zoning, modelling and design of integrated scenarios are key elements that enable strategic investments in agriculture through the adoption of a multi-year perspective.</p> <p>- EWS provide information that enables making decisions that prevent or reduce damage caused by climate change, including: the choice of the appropriate varieties to plant; optimal planting/harvesting dates; and the timing of pest and disease control and other plant production activities during the cropping cycle. Developing country Parties further noted that EWS coupled with contingency plans contribute to adaptation of their agricultural systems, particularly that of smallholder agriculture. Some Parties felt that EWS and contingency plans may contribute to both climate change adaptation and mitigation.</p>	<p>Institutional/ role of members & UNFCCC</p> <p>Substantial issues / Issue focus (country example)</p>

		<p>- Synergies under the Convention could include the existing processes (e.g. the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts, the Cancun Adaptation Framework and NWP) and activities (e.g. the strengthening of linkages with UNFCCC constituted bodies in order to enhance the exchange of technologies for EWS and contingency planning in agriculture and early warning for food security).</p> <p>(FCCC/SBSTA/2015/INF.6)</p>	
	<p>SBSTA 40. Bonn, 4–15 June 2014</p>	<p>-Existing adaptation strategies and methodologies are already largely based on the application of scientific knowledge in specific areas and activities. This includes monitoring and forecasting (i.e. weather prediction and early warning systems, identification and analysis of drought risk, pest and disease monitoring and forecasting), improvements in crops and livestock (i.e. development of new crop varieties and new cultivation techniques, conservation of crop and livestock diversity), optimization of fertilizer use and development of rainwater harvesting technologies. In this context, a group of Parties mentioned that, because of the limited capacity of their scientists and technicians, they had rather limited experience with applying scientific knowledge for enhancing adaptation in agriculture while promoting productivity and taking into account co-benefits.</p> <p>- Technical and financial support is needed for identifying and scaling up useful approaches for climate change adaptation in agriculture, including related capacity-building. Agriculture is an essential part of many of the national adaptation plans (NAPs) in African countries and adaptation co-benefits should allow for an increase in productivity, enhanced economic growth and poverty reduction. African countries have some positive experiences in applying scientific knowledge for enhancing adaptation while promoting productivity. These experiences include the application of seasonal rainfall forecasts and weather index-based crop insurance, the promotion of improved seed varieties which allow increased productivity of farmers, conservation agriculture and sustainable land management, water management and irrigation technologies, fertilizer management and agroforestry.</p> <p>- There is a need for improving scientific knowledge (including modelling), enhancing capacity-building (including downscaling information for farmers) and providing technical assistance at all levels (national, regional and local).</p> <p>-Several Parties highlighted the pilot application of technologies such as customized (prescribed) fertilizers, closed systems for aquaculture and cooling for livestock. Other Parties elaborated on other adaptation measures, such as the selection and genetic improvement of seeds or better-informed choice among available varieties of seeds to achieve crop performance adapted to new agro climatic conditions. Conservation of crop and livestock diversity is seen as an essential element of agricultural adaptation strategies in some countries. A group of Parties mentioned activities to promote the setting up of green infrastructure such as wooded riparian areas and buffer strips along water bodies/flood plains.</p> <p>- The adoption of adaptation practices such as agroforestry or conservation tillage have also resulted in a number of co-benefits, including improved soil health, strengthened rural development, increased efficiency, sustainable land management, mitigation and some economic benefits. Parties further noted that it is important to find the best ways to achieve elements of these co-benefits while at the same time improving the resilience of agricultural systems to climate change.</p>	<p>Institutional/ role of members & UNFCCC Substantial issues / Issue focus (country example)</p> <p>Support to be provided (technical, financial, capacity building, etc)</p> <p>Specific needs to be addressed</p>

		<p>- Ways and means to support adaptation while allowing for potential adaptation co-benefits should include financial support, the sharing of knowledge and best practices, the strengthening of institutional capacity, development and transfer of technology, capacity-building and exchange of or assistance from experts.</p> <p>- Gaps in scientific knowledge remain in particular in the areas of vulnerability and risk assessments for extreme weather events, early warning systems and contingency plans, national planning for disaster response, institutional capacity and infrastructure maintenance, crop insurance systems, farmers' household resilience strategies, organic farming and application of traditional knowledge. There is a need for further research in order to deal with issues relating to climate change and identify improvements in agricultural productivity, resilience, water use efficiency and reduced input intensity. More research may also be needed to identify the best ways to enhance adaptation co-benefits, such as poverty eradication, sustainable land management, rural development and reduction of GHG emissions.</p> <p>-Japan [...] presented national experiences with the development and cultivation of climate change resilient varieties of rice and cultivation techniques, which proved their effectiveness in increasing productivity under climate change conditions. This included the introduction of an alternate wetting/drying technology used by farmers to reduce their water use in irrigated fields. The panellist also elaborated on the multilateral and bilateral collaboration with developing countries in which Japan is involved with a view to assisting them in making effective use of new rice varieties and cultivation techniques as a measure to adapt to climate change, while improving the productivity and resilience of agriculture and ensuring food security.</p> <p>-It is important to identify actions which will support the food production capacity and allow for its increase, taking into consideration human population growth. Such actions should strengthen the capacity of different agricultural production systems to adapt to the negative impacts of climate change, by building resilience and reducing vulnerabilities. The view was expressed that these actions should not constitute distortions to agricultural trade and production.</p> <p>- Introduction of risk management tools (mutual funds, insurance) to protect farmers against the adverse impacts of climate variability and change, including index-based crop insurance schemes. It was also mentioned that farmers need incentives to encourage them to change existing agricultural practices for those allowing for improved resilience and adaptation.</p> <p>(FCCC/SBST A/2014/INF.2)</p>	
<p>c) Improved soil carbon, soil health and soil fertility under grassland and cropland as well as integrated systems, including water management</p>	<p>SBSTA 45. Marrakech, 7–14 November 2016. Workshop on the identification and assessment of agricultural practices and technologies to enhance productivity in a sustainable manner, food security and resilience, considering the differences in agro ecological zones and farming systems, such as different grassland and cropland practices and systems</p>	<p>- Experiences relating to particular technologies and practices that enhance productivity and resilience in agriculture while promoting various co-benefits, including: (1) the preparation and implementation of soil use and management plans focused on decreasing soil loss through, for example, decreased intensity of tillage; (2) resilient grassland and cattle management promoting soil restoration; (3) innovative irrigation of crops; (4) controlling soil evaporation; (5) dryland farming practices; (6) increased application of organic fertilizer; and (7) agroforestry and use of forests as reservoirs of water to support agriculture.</p> <p>-The EU presented several examples of the practical implementation of its policy by its member States, including: the optimization of nutrient flows in agricultural production and the full utilization of the bioenergy potential of biomass flows; a project aimed at promoting agroecology by encouraging the development of farmers groups to promote innovative practices supported by applied research and educational schemes; a project to reward farmers</p>	<p>Institutional/ role of members & UNFCCC</p> <p>Substantial issues / Issue focus (country example)</p>

		<p>for carbon sequestration in soil through the application of low- or no-till technologies at degraded pastures; and projects aimed at maintaining and increasing the carbon content of agricultural soils and enhancing the efficiency of nitrogen use in agriculture.</p> <p>-Parties' experiences relating to particular technologies and practices that enhance productivity and resilience in agriculture while promoting various co-benefits, including: (1) the preparation and implementation of soil use and management plans focused on decreasing soil loss through, for example, decreased intensity of tillage; (2) resilient grassland and cattle management promoting soil restoration; (3) innovative irrigation of crops; (4) controlling soil evaporation; (5) dryland farming practices; (6) increased application of organic fertilizer; and (7) agroforestry and use of forests as reservoirs of water to support agriculture.</p> <p>- Importance of diversity in terms of space (including the important contribution of marginal land to the productivity of main land by, for example, ensuring the presence of pollinators) to maintaining productivity at the landscape level. It was highlighted how enhancing productivity could lead to greenhouse gas (GHG) emission reduction through optimal use of fertilizer, less wastage of resources and reduction in demand for additional land.</p> <p>- Overview of key agro ecological zones in Africa and related practices and technologies aimed at enhancing food security and ecological resilience. They include the diversification of crops and integrated management of soil and water resources, livestock and rangeland activities, while taking into account social and cultural elements (e.g. gender) and risk and climate information.</p> <p>- Growth in production will have to be decoupled from the increase in the risk to the environment. This decoupling will require continuing improvement, development and adoption of innovative technologies and management practices, including addressing water and soil conservation and supporting investment in clean and sustainable technologies and processes.</p> <p>- India has implemented a number of national actions within various processes under the Convention aimed at: (1) increasing water use efficiency and enhancing water harvesting; (2) preventing soil erosion and improving soil carbon content; (3) developing contingency plans and identifying contingency crops; (4) advancing national and state disaster management (including preparing vulnerability maps); and (5) enhancing research and development and dissemination of knowledge.</p> <p>-Many Parties shared their views on the potential role of the SBSTA in the context of issues relating to agriculture, which could include work relating to: (1) the exchange of information on efficient water management and irrigation systems; (2) the assessment of ecosystem-based approaches for adaptation and participatory and gender-responsive approaches to climate action; (3) on- and off-farm practices and technologies, together with approaches to landscape-level management, including interaction among various sectors; (4) providing access to integrated technologies for the control of climate change induced pests and diseases; [...]</p> <p>(FCCC/SBSTA/2016/INF.6)</p>	<p>Support to be provided (technical, financial, capacity building, etc)</p>
	<p>SBSTA 45. Marrakech, 7–14 November 2016</p>	<p>- Adaptation activities in many cases have mitigation co-benefits, sometimes to the extent that it would be difficult to categorize them as an activity focusing on either mitigation or adaptation. One specific example mentioned related to projects to enhance soil carbon, which will simultaneously sequester carbon, reduce erosion and increase the productivity and water retention capacity of the soil.</p>	<p>Substantial issues / Issue focus (country example)</p>

	<p>Workshop on the identification of adaptation measures, taking into account the diversity of the agricultural systems, indigenous knowledge systems and the differences in scale as well as possible co</p> <p>-benefits and sharing experiences in research and development and on-the-ground activities, including socioeconomic, environmental and gender aspects.</p>	<p>-Vietnam National Action Plan on Climate Change for the period 2012–2020, in combination with subnational climate change response action plans, provides a policy framework for the implementation of a number of adaptation measures, with a focus on water resource management, crop production, forest management, coastal zone management, agricultural waste management, aquaculture and fisheries.</p> <p>FCCC/SBSTA/2016/INF.5</p>	
	<p>SBSTA 43. Paris, 30 November -11 December 2015</p> <p>Report on the workshop on the assessment of risk and vulnerability of agricultural systems to different climate change scenarios at regional, national and local levels, including but not limited to pests and disease.</p>	<p>- Risk assessment process enabled the identification of reduced water availability and soil productivity as the two primary threats to their agriculture systems. Soil degradation, in particular, could decrease the soil's ability to support agricultural production and carbon storage. In this context, a Party expressed the opinion that soil protection is an adaptation action that also benefits mitigation.</p> <p>- China elaborated on the existing practices and approaches relating to the monitoring of climate change and use of integrated impact models to obtain relevant vulnerability indicators appropriate to China's conditions. The panellist emphasized the importance of localized modelling tools and transdisciplinary analysis that involves, inter alia, a dialogue between policymakers and scientists.</p> <p>- Importance of assisting developing country Parties in improving the data needed to run models that predict climate change impacts on yields of important crops, animal production, water availability and soil erosion among others (i.e. integrated assessment of climate change impacts on food security).</p> <p>(FCCC/SBSTA/2015/INF.7)</p>	<p>Substantial issues / Issue focus (country example)</p> <p>Specific needs to be addressed</p>
	<p>SBSTA 43. Paris, 30 November - 11 December 2015.</p> <p>Report on the workshop on the development of early warning systems and contingency plans in relation to extreme weather events and their effects such as desertification, drought, floods, landslides, storm surge, soil erosion, and saline water intrusion.</p>	<p>-Some Parties informed workshop participants that they address the development of EWS in the context of national projects, by combining climate forecasting systems, remote data acquisition technologies, development of climate-resilient technologies and promotion of climate-resilient agriculture within their national sustainable development strategies. These also include elements of NAPs, including a comprehensive farmer-centred EWS as its key component, and nationally appropriate mitigation actions under the Convention. EWS-specific services and tools include: bioclimatic risk models; drought monitors allowing for forecasting of soil moisture conditions and drought risk; and an agro-climatic website and online platform to disseminate information enabling more efficient preparation by farmers for extreme weather events.</p> <p>- Brazil identified specific actions to facilitate the development of EWS and contingency plans, including: the improved management of water in agriculture; combating desertification; the management of pests and diseases; and the improvement of knowledge on genetic resources. In addition, Brazil noted the importance of: the intensification of the acquisition and use of information, including on land use; risk zoning; the identification of key vulnerabilities; the adaptation of production systems for their economic, social and environmental sustainability;</p>	<p>Substantial issues / Issue focus (country example)</p>

		<p>and technology transfer. Furthermore, Brazil explained that the risk zoning, modelling and design of integrated scenarios are key elements that enable strategic investments in agriculture through the adoption of a multi-year perspective.</p> <p>(FCCC/SBSTA/2015/INF.6)</p>	
	<p>SBSTA 40. Bonn, 4–15 June 2014</p>	<p>- African countries have some positive experiences in applying scientific knowledge for enhancing adaptation while promoting productivity. These experiences include the application of seasonal rainfall forecasts and weather index-based crop insurance, the promotion of improved seed varieties which allow increased productivity of farmers, conservation agriculture and sustainable land management, water management and irrigation technologies, fertilizer management and agroforestry.</p> <p>- [...] the pilot application of technologies such as customized (prescribed) fertilizers, closed systems for aquaculture and cooling for livestock. Other Parties elaborated on other adaptation measures, such as the selection and genetic improvement of seeds or better-informed choice among available varieties of seeds to achieve crop performance adapted to new agroclimatic conditions. Conservation of crop and livestock diversity is seen as an essential element of agricultural adaptation strategies in some countries. A group of Parties mentioned activities to promote the setting up of green infrastructure such as wooded riparian areas and buffer strips along water bodies/flood plains.</p> <p>- Water deficits and droughts significantly decrease agricultural production. Addressing the issue of drought, many Parties provided information on the establishment of services for climate seasonal forecasting, drought monitoring or drought early warning systems as elements of their adaptation practices in agriculture. They mentioned the diverse approaches that they have followed to address the impact of drought. These approaches included: rainwater harvesting for irrigation purposes, integrated land use and water management, efficient use and conservation of water, improved water saving irrigation techniques and broader application of already available techniques of crop management, such as crop establishment/rotation, no-till techniques and crop–livestock integrated systems.</p> <p>-Japan introduced an alternative wetting/drying technology used by farmers to reduce their water use in irrigated fields. [...] on the multilateral and bilateral collaboration with developing countries in which Japan is involved with a view to assisting them in making effective use of new rice varieties and cultivation techniques as a measure to adapt to climate change, while improving the productivity and resilience of agriculture and ensuring food security.</p> <p>(FCCC/SBST A/2014/INF .2)</p>	<p>Substantial issues / Issue focus (country example)</p>
<p>(d) Improved nutrient use and manure management towards sustainable and resilient agricultural systems</p>	<p>SBSTA 45. Marrakech, 7–14 November 2016</p> <p>Workshop on the identification and assessment of agricultural practices and technologies to enhance</p>	<p>- EU implementation of its policy by its member states: the optimization of nutrient flows in agricultural production and the full utilization of the bioenergy potential of biomass flows; a project aimed at promoting agroecology by encouraging the development of farmers groups to promote innovative practices supported by applied research and educational schemes; a project to reward farmers for carbon sequestration in soil through the application of low- or no-till technologies at degraded pastures; and projects aimed at maintaining and increasing the carbon content of agricultural soils and enhancing the efficiency of nitrogen use in agriculture.</p>	<p>Substantial issues / Issue focus (country example)</p>

	<p>productivity in a sustainable manner, food security and resilience, considering the differences in agroecological zones and farming systems, such as different grassland and cropland practices and systems</p>	<p>(FCCC/SBSTA/2016/INF.6)</p>	
	<p>SBSTA 45. Marrakech, 7–14 November 2016</p>	<p>-Japan elaborated on the Climate Change Adaptation Plan of its Ministry of Agriculture, Forestry and Fisheries, which was formulated to address factors that could threaten agricultural production, including yield loss and lower quality of crops due to higher temperatures and damage caused by high temperature, heavy rain and heavy snow. The plan provides for specific adaptation actions in crop management where climate impacts have already been observed. Japan provided examples of adaptation measures for paddy rice, including the development of resistant crop varieties, improved nutrition and water management practices, and timely pest and disease control based on the outputs of early warning systems. Japan also presented a few adaptation measures undertaken in orchards, such as peel puffing in citrus unshu, prevention of sunburn of fruit, development of new varieties and shifting orchard lands to higher altitude areas.</p> <p>(FCCC/SBSTA/2016/INF.5)</p>	<p>Substantial issues / Issue focus (country example)</p>
	<p>SBSTA 43. Paris, 30 November -11 December 2015</p> <p>Report on the workshop on the assessment of risk and vulnerability of agricultural systems to different climate change scenarios at regional, national and local levels, including but not limited to pests and disease</p>	<p>-New Zealand, [...] further research focuses on first-order impacts of increased temperature and changes to rain and wind patterns, including changes to variability between years and within years as well as second-order impacts, such as pests and diseases, fire risk and wind throw impacts as well as changes in nutrient cycling and ecosystem services.</p> <p>- T[...] the importance of involving risk and vulnerability assessments in identifying adaptation measures suited to local circumstances and productive systems. Such measures included, inter alia, the development of improved seed varieties adapted to new agro-climatic conditions, thermal/water stress and exposure to different pests. Parties also noted the importance of the improvement of the adaptive planning capacity of farmers in order to ensure stabilized and increased yields and thus contribute to food security.</p> <p>(FCCC/SBSTA/2015/INF.7)</p>	<p>Substantial issues / Issue focus (country example)</p> <p>Specific needs to be addressed</p>
	<p>SBSTA 40. Bonn, 4–15 June 2014</p>	<p>- [...] National Initiative on Climate Resilient Agriculture focuses on long-term research on the impacts of climate change on agriculture and options for the adaptation of Indian agriculture, covering grain crops, horticulture, livestock and fisheries. [...] adaptation of agriculture to climate change requires support in terms of technology, finance, capacity-building, national and international research and development, and enhanced integration of indigenous, traditional and science-based knowledge and practices, as well as the exchange of information and the provision of technical advice on improving the efficiency, productivity and resilience of agriculture.</p> <p>- African countries have some positive experiences in applying scientific knowledge for enhancing adaptation while promoting productivity. These experiences include the application of seasonal rainfall forecasts and weather</p>	<p>Substantial issues / Issue focus (country example)</p> <p>Support to be provided (technical, financial, capacity building, etc)</p> <p>Specific needs to be addressed</p>

		<p>index-based crop insurance, the promotion of improved seed varieties which allow increased productivity of farmers, conservation agriculture and sustainable land management, water management and irrigation technologies, fertilizer management and agroforestry.</p> <p>-Some Parties informed participants about the introduction of risk management tools (mutual funds, insurance) to protect farmers against the adverse impacts of climate variability and change, including index-based crop insurance schemes. It was also mentioned that farmers need incentives to encourage them to change existing agricultural practices for those allowing for improved resilience and adaptation.</p> <p>-The application of some adaptation techniques and approaches increases agricultural productivity and may allow for increased food production while reducing the land area used for agriculture. It was noted that the adoption of adaptation practices such as agroforestry or conservation tillage have also resulted in a number of co-benefits, including improved soil health, strengthened rural development, increased efficiency, sustainable land management, mitigation and some economic benefits. Parties further noted that it is important to find the best ways to achieve elements of these co-benefits while at the same time improving the resilience of agricultural systems to climate change.</p> <p>- It was also noted that gaps in scientific knowledge remain in particular in the areas of [...] crop insurance systems, farmers' household resilience strategies, organic farming and application of traditional knowledge. [...] More research may also be needed to identify the best ways to enhance adaptation co-benefits, such as poverty eradication, sustainable land management, rural development and reduction of GHG emissions.</p> <p>-[...] adapted timings of agricultural practices, such as changing dates for sowing to respond to changes in precipitation and temperature. Some Parties noted that they apply the optimization of the time of sowing/harvesting based on weather forecasting and climate modelling. Increased planting of early maturing and drought-tolerant varieties of plants adapted to climate change and the breeding of more resilient and productive animals was also noted. Some Parties acknowledged that the use of existing technologies that were not previously suited to the location of the farm could also form a part of adaptation. In general, the importance of locally appropriate approaches for adaptation and efforts to engage farmers at the local level was highlighted.</p> <p>-There is a need for improving scientific knowledge (including modelling), enhancing capacity-building (including downscaling information for farmers) and providing technical assistance at all levels (national, regional and local).</p> <p>(FCCC/SBST A/2014/INF .2)</p>	
<p>(e) Improved livestock management systems</p>	<p>SBSTA 45. Marrakech, 7–14 November, 2016</p> <p>Workshop on the identification and assessment of agricultural practices and technologies to enhance productivity in a sustainable manner, food security and resilience,</p>	<p>-[...] an overview of key agro ecological zones in Africa and related practices and technologies aimed at enhancing food security and ecological resilience. They include the diversification of crops and integrated management of soil and water resources, livestock and rangeland activities, while taking into account social and cultural elements (e.g. gender) and risk and climate information. Agriculture in Africa faces a significant challenge in adapting to climate change owing to costs and damages rising rapidly with the warming climate.</p> <p>-[...] The key factor enabling the stabilization of agricultural emissions is the adoption by Canadian farmers of practices and technologies that have improved productivity in both cropping and livestock systems, thus allowing</p>	<p>Substantial issues / Issue focus (country example)</p>

	<p>considering the differences in agro ecological zones and farming systems, such as different grassland and cropland practices and systems</p>	<p>agricultural soils to turn from a source to a sink of emissions. Currently, around 80 per cent of all agricultural land in Canada is under some form of conservation tillage, with no till or zero tillage being the most predominant tillage regimes in use. The Canadian cattle sector has made significant improvements in feeding and breeding practices. As a result, in 2011 Canada produced more beef with fewer emissions than in 1981. Similar declining emission intensities (i.e. lower emissions per unit of product) have been observed and measured for dairy and swine production.</p> <p>(FCCC/SBSTA/2016/INF.6)</p>	
	<p>SBSTA 40. Bonn, 4–15 June,2014</p>	<p>-India National Initiative on Climate Resilient Agriculture focuses on long-term research on the impacts of climate change on agriculture and options for the adaptation of Indian agriculture, covering grain crops, horticulture, livestock and fisheries. [...] adaptation of agriculture to climate change requires support in terms of technology, finance, capacity-building, national and international research and development, and enhanced integration of indigenous, traditional and science-based knowledge and practices, as well as the exchange of information and the provision of technical advice on improving the efficiency, productivity and resilience of agriculture.</p> <p>-[...] diverse approaches that they have followed to address the impact of drought. These approaches included: rainwater harvesting for irrigation purposes, integrated land use and water management, efficient use and conservation of water, improved water saving irrigation techniques and broader application of already available techniques of crop management, such as crop establishment/rotation, no-till techniques and crop–livestock integrated systems.</p> <p>-[...] pilot application of technologies such as customized (prescribed) fertilizers, closed systems for aquaculture and cooling for livestock. Other Parties elaborated on other adaptation measures, such as the selection and genetic improvement of seeds or better-informed choice among available varieties of seeds to achieve crop performance adapted to new agro climatic conditions. Conservation of crop and livestock diversity is seen as an essential element of agricultural adaptation strategies in some countries. A group of Parties mentioned activities to promote the setting up of green infrastructure such as wooded riparian areas and buffer strips along water bodies/flood plains.</p> <p>(FCCC/SBST A/2014/INF .2)</p>	<p>Substantial issues / Issue focus (country example)</p> <p>Specific needs to be addressed</p>
<p>(f) Socio economic and food security dimensions of climate change in the agriculture sector</p>	<p>SBSTA 46, Marrakech, 7–14 November 2016</p>	<p>-It is important to take into account all the diversities inherent to agricultural systems in the context of the identification and assessment of agricultural practices and technologies to enhance productivity in a sustainable manner, while emphasizing the importance of agriculture to ensuring food security and resilience, sustainable rural development, economic development, poverty eradication and livelihoods.</p> <p>- The adverse effects of climate change pose a major threat to the productivity of agricultural systems. Developing country Parties, in particular, stressed the importance of increasing the adaptive capacity and productivity of the agriculture sector in a sustainable manner under the adverse impacts of climate change, while taking into account</p>	<p>Substantial issues / Issue focus (country example)</p> <p>Support to be provided (technical, financial, capacity building, etc)</p>

		<p>agricultural diversity and the close relationship of agriculture with food security and poverty eradication in those countries.</p> <ul style="list-style-type: none"> - Some Parties implement their NAPs jointly with other countries within the framework of a global programme coordinated by FAO and the United Nations Development Programme (UNDP) that focuses on increasing the countries' capacity to assess vulnerabilities and risks and to identify and assess technologies and practices that can help in managing climatic risks and adapting to climate change. One Party highlighted that it is also the role of NAPs to collect actions targeting food security while considering the different agro ecological regions and sustainable farming systems. - Financial resources and support should be made available to developing countries to address agricultural climate change adaptation and promote co-benefits in order to ensure the achievement of food security and resilience goals. In particular, the support mechanisms should include: (1) research, development and transfer of technology; (2) financing and budget tracking; (3) assistance with the implementation of pilot projects and scaling up successful strategies to the national level; and (4) capacity-building with a strong emphasis on monitoring, reporting and verification, climate policy integration, improving human resources, methodologies and metrics. <p>(FCCC/SBSTA/2016/INF.6)</p>	<p>Specific needs to be addressed</p>
	<p>SBSTA 45, Marrakech, 7–14 November 2016</p> <p>Workshop on the identification of adaptation measures, taking into account the diversity of the agricultural systems, indigenous knowledge systems and the differences in scale as well as possible co-benefits and sharing experiences in research and development and on-the-ground activities, including socioeconomic, environmental and gender aspects</p>	<ul style="list-style-type: none"> - Several developing country Parties elaborated on a number of challenges faced in effectively adapting to climate change and ensuring food security, including constraints in relation to research, development and capacity-building and lack of access to advanced technologies and facilities for precision water and fertilization management. - South Africa explained that its national circumstances are characterized by low resilience to extreme weather events, with a large proportion of its population significantly affected by rainfall variability. As a result, climate change exacerbates existing socioeconomic challenges, inequalities and vulnerabilities, thus affecting food security and local livelihoods. -Synergies between all processes for the effective implementation of countries' intended nationally determined contributions (INDCs) should be explored, addressing the needs that Parties have expressed in relation to adaptation, mitigation and related capacity-building, etc. The SBSTA agenda item on issues relating to agriculture could serve as the connective hub to ensure that those needs are properly addressed, taking into account linkages with food security, synergies between adaptation and mitigation, and socioeconomic co-benefits. In addition, the EU highlighted the need for a participatory approach to the determination of the financial and technical feasibility of the basket of options when identifying priorities. - Climate change as an important threat, in particular because of its impacts on food security and local livelihoods. Many Parties consider food security to be their top-priority concern, as also expressed in the United Nations Sustainable Development Goals and the Paris Agreement. This applies particularly to countries in which agriculture is highly vulnerable because of unfavourable socioeconomic conditions and an already high- risk natural environment, often characterized by high season-to-season climate variability, extreme weather events and periods of severe water stress. 	<p>Institutional/ role of members & UNFCCC</p> <p>Substantial issues / Issue focus (country example)</p> <p>Support to be provided (technical, financial, capacity building, etc)</p>

		<p>- The importance of means of implementation, noting, in particular, that mobilizing climate finance and the use of current and new technologies and practices, especially targeting small-scale farmers and women, will become important instruments of adaptation and ensuring food security. Other elements to support the identification of adaptation measures were mentioned, including capacity- building and technology transfer and, especially, specific packages of carefully aligned technology components for the adaptation of particular crops in particular conditions.</p> <p>- A key objective of the work of the SBSTA on agriculture should be the sharing and development of sound scientific and technical information to help Parties to make informed decisions on approaches and actions in agriculture that could increase food security and promote, within a sustainable development framework, synergies between agricultural productivity, adaptation and mitigation objectives. Furthermore, given its specific mandate under the Convention, the SBSTA should be the key body to facilitate the provision of technological support to Parties. Several Parties added that the SBSTA could also play a role in ensuring that the specificities of the agriculture sector are properly addressed under all Convention processes, including the linkages with food security, socioeconomic benefits and synergies between adaptation and mitigation. Developing countries added that these linkages continue to be the key priority for the SBSTA in its work, in the light of the particular vulnerabilities of the agriculture sector and its relationship with food security, poverty eradication and the livelihoods of millions of farmers.</p> <p>- The potential role of the Convention in facilitating the identification of adaptation measures in agriculture, taking into account the diversity of the agricultural systems, indigenous knowledge systems and differences in scale as well as possible co-benefits of adaptation measures. Parties noted, in particular, the importance of sharing experience in research and development and in the implementation of on-the-ground activities, including their socioeconomic, environmental and gender aspects.</p> <p>(FCCC/SBSTA/2016/INF.5)</p>	
	<p>SBSTA 43. Paris, 30 November to 11 December 2015.</p> <p>Report on the workshop on the assessment of risk and vulnerability of agricultural systems to different climate change scenarios at regional, national and local levels, including but not limited to pests and disease.</p>	<p>- Developing Country Parties highlighted that these extreme weather events exacerbate the existing levels of poverty and reinforce persistent inequity and chronic undernutrition in their countries. Parties gave many examples of agricultural activities affected by extreme weather events, including animal husbandry, poultry farming, fisheries, cropping and horticulture. Parties noted that smallholder and subsistence farming, being predominantly rain and monsoon dependent, is particularly impacted. Policies aimed at ensuring food security require various mechanisms to enable the provision of support from national and international organizations in order to direct adaptation actions in the agriculture sector, including: the development of water capture, storage and irrigation systems; the preservation, strengthening and promoting of traditional and indigenous knowledge related to food production; and the use of native seeds.</p> <p>-[...] the important role of the assessment of risk and vulnerability of agricultural systems, taking into consideration the particular vulnerability of agriculture to climate change impacts and the central role of the agriculture sector in ensuring food security in different climatic conditions.</p> <p>-[...] the diversity of the agricultural systems, including those relating to different stakeholders (e.g. rural and poor people, smallholders, women and youth), and different spatial (e.g. regional, national and local levels; macro to micro specificities) and temporal (e.g. short, medium and long-term perspectives) scales. Parties considered it</p>	<p>Substantial issues / Issue focus (country example)</p> <p>Support to be provided (technical, financial, capacity building, etc)</p> <p>Specific needs to be addressed</p>

		<p>important to take into account all the diversities inherent in agricultural systems in the work on risk and vulnerability assessment and emphasized the importance of agriculture in ensuring progress, food security, sustainable rural development, economic development, poverty eradication and livelihoods.</p> <p>-[...] promote sustainable farming approaches and take immediate action in order to build resilience and create equitable food systems ensuring that small scale farmers are supported, and ecosystems are protected. The representative called for ambitious emission reductions together with adaptation actions and provision of support.</p> <p>-[...]the importance of assisting developing country Parties in improving the data needed to run models that predict climate change impacts on yields of important crops, animal production, water availability and soil erosion among others (i.e. integrated assessment of climate change impacts on food security).</p> <p>(FCCC/SBSTA/2015/INF.7)</p>	
	<p>SBSTA 43. Paris, 30 November to 11 December 2015.</p> <p>Report on the workshop on the development of early warning systems and contingency plans in relation to extreme weather events and their effects such as desertification, drought, floods, landslides, storm surge, soil erosion, and saline water intrusion</p>	<p>- A key objective of the work of the SBSTA should be the development and sharing of sound scientific and technical information that would help Parties to make informed decisions on approaches in agriculture that increase food security and promote synergies between agricultural productivity and adaptation and mitigation objectives in the context of sustainable development.</p> <p>- [...] highlighted the diversity of agricultural systems and emphasized the importance of agriculture in ensuring progress, food security, sustainable rural development, economic development, poverty eradication, and livelihoods. Parties considered it important to take into account all the diversities inherent in agricultural systems in the context of the development of EWS and contingency plans.</p> <p>-[...] the importance of the Convention in enhancing the existing regional EWS and promoting their use by: strengthening the capacity of regional forums/networks for seasonal climate forecasts; removing barriers to the use and uptake of early warning information from regional systems by downscaling and appropriate packaging of regional information for action at local levels; collecting and establishing accessible regional climate databases; and implementing regional systems for the inventory and documentation of early warning systems for food security.</p> <p>(FCCC/SBSTA/2015/INF.6)</p>	<p>Institutional/ role of members & UNFCCC</p> <p>Specific needs to be addressed</p>
	<p>SBSTA 40. Bonn, 4–15 June 2014.</p> <p>Report on the workshop on the current state of scientific knowledge on how to enhance the adaptation of agriculture to climate change impacts while promoting rural development, sustainable development and productivity of agricultural systems and food security in all countries,</p>	<p>- In countries where the agriculture sector plays an important economic role, changing climatic conditions may also have socio-economic implications, such as reduction of the gross domestic product and an increased need for food imports. The need to enhance agricultural production for a growing population was also highlighted.</p> <p>-India indicated that agriculture is of crucial importance for food, nutrition and livelihood security. Climate change has already had a negative impact on the country's predominantly monsoon dependent agriculture, leading to losses/reductions in crops and animal production, including milk production and fisheries. India launched a National Mission for Sustainable Agriculture, which aims at devising appropriate adaptation strategies to support food security and economic stability.</p>	<p>Substantial issues / Issue focus (country example)</p> <p>Support to be provided (technical, financial, capacity building, etc)</p>

	<p>particularly in developing countries, taking into account the diversity of the agricultural systems and the differences in scale as well as possible adaptation co-benefits.</p>	<p>-It is important to identify actions which will support the food production capacity and allow for its increase, taking into consideration human population growth. Such actions should strengthen the capacity of different agricultural production systems to adapt to the negative impacts of climate change, by building resilience and reducing vulnerabilities. The view was expressed that these actions should not constitute distortions to agricultural trade and production.</p> <p>- Japan [...] national experiences with the development and cultivation of climate change resilient varieties of rice and cultivation techniques, which proved their effectiveness in increasing productivity under climate change conditions. This included the introduction of an alternate wetting/drying technology used by farmers to reduce their water use in irrigated fields. The panellist also elaborated on the multilateral and bilateral collaboration with developing countries in which Japan is involved with a view to assisting them in making effective use of new rice varieties and cultivation techniques as a measure to adapt to climate change, while improving the productivity and resilience of agriculture and ensuring food security.</p> <p>- Parties highlighted the important role of agriculture in national economies and the central role of the agriculture sector in ensuring food security. Developing country Parties further emphasized the important role of agriculture in poverty reduction, sustainable development and livelihoods. Parties also highlighted the importance of considering the interests of small and marginal farmers and indigenous communities, and the role of women in agriculture. [...] experiences with the application of scientific knowledge for enhancing adaptation in agriculture while promoting productivity and taking into account co-benefits</p> <p>- [...] when there is no possibility for effective adaptation, or climate variability overtakes the ability of farming systems to cope, there is a need to address loss and damage and develop a methodology for loss and damage in the agriculture sector. It was also mentioned that the limits of adaptation are linked to the importance of mitigation, bearing in mind the need to safeguard food security and the rights of small and marginal farmers.</p> <p>(FCCC/SBSTA/2014/INF.2)</p>	
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