The role of the National Adaptation Plans (NAPs) in agriculture for achieving multiple Sustainable Development Goals and implementing the Paris Agreement

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Abstract
Climate change adaptation in agriculture is a foremost priority in developing countries. According to a FAO analysis in the Intended Nationally Determined Contributions (INDCs) 93 % of developing countries included agriculture in their adaptation needs. The process of formulating and implementing National Adaptation Plan (NAP) while addressing the agricultural sectors provides a tool for the implementation of the adaptation commitments under the Paris Agreement on Climate Change.

The process of the formulation and implementation of National Adaptation Plans (NAP) was established under the Cancun Adaptation Framework asa mechanism to enhance medium- to long-term climate change adaptation planning and implementation in least developed and developing countries. Specifically, NAPs aim to reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience, and by facilitating the integration of climate change adaptation into relevant new and existing policies, programmes and activities, within all relevant sectors and at different levels, as appropriate.

As the Sustainable Development Goal (SDG) 13 on Climate Actions connects the 2030 Agenda on Sustainable Development and the Paris Agreement on Climate change, NAPs provide a vehicle to deliver not only on the national adaptation priorities under the Paris Agreement but also to address SDGs.

Due to critical interdependence of the SDGs, NAPs implementation additionally to the SDG 13, can accelerate the achievement of a number of other interlinked goals, for example: SDG-1 “No poverty” by increasing income from agriculture and reducing revenues losses caused by the climate change impacts on agriculture in rural areas, SDG-2 “Zero Hunger” by improving agricultural productivity and adapting food systems to changing climatic conditions, SDG-3 “Good health and well-being” by reducing malnutrition rate, SDG 5 “Gender Equality” by mainstreaming gender in adaptation planning, SDG 6 “Clean water and sanitation” by increasing water-use efficiency and addressing water scarcity, and SDG-15 “Life on land” by adjusting to climate change silvicultural practices, composition of species and varieties etc. Additionally, it can contribute to the peace component of the SDG 16 by building resilience to protracted crises, disasters and conflicts.

The objectives of this paper to (1) showcase the impacts of climate change on agriculture and interlinkages of the 2030 Agenda and the Paris Agreement, (2) inform about the NAPs processes and “NAP Guidelines for Agriculture, Forestry and Fisheries - supplement to the LEG NAP Technical Guidelines”, and (2) introduce the Integrating Agriculture in National Adaptation Plans (NAP-Ag) Programme which provides tailored support to 11 countries for addressing their specific climate change adaptation concerns related to the agriculture sectors and existing national planning and budgeting processes.

Impacts of climate change in agriculture

Agriculture is the main source of livelihood in most developing countries. Globally, 40 percent of the economically active population was engaged in crop and livestock production in 2010. Based on 2011 estimates in many developing countries this proportion was much higher, e.g. 68 percent in Solomon Islands, 93 percent in Bhutan, and 89 percent in Burundi (FAO, 2012a). Additionally, fisheries and aquaculture, and forestry remain important sources of food, nutrition, income and livelihood for hundreds of millions of people around the world (FAO, 2012b; FAO, 2016c). At the same time over 70 percent of the world's poor live in rural areas and earn income from agriculture for their livelihood (IFAD 2011; Olinto *et al*., 2013).

Climate change is considered as a significant "hunger-risk multiplier, and as a fundamental threat to global food security by affecting all four dimensions of food security: availability, access, stability, and utilization of food (Porter et al., 2014, FAO, 2016a).

In many regions, food security is already being adversely affected by the climate change impacts such as rising temperatures, increased temperature variability, changes in levels and frequency of precipitation, a greater frequency of dry spells and droughts, increasing intensity of extreme weather events, rising sea levels, and salinization of arable land and freshwater, pest and disease outbreaks. According to FAO estimates already from 2003-13, the agricultural sectors absorbed nearly 23 percent of all loss and damage caused by climate-related disasters in developing countries (FAO, 2016d). The world's poorest people and countries are particularly hard hit, the vast majority of who are smallholder producers in developing countries such as farmers, herders, fishers, forest-dependent communities as well as women and indigenous people (FAO, 2014). At the same time food production will need to increase by 50–70 percent by 2050 to meet the needs of the expanding global population (Alexandratos and Bruinsma, 2012).

The negative effects of climate change on agricultural production and livelihoods are expected to intensify over time, especially in sub-Saharan Africa and South Asia, where most of today's food insecure live (FAO, 2016a). Climate change will also very likely change the geography of production. For instance, in many cases, production is projected to shift from low latitude areas to high latitudes areas. Contrasted impacts between high- and low-latitude regions indicate that climate change is likely to exacerbate existing imbalances between the developed and developing world and inequalities within the countries (UNFCCC, 2012; Porter *et al*., 2014; FAO, 2016a).

Overall, the negative effects of climate change will exacerbate poverty, jeopardize food security, increase unemployment rate, and ignite conflicts and violence among and within rural communities, thus causing migration and forced displacement. It is estimated that with climate change, the population living in poverty could increase between 35 and 122 million by 2030 relative to a future without climate change, largely due to its negative impacts on incomes in the agricultural sector (FAO, 2016a).

Therefore, the Paris Agreement on Climate change recognizes 'the fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse effects of climate change' (UNFCCC, 2015).

However, unless concerted global action is taken now to make agriculture more sustainable, productive and resilient, climate change impacts will seriously compromise food production in the most fragile countries (FAO, 2016 a,d).

Adaptation actions in agriculture

It is widely recognized that the costs of inaction exceed by far the cost of interventions that would make smallholder farming systems resilient, sustainable and more prosperous (FAO, 2016a).

Currently, there are a number of proven solutions of climate change adaptation in agriculture that additionally provide a number of other co-benefits such as increased agricultural productivity, strengthened resilience, and biodiversity conservation. For example, adaptive measures in crop management have the potential to increase yields by 7–15 percent on average (Müller and Elliott 2015). Furthermore, climate change adaptation actions in Agriculture, forestry and other land use (AFOLU) sector, which is the largest greenhouse gas emitting sector after the energy sector, can provide also climate change mitigation benefits by easing the pressures that drive for example deforestation and enhancing soil organic carbon (IPCC, 2014; FAO, 2016a).

The report on The State of Food and Agriculture 2016 underlines that in order to maximize the co-benefits of climate change adaptation and mitigation efforts, deep transformations in agriculture and food systems is needed (FAO,2016a).

Generally, smallholder agricultural systems can adapt to climate change by adopting climate-smart practices, diversifying on-farm agricultural production and diversifying into off-farm income and employment (FAO, 2016a). Also, improvements in infrastructure, extension services, market access, climate information and data, credit and social insurance are needed to facilitate adaptation and diversification of smallholder livelihoods (FAO, 2016a).

However, not all of the adaptation measures are directly transferable between countries as agricultural production tends to be very context-specific and the choice of adaptation options will depend on the conditions under which they will be applied (FAO, 2016 a,e).

The identify appropriate adaptation responses it is necessary to integrate social, economic (including farm and household survey data and especially of vulnerable groups) and biophysical data (including GIS and remote sensing data) and a better understanding of the direct and indirect impacts on agricultural and rural systems (FAO,2013).

Although there may be uncertainty on future changes in climate, action needs to be initiated and should begin by addressing present risks and vulnerabilities and restoring the natural resource base and ecosystem services.

National Adaptation Plans as a vehicle for the implementation National Determined Contributions (NDCs) contributing to achieving the Paris Agreement and the 2030 Agenda for the sustainable development

The process of formulating and implementation of national adaptation plan (NAP), established under the Cancun Adaptation Framework, is a mechanism to enhance medium- to long-term climate change adaptation planning and implementation in least developed and developing countries.

Specifically, NAPs aim to reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience, and by facilitating the integration of climate change adaptation into relevant new and existing policies, programmes and activities, within all relevant sectors and at different levels, as appropriate.

The NAP process in agricultural sectors provides a tool for the implementation of the adaptation commitments under the Paris Agreement on Climate Change as according to a FAO analysis in the Intended Nationally Determined Contributions (INDCs) 93 % of developing countries included agriculture in their adaptation needs (FAO,2016f).

As Sustainable Development Goal (SDG) 13 on Climate Actions connects the 2030 Agenda on Sustainable Development and the Paris Agreement on Climate change, NAPs provide a vehicle to deliver on national adaptation priorities under the Paris Agreement while addressing SDGs. Specifically, NAPs can support the implementation by strengthening the resilience and adaptive capacity to climate-related hazards and natural disasters and by integrating climate change measures into national, policies, strategies and planning.

Due to critical interdependence of the SDGs, NAPs implementation can accelerate the achievement of not only SDG 13 but also a number of other interlinked goals, for example: SDG-1 “No poverty” by increasing income from agriculture and reducing revenues losses caused by the climate change impacts on agriculture in rural areas, SDG-2 “Zero Hunger” by improving agricultural productivity and adapting to changing climatic conditions, SDG-3 “Good health and well-being” by reducing malnutrition rate, SDG 5 “Gender Equality” by mainstreaming gender in adaptation planning, SDG 6 “Clean water and sanitation” by increasing water-use efficiency and addressing water scarcity, and SDG-15 “Life on land” by adjusting to climate change silvicultural practices, composition of species and varieties. Additionally, it can contribute to the peace component of the SDG 16 by building resilience to protracted crises, disasters and conflicts etc.

Thus, without adaptation to climate change in agriculture sectors, it would be also not possible and achieve the SDGs of the 2030 Agenda and implement the Paris Agreement.

To facilitate adaptation planning in agriculture sectors the “Addressing agriculture, forestry and fisheries in National Adaptation Plans -- Supplementary guidelines’’ (also referred to as the NAP-Ag Guidelines) were developed by FAO to compliment the UNFCCC NAP Technical Guidelines providing step by step guidance for the formulation and implementation NAPs and addressing key issues of the agriculture sectors (FAO, 2017).

The NAP-Ag Guidelines address the specific challenges that adaptation efforts pose in the agricultural sector - steering change at a manageable pace for those who depend on related activities for incomes, food security and livelihoods (FAO, 2017).

Integrating Agriculture in National Adaptation Plans (NAP-Ag)

Considering the varying climate change adaptation needs of different counties, it is important to develop country and context specific NAPs. Therefore, the Integrating Agriculture in National Adaptation Plans (NAP-Ag) programme implemented by the Food and Agriculture Organization (FAO) and the United Nations Development Programme (UNDP) provides tailored support for addressing specific climate change adaptation concerns related to the agriculture sectors and existing national planning and budgeting processes in eleven developing countries (Colombia, Gambia, Guatemala, Nepal, Kenya, the Philippines, Thailand, Uganda, Uruguay, Viet Nam and Zambia).

Additionally, NAP–Ag provides support to countries for cost–benefit analysis of adaptation actions and impact evaluation, gender mainstreaming, accessing climate finance through international mechanisms, such as the Green Climate Fund (GCF), bilateral and multilateral funding mechanisms, as well as national financing. The Programme contributes to NAPs and the achievement of targets laid out in partner countries' Nationally Determined Contributions (NDC) and the SDGs.

For example, in Kenya, the Programme has supported local, county–level consultations on Kenya's Climate Smart Agriculture Framework Programme (KCSAFP) that seeks to mainstream climate change considerations into national development planning and budgeting. The consultations engaged government representatives to establish baselines, formulation of targets for activities and provision of local guidance on the KCSAFP around agriculture which led to the initiation of the sectoral sub–strategies for adaptation development (FAO and UNDP, 2017). In Thailand, the programme through the participatory approach and by engaging all departments of the Ministry of Agriculture and Cooperatives is upgrading the Climate Change Strategic Plan for the Agricultural Sector (2017–2021).

For enhancing global and country team members' capacity to address gender issues the NAP-Ag also produced guidance materials and performed a series of gender mainstreaming activities focusing on women's economic empowerment through enterprise and market development, incorporation of sex–disaggregated data and gender analysis into cost–benefit analysis and impact evaluations. For example, in Uruguay, through the NAP-Ag programme work is on–going on obtaining sex– disaggregated data as well as the development of a baseline on gender– sensitive indicators for the agricultural sectors (FAO and UNDP, 2017).

Implementation challenges and recommendations

Even though investment in climate change adaptation and sustainable agriculture is a proven accelerator of sustainable development, the implementation of climate change adaptation measures in agriculture is constrained by the availability of funds as generally agriculture receives a limited funding for climate change and development as it is considered low-profit and high-risk. Smallholders, especially, face a broad range of barriers on the path to sustainable agriculture, such as limited access to markets, credit, extension services, weather information, risk management tools and social protection (FAO, 2016a). Additionally, the adoption of climate-smart practices is hampered by policies, such as input subsidies, that perpetuate unsustainable production practices (FAO, 2016a).

NAPs implementation similarly to the delivery of the SDGs and the Paris Agreement requires continuous strong political support and commitment. Additionally, it is necessary to:

- **Policy and coordination:** (1) improve policies/regulatory frameworks and mainstream the relevant actions within national and sub-national plans in a coherent manner, (2) establish clear institutional frameworks and cross-sectoral coordination mechanisms; (3) link with the private business sector, civil society and academia (4) foster partnerships and international cooperation.
- **Capacity building and data availability:** (1) strengthen national statistical systems to identify relevant indicators and ensure the availability of quality disaggregated and baseline data, (2) enhance monitoring and evaluation systems, (3) provide continuous capacity building support.
- **Financing:** (1) mobilize necessary means of implementation, (2) coordinate budgeting and planning.

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