

# Info Note

## How countries plan to address agricultural adaptation and mitigation

### *An analysis of Intended Nationally Determined Contributions*

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#### Key messages

- Agriculture is well represented in Parties' adaptation and mitigation strategies as communicated in their Intended Nationally Determined Contributions (INDCs).
- There is much attention to conventional agricultural practices that can be climate-smart (e.g. livestock and crop management), but less to the enabling services that can facilitate uptake (e.g. climate information services, insurance, and credit).
- Considerable finance is needed for agricultural adaptation and mitigation by Least Developed Countries (LDCs) – on the order of USD 3 billion annually for adaptation and 2 billion annually for mitigation.
- Parties need better information in order to refine their finance needs.
- Non-Annex 1 Parties raise issues of climate justice, social inequality and food security in their INDCs.

In its founding documents, the UN Framework Convention on Climate Change (UNFCCC) seeks the stabilization of greenhouse gas concentrations in the atmosphere to “ensure[s] that food production is not threatened” (UNFCCC 1992. Article 2). In addition, agriculture is listed among the sectors falling within the obligation of Parties to develop mitigation plans and measures (UNFCCC 1992. Article 4.1(c)). However, agriculture has historically been excluded from the UNFCCC negotiations (Kalfagianni and Duyck 2015). There was a breakthrough at COP17 in Durban (2011) when agriculture was referred to the Subsidiary Body for Scientific and Technological Advice (SBSTA) for an eventual decision on agriculture. But progress thereafter remained slow, with four agricultural topics identified for discussion in 2015 and 2016.

Despite this lack of progress, agriculture is prominent in the Intended Nationally Determined Contributions (INDCs) submitted by Parties to the UNFCCC (Richards et al. 2015). Of 160 Party submissions analysed, 103 include agricultural mitigation. And of the 113 Parties that include adaptation in their INDCs, almost all (102) include agriculture among their adaptation priorities.

This brief examines the INDCs in relation to how Parties include agriculture in their adaptation and mitigation strategies.

### Overview of agriculture in the INDCs

#### ***Agricultural sub-sectors are generally well represented in the INDCs***

Agriculture, in the context of adaptation and/or mitigation, is discussed in 131 INDCs. Some Parties also specify sub-sectors such as livestock (70), fisheries (71) and agricultural water management (83). Given that fisheries and water management are largely adaptation issues, and given that it is 102 Parties that reference agricultural adaptation, these sub-sectors are well represented in the INDCs. Forestry is exceptionally well represented (153 Parties) because it is central to mitigation actions in the UNFCCC.

#### ***Parties recognise that adaptation and mitigation can go hand in hand***

Historically, one of the sticking points for agricultural discussions in the negotiations has been the degree to which the discussion should be about mitigation or adaptation (Kalfagianni and Duyck 2015). In general, the INDCs of Annex 1 Parties focus on mitigation, with little attention to adaptation (see maps in Richards et al. 2015). The non-Annex 1 Parties put much attention on adaptation and development in general; their climate actions are very much linked to their concerns for development, reducing social inequalities and achieving food security.

Non-state actors, and some Parties, have tried to argue that in agriculture, adaptation and mitigation are closely linked (e.g. Jarvis et al. 2011). It is thus positive that many Parties have alluded to the close links between adaptation and mitigation. Forty-four Parties, all non-Annex 1, have referred to mitigation and adaptation synergies, mitigation as a co-benefit of adaptation or vice versa. Twenty-nine Parties mention climate-smart agriculture (CSA), which sees productivity, adaptation and mitigation objectives as closely linked (but does recognise trade-offs) (Lipper et al. 2014). Twenty Parties mention agro-ecological approaches or similar approaches which embrace food security and social and environmental concerns. Nine Parties reference both CSA and agro-ecological approaches, thus recognising many similarities in these approaches.

### Agricultural adaptation measures

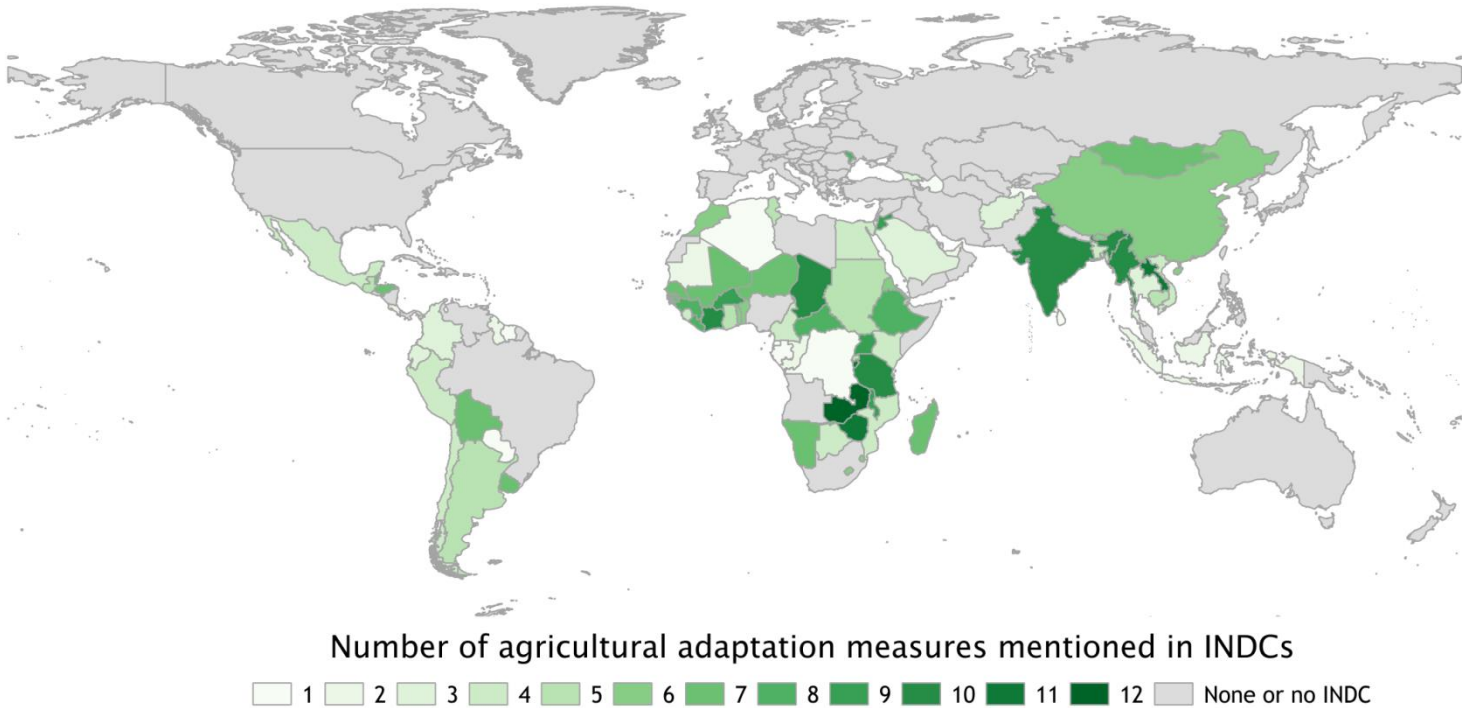
Of the 102 Parties that include agricultural adaptation in their INDCs, 94 include some details on how this will be implemented, for example mentioning at least one adaptation measure. The main measures recorded, in order of frequency, are shown in Table 1.

Asian parties have tended to include many agricultural adaptation measures as have Parties in Africa and the Pacific, with less detail in Latin America INDCs (Figure 1).

Main adaptation measures	Number of Parties
Livestock management	54
Crop management	51
Fisheries and aquaculture management	48
Irrigation management	46
Water management <sup>1</sup>	45
Knowledge transfer (e.g. extension)	35
Agricultural diversification	32
Soil and land management	31
Climate-smart agriculture <sup>2</sup>	29
Early warning systems (e.g. seasonal forecasts)	28
Agroforestry	22
Agro-ecology <sup>2</sup>	20
Indigenous knowledge	19
Financial mechanisms (e.g. crop insurance)	18
<b>Total parties including agricultural adaptation</b>	<b>102</b>
<b>Total parties including at least one measure</b>	<b>94</b>

**Table 1** Number of Parties citing particular measures to enable their agricultural adaptation commitments

<sup>1</sup>This category likely includes some cases of irrigation. <sup>2</sup>These categories are generic and could include other measures listed. Climate-smart agriculture includes, for example, climate-smart fisheries.



**Figure 1** Number of adaptation measures mentioned in INDCs

### Adaptation technologies

There is a focus on agricultural technologies in the INDCs, with less attention to services and incentives that will ensure uptake. The focus is also on the conventional agenda of agricultural development, with less attention to other key areas. The top five measures are livestock, crop, fisheries, irrigation and water management. As an example, Bangladesh illustrates the agricultural outlook of Parties, with a strong production focus. They have a focus on stress-tolerant crop varieties (covering salinity, drought and flood challenges) and also include livestock and fisheries management. Likewise, Bolivia's goal is to triple irrigation area to over 1 million hectares by 2030 and double food production under irrigation by 2020. Their stated focus is on resilient agriculture and livestock systems.

### Adaptation support

There is less attention in the INDCs to the measures that will be needed to ensure technology transfer and uptake, such as early warning systems, knowledge management and financial mechanisms. Such measures are crucial to enhance adaptive capacity and sustainable uptake of adaptation technologies, both within the agricultural sector but also for broader livelihood systems.

Financial mechanisms are only covered by 18 Parties. These include agricultural insurance, credit and micro-finance. Ethiopia provides a positive example, focussing on developing "insurance systems to enable citizens, especially farmers and pastoralists, to rebuild economic life following exposure to disasters caused by extreme weather events." Extension, education, awareness and knowledge are covered by 35 Parties. This varies from education and awareness actions (e.g. Morocco), research on climatic impacts on agriculture (e.g. Myanmar), technology transfer (e.g. Vietnam) and increasing public awareness of climate-smart agriculture (e.g. Zambia). Early warning systems, climate information systems and disaster risk management (in the agricultural adaptation context) are mentioned by 28 Parties. For example, Argentina, Gambia and Mongolia intend to strengthen agricultural resilience by expanding climate information and early warning systems, and promote linkages between the meteorological and agricultural communities.

### Agricultural mitigation measures

Of the Parties that include mitigation in their INDCs, 103 include targets related to agriculture and 128 include targets related to other land use (most commonly forests). However, only 9 countries provide quantitative estimates of sector-specific reductions: Ethiopia, for example, intends to reduce agricultural emissions in 2030 by 49% (90 MtCO<sub>2</sub>e) from its projected business as usual scenario (185 MtCO<sub>2</sub>e), conditional on international support. Agricultural emissions would still be 20 MtCO<sub>2</sub>e higher in 2030 than in 2010. Other countries intend more modest reductions in agricultural emissions, such as Senegal's action-based unconditional reduction of 0.19%

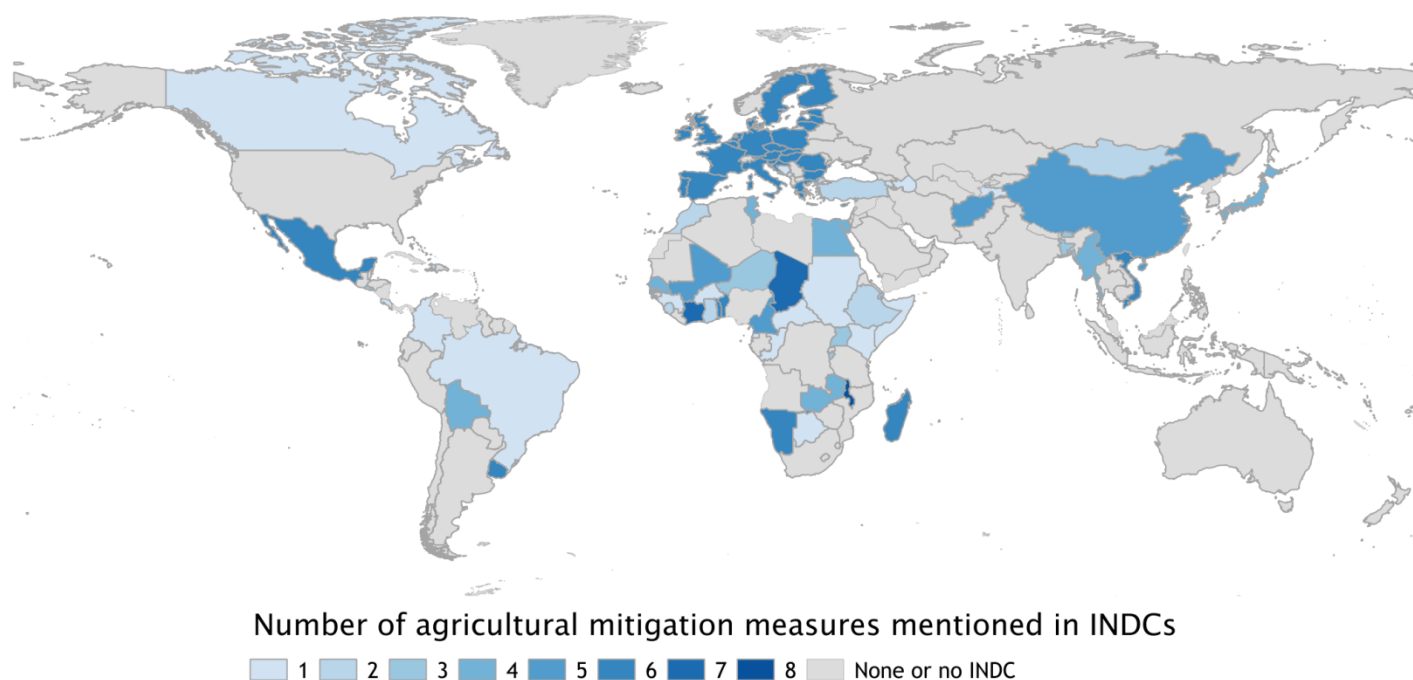
(which would increase to 0.63% conditional upon international support) against 2030 business as usual agricultural emissions. The mean reduction in the agricultural sector among all Parties that provided greenhouse gas (GHG) targets is 15% of 2030 business as usual emissions. A 15% reduction is significant, and on the order of what has been estimated for agriculture in global models to limit warming to 2°C (Wollenberg et al. 2015). However, the largest agricultural emitters (e.g. India, China, United States) are not among those that included sector-specific targets, so it is impossible to tell whether the ambition of agricultural reductions is sufficient at the global scale.

Of the Parties that include specific agricultural sub-sectors or mitigation technologies, livestock is the most frequently cited. Livestock mitigation activities generally focus on increasing efficiency and productivity, such as Uruguay's plan to reduce methane emissions per kilogram of beef by 33-46% and Bangladesh's intention to reduce emissions from draft animals through agricultural mechanization. However, livestock is frequently mentioned a focus area without specifics on how mitigation will be achieved, indicating a potential need for further technology and capacity development in this area. Parties also plan to use mitigation measures in croplands, such as reduction of tillage or conservation agriculture, and grasslands, such as pasture improvement or reduction of savannah burning. Rice management and manure management are other frequently cited mitigation measures (Table 2). African countries have provided greater specificity on agricultural mitigation measures. The EU's INDC also specifies agricultural sub-sectors for mitigation (Figure 2).

**Table 2** Number of Parties citing particular agricultural measures to enable their mitigation targets and actions

Mitigation measures	Number of Parties
Livestock	54
Croplands	50
Grasslands	48
Rice	48
Manure management	46
Agricultural residue management	41
Fertilizer	17
Agroforestry	15
Climate-smart agriculture <sup>1</sup>	11
Agricultural intensification <sup>1</sup>	6
<b>Total Parties including agricultural mitigation</b>	<b>103</b>
<b>Total Parties specifying at least one measure</b>	<b>84</b>

<sup>1</sup> Includes only INDCs where cited as a mitigation strategy



**Figure 2** Number of agricultural mitigation measures mentioned in INDCs

Forest-related mitigation measures were more frequently mentioned than agricultural measures; 109 Parties intended to use forest management, deforestation, afforestation, or reforestation to meet their mitigation commitments (Table 3). Other high-carbon landscapes are also mentioned: for example, Iceland, China, and Côte d'Ivoire include restoration of organic soils, while Sri Lanka, Bangladesh and Senegal mentioned protection of mangroves. Additionally, a number of Parties included mitigation measures within their energy sector contributions that have implications for land use: 56 Parties mention a shift to bioenergy and 30 intend to introduce or expand the use of improved cook stoves, anticipating that such stoves will reduce harvesting of fuel wood from natural forests.

**Table 3** Number of Parties citing particular land use measures to enable their mitigation targets and actions

Mitigation measures	Number of Parties
Forest management	82
Reforestation	67
Avoided deforestation	64
Afforestation	40
Restoration of degraded land, soil, or forest	22
Organic soils (peatlands)	9
Soil carbon	8
Coastal ecosystems (e.g. mangroves)	7
<b>Total Parties including other land use mitigation</b>	<b>128</b>
<b>Total Parties specifying at least one measure</b>	<b>109</b>

### Mitigation and climate justice

The question of responsibility for mitigation is raised by a number of non-Annex 1 Parties. Thirty-four Parties (of the 160 analysed<sup>2</sup>) evoke the common but differentiated responsibility (CBDR) principle – all of them non-Annex 1 Parties. Ten make references to “historic responsibility” and “climate justice”, one Party going so far as to state that “the main burden for any mitigation undertaken by the country must be the responsibility of the developed countries that have been primarily responsible for the bulk of the world's emissions”. Two non-Annex 1 Parties noted that their mitigation commitments exceed their fair share. It is difficult to compare the mitigation targets of Annex 1 and non-Annex 1 Parties because Annex 1 parties generally use historical emissions as a baseline in their INDCs, whereas non-Annex 1 parties use projected (business as usual) emissions.

However, non-Annex 1 Party plans contain substantial commitments to emissions reduction and mitigation actions; most quantified targets are in the realm of 15-30% of business as usual emissions. A recent civil society review of INDCs indicates that, based on historical responsibility and capacity to take action, poorer countries' pledged actions meet their “fair share” of climate action, while wealthier countries' pledges show a substantial gap in ambition (Climate Equity Reference Project 2015).

<sup>2</sup> There were 120 non-Annex 1 countries in the 160 analysed for this paper.



Policies for agricultural adaptation and mitigation

Most Parties describe policy dimensions that support their INDC, such as National Climate Policies or Strategies, National Adaptation Plans (NAPs), low emissions development strategies (LEDs), and Nationally Appropriate Mitigation Actions (NAMAs). Parties vary in the degree to which climate change has been integrated into national policy. As a relatively well-integrated example, Vietnam in 2008 issued the National Target Programme to Respond to Climate Change (NTP-RCC) and has mainstreamed climate change into the National Socio-Economic Development Strategy (2011-2020) and Socio-Economic Development Plan (2011-2015). The country also has a National Climate Change Strategy and National Green Growth Strategy. Economic sectors and provinces have developed Action Plans to respond to climate change, and the country is preparing several NAMAs and carbon credit projects.

Likewise, Zambia draws on its experience with its National Adaptation Plan of Action (NAPA), has a cross-sector Climate Policy, and also addresses climate adaptation in its National Agriculture Policy (2014). To support INDC implementation, Zambia is in the process of making a NAP and strengthening its measurement, reporting and verification (MRV) system in order to monitor implementation of both adaptation and mitigation plans. The country, along with 36 other Parties, also notes the preparation of NAMAs.

Capacity building, technology transfer and finance

Parties expect much out of the finance, capacity building and technology transfer mechanisms of the UNFCCC. Over 70 Parties make reference to capacity building and over 50 to technology transfer. Even those Parties with relatively well-developed policy environments note the need for improved capacity and technology to implement their INDCs. For example, Vietnam, like many countries, notes the challenge of developing an MRV system, as well as a need for technologies to reduce GHG emissions in agriculture, and scientific expertise in early warning of natural disasters and hazards.

Adaptation finance

Of the 113 Parties that have adaptation commitments, nearly half (47) include estimations of the financing needed to implement their INDC adaptation component; this totals USD 470 billion. The time frames are mostly up to 2030, starting in 2015 or 2020, so involve a 10-15 year range. Assuming a 15-year time frame, this gives about USD 30 billion per year that is needed by this subset of countries.

India alone accounts for 44% of this requirement with an estimated financing need of USD 206 billion. Bangladesh has the second-highest requirement with USD 40 billion followed by Madagascar (USD 29 billion), Namibia (USD 23 billion), Benin (USD 18 billion), Haiti (USD 17 billion), Senegal (USD 15 billion), Tanzania (USD 12 billion), Afghanistan (USD 11 billion), Mauritania (USD 9 billion) and DR Congo (USD 9 billion).

A total of USD 178 billion comes from 24 African Parties, possibly reflecting the severe effects that climate change will have on this part of the world. The highly climate-vulnerable Small Island Developing States (SIDS) account for a relatively modest share of the adaptation financing requirements – only USD 5 billion (1%) of the total.

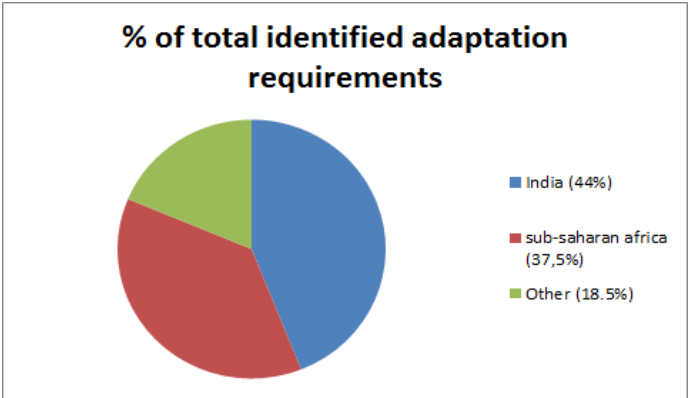


Figure 3 Distribution of adaptation funding requirements estimated in INDCs

The most frequently identified sources of financing adaptation are international financial support and public domestic funding. The Green Climate Fund (GCF) is frequently mentioned (by 25 Parties) followed by the Global Environment Facility (GEF) (13 Parties) and the Adaptation Fund (13 Parties) (Table 4).

Table 4 Funding sources for adaptation commitments, as cited by Parties in their INDCs

Funding sources for adaptation commitments <sup>1</sup>	Number of Parties
International financing	74
Public domestic funding	45
Green Climate Fund	28
Private domestic funding	21
Private international funding	14
Global Environment Facility	13
Adaptation Fund	10

<sup>1</sup> Funding categories are not mutually exclusive.

### ***Agricultural adaptation finance***

Only 16 Parties specify financing requirements for agricultural adaptation. African Parties account for 91% of the total amount and 2 Parties, Zimbabwe (USD 35 billion) and Benin (USD 10.5 billion), have identified especially high financing needs (77% of the total amount). Only 4 Parties outside Africa have identified financing requirements (Afghanistan, Laos, Mongolia and Belize).

The median request for agricultural adaptation finance is USD 50 million per year (assuming a 15-year time frame for countries that did not specify a year range). If this median value per country is multiplied by 55 countries (developing countries with major agricultural economies), then the total is USD 3 billion per annum for agricultural adaptation in LDCs.

### ***Mitigation finance***

Fifty Parties provide estimates for the cost of their INDC mitigation targets and actions, totalling USD 2677 billion. As with adaptation finance, the cost estimates are mostly over a 15-year time frame up to 2030, yielding an approximate estimate of USD 121 billion required each year for mitigation. Even assuming that half of this cost may be met with domestic sources, when combined with the approximate USD 30 billion per year needed for adaptation, it dwarfs what has been currently committed to the GCF.

South Africa has the largest investment requirement for mitigation at USD 1380 billion for actions in the energy and transportation sectors, though this is to 2050 whereas most other Parties estimate finance needs only to 2030. India has the second largest investment requirement for mitigation at USD 834 billion (to 2030), followed United Arab Emirates (USD 60 billion), Morocco (USD 45 billion), Kenya (USD 40 billion), Zambia (USD 35 billion), Mali (USD 35 billion) and Bangladesh (USD 27 billion). Similar to adaptation finance needs, over half (USD 1638 billion) comes from sub-Saharan African Parties, though much of this is from South Africa.

Parties have high expectations for the GCF; 45 Parties identified GCF as a source of mitigation finance. Parties also anticipate funding their efforts via the Clean Development Mechanism (CDM) (23 Parties) and GEF (21 Parties). Forty-seven Parties also mention Reducing Emissions from Deforestation and forest Degradation (REDD+) processes in their countries for their forest-related mitigation activities.

### ***Agricultural mitigation finance***

Sixteen Parties – primarily in Africa – provided costs associated with their agricultural and land use mitigation measures. The costs range from smaller amounts for specific projects – such as USD 2.5 million for a program to reduce slash-and-burn agriculture in the Central African Republic – to larger quantities for entire sectoral

mitigation plans, such as Senegal's USD 1.8 billion plan to implement sustainable intensification of rice, biodigesters, agroforestry systems, and assisted natural regeneration of degraded lands.

The median request for agricultural mitigation finance is USD 42 million per year. As for adaptation finance, this number was calculated assuming a 15-year time frame for countries that did not specify the time frame of their finance needs. If this median value per country is multiplied by 55 countries (developing countries with major agricultural economies) then the total is about USD 2.3 billion per year for agricultural mitigation in LDCs.

### ***Private sector initiatives***

The private sector can play a key role in supporting agricultural adaptation and mitigation, particularly in countries that are large agricultural commodity producers. Sixty-seven Parties – all non-Annex 1 – refer to the role of the private sector in helping to achieve climate adaptation and mitigation goals. Almost no countries refer to specific and concrete actions by the private sector to combat climate change, apart from public-private partnerships, and private sector participation in multi-stakeholder consultations and actions at the national level. A small number of Parties (22) call on the private sector to invest in climate change actions or to undertake climate- or environmentally-sustainable actions. India, for example, has implemented the GreenCo Rating System which assesses companies on their environmental performance across 10 different parameters to help them develop a roadmap for action. Meeting climate change targets will require the private sector to go beyond corporate social responsibility to integrating environment and climate concerns into how they do business.

## **Non-Annex 1 Parties raise issues of social inequality and food security**

### ***Poverty and social inequality***

Attention to poverty and social inequality all 160 Parties is less than might be expected, given the impacts that climate change is likely to have on vulnerable people and communities (IPCC, 2014). However, 82 Parties do include references to social issues (e.g. poverty, inequality, human well-being, marginalisation). Poverty is the category of social issues receiving the most attention (70 Parties). Social inequality, inclusion and human rights concerns are recognized by fewer Parties (37), as are the needs of vulnerable and marginalized communities (25). Only 27 Parties refer to indigenous knowledge, practices or peoples.

Gender receives substantial attention (57 Parties), but gender references are confined mostly to impacts of climate change with less emphasis on supporting women to actively address and participate in adaptation and mitigation actions. Only 10 Parties refer to the role of

women in agriculture. References to women and gender in relation to water (4), energy (6), and health (6) are also low. National policy approaches tend to focus on social development-related policy frameworks (33), with 20 Parties integrating gender into climate change policy and strategy. Two Parties have developed Gender and Climate Change Action Plans. The lack of substantive references and commitments in the INDCs to gender equality and women reflects the limited approach to gender within the UNFCCC. Global climate funds are taking stronger approaches to gender equality and gender-sensitive approaches, but global institutions still fall short of the gender-transformative approach needed.

### **Food and nutritional security**

Considering that 102 Parties (largely non-Annex 1) include agriculture in their adaptation commitments, it is not surprising that a relatively large number (73) refer to food security, defined by the World Food Summit in 1996 as “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life”. In doing so, Parties go beyond the narrower UNFCCC usage in Article 2 of only one component of food security, namely food production. References in the INDCs tend to be rather general, relating to recognition of the importance of achieving food security, taking measures to do so, and the national policy framework which supports food security. Nutritional security receives much shorter shrift, with only 25 Parties noting nutritional security as an important concern. These references are limited to calling attention to potential impacts of climate change, including malnutrition, but specify few concrete actions. Exceptions include Bhutan which commits to promoting climate-smart agriculture for food and nutrition security, poverty alleviation and self-sufficiency.

## **Discussion**

Despite the historical challenges to including agriculture in the official climate change negotiations, the submitted INDCs underline countries’ priority to determine and address agricultural adaptation and mitigation at the national level.

Our analysis shows that the vast majority of Parties recognise the significant role of agriculture in supporting a secure sustainable development pathway. In fact, agriculture and/or its sub-sectors are discussed in 80% of the INDCs, while forestry is included in 95% of the submissions.

Expectedly, Annex 1 Parties focus primarily on mitigation, and non-Annex 1 on adaptation, and this is also reflected in reference to agricultural issues. Remarkably, out of the 160 submissions analysed, 102 include targets related to agricultural adaptation, 103 to agricultural mitigation, and 128 to other land use. Additionally, it is also positive that many Parties seem to recognise the close links between

adaptation and mitigation in agriculture, with 29 of them specifically mentioning climate-smart agriculture in their INDCs.

A more thorough analysis of the INDCs also shows a focus on technologies and practices adaptation for adaptation, with less attention given to the enabling environments that will facilitate uptake, including knowledge management, technology transfer, and financing needs and mechanisms.

On mitigation, the mean reduction in the agricultural sector is estimated at 15% of 2030 business as usual emissions, but methodological difficulties in accounting, and the lack of specific targets among some of the largest emitters, do not provide sufficient information for a reasonable estimate of commitments at the global scale.

Old and new policy instruments with relevance to agriculture such as NAPs and NAMAs are also often adequately reflected in the majority of the INDCs. Similarly, most of the Parties agree on the need for enhanced targeted financing mechanisms, and cite significant funding needs. Additionally, there appear to be some marked outliers among financing requests and thus estimated median values for the requests, in our analysis, probably better reflect needs than average amounts. For adaptation this is USD 50 million per year and mitigation is USD 42 million per year. Urgent research is needed on the actual costs of adaptation and mitigation options, so that realistic estimates of financial needs can be made.

Social equality, human rights and food security are not receiving high levels of attention in climate change policy either at national or global levels. As they stand, the INDCs do not go far enough to meaningfully address climate-change induced stresses on society and social inclusion, while limited attention to gender equality in climate change actions risks substantially increasing the global gender gap.

## **Methods**

Given that Parties received little guidance on format for the INDCs, the level of information regarding agriculture, adaptation and mitigation varies and comparisons are difficult. Our analysis is based on the terminology used in the INDCs to describe agricultural plans. A set of keywords were selected for a particular measure and then searched and counted, excluding results that yielded the selected word in a wrong context (e.g. for agricultural diversification, the search was based on “diversification”, but when this referred to livelihood diversification it was excluded). The program QDA Miner was used for keyword searches. This analysis was based on the 133 INDCs submitted as of November 15 2015, representing the contributions of 160 Parties (the European Union’s 28 member countries submitted a joint INDC).



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The information presented here is the result of an analysis of the 133 INDCs submitted as of 15 November 2015. Data were collected directly from INDC submissions, which can be found at: [http://unfccc.int/focus/indc\\_portal/items/8766.php](http://unfccc.int/focus/indc_portal/items/8766.php)

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