

**NEGOTIATING THE LINKAGES BETWEEN CLIMATE
CHANGE AND AGRICULTURE: THE ROLE OF STATE AND
NON-STATE ACTORS**

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DECLARATION

I declare that the dissertation entitled "Negotiating the Linkages between Climate Change and Agriculture: The Role of State and Non-State Actors" submitted by me for the award of the degree of Master of Philosophy of Jawaharlal Nehru University is my own work. The dissertation has not been submitted for any other degree of this university or any other university.

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“Our coming generations will ask for answer, they will ask us, where were you when new social forces were being unleashed, where were you when people who live and die every moment, everyday fight for their rights, where were you when there was assertion of the marginal voices of society, they will seek an answer from all of us”, Comrade Chandrashekar former JNUSU President left these words imprinted on the soul of JNU before being shot dead fighting for the rights of landless Dalits in Siwan. Today in these times of fascism, every student of JNU has stood up and has lived up to the idea of JNU envisioned by students like Com. Chandrashekar. Keeping alive the spirit of resilience JNU students in the past two years especially in the last six months have enriched Dr B.R. Ambedkar “Educate, Agitate and Organise”. The journey of JNU has been one filled with rejoicing, resistance and recalcitrant. Rejoice in our collective struggle for justice, resistance to fight inequality and recalcitrant against fascist farmaans.

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To take the liberty to quote Bertolt Brecht question on dark times and to present a true picture of today “In the dark times will there also be singing? Yes, there will also be singing. About the dark times.” JNU has truly shown that even in times of fascism, there would be resistance and resilience through research about the times and struggles of people against fascism. To famously quote Mohammad Ali decision not get drafted into US army to fight an unjust war against “brown people in Vietnam while so-called Negro people in Louisville are treated like dogs and denied simple human rights? No, I’m not going 10,000 miles from home to help murder and burn another poor nation simply to continue the domination of white slave masters of the darker people the world over.” Today JNU’s act of defiance against this fascist attack for preserving the cherished Indian constitution in letter and spirit is no less than Mohammad Ali’s defiance for humanity and justice. The greatest of great autocrats and dictators had to fall against the collective assertions of people for justice and democracy. Today when the attack on higher education, social justice and constitution of India is growing to its extreme levels, it is important to remember what revolutionary freedom fighter and comrade Bhagat Singh had to say that “by crushing an individual they cannot kill an idea”. Similarly, by punishing students, harassing teachers and destroying higher education, they cannot kill the idea of JNU. JNU stands for the inclusive ethos of education with principles of social and gender justice. JNU stands for the emancipation of the oppressed and liberation of the marginalised through access to quality and affordable higher education. JNU is this idea which no bomb, no sedition case, no fine, no punishment and no bullet can kill. JNU is an idea, a phoenix that never dies but will always rise from the ashes to the stars because ideas can’t be killed.

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List of Abbreviations

ABC	: Carbon Agriculture Plan
AFOLU	: Agriculture, Forestry and Other Land Use
AIKS	: All India Kisan Sabha
AISMR	: All India Summer Monsoon Rainfall
ANC	: African National Congress
AoA	: Agreement on Agriculture
AOSIS	: Alliance of Small Island States
AWG-LCA	: Ad hoc Working Group on Long term Cooperative Action
BASIC	: Brazil, South Africa, India, China
BAU	: Business As Usual
BJP	: Bhartiya Janta Party
CAN	: Climate Action Network-International
CARICOM	: The Caribbean Community
CBDR	: Common But Differentiated Responsibilities
CCP	: Chinese Communist Party
CDM	: Clean Development Mechanism
CFE	: Carbon Fertilisation Effect
CNCCP	: China's National Climate Change Programme
COP	: Conference of the Parties
COP21	: 2015 United Nations Climate Change Conference
CPI(M)	: Communist Party of India (Marxist)
CPI(ML)	: Communist Party of India (Marxist-Leninist) Liberation
CSA	: Climate Smart Agriculture
CSCAP	: Council for Security Cooperation in the Asia Pacific
DESA	: United Nations Department of Economic and Social Affairs
DWS	: Department of Water and Sanitation
EEA	: European Economic Area
ENSO	: El Nino Southern Oscillation
EU	: European Union
FAO	: Food and Agriculture Organisation of the United Nations
FEW	: Food-Water-Energy
GACSA	: Global Alliance for Climate Smart Agriculture
GHG	: Greenhouse Gas
GLOBIOM	: Global Biosphere Management Model

G8	: Group of Eight with USA, Russia, Japan, Canada, Italy, Germany, UK, France as members.
G77	: The Group of 77 coalition of developing nations at the United Nations
HDR	: Human Development Report
IATP	: Institute for Agriculture and Trade Policy
IFAD	: International Fund for Agricultural Development
IFPRI	: International Food Policy Research Institute
IGOs	: Intergovernmental Organizations
IIASA	: International Institute for Applied Systems Analysis
ILO	: International Labour Organization
IMPACT	: International Model for Policy Analysis of Agricultural Commodities and Trade
INDCs	: Intended Nationally Determined Contributions
IPCC	: Intergovernmental Panel on Climate Change
NAMA	: Non-Agricultural Market Access
NATO	: North Atlantic Treaty Organization
NPC	: National People's Congress
OECD	: Organization for Economic Cooperation and Development
RWR	: Renewable Water Resources
SAARC	: South Asian Association for Regional Cooperation
SIDS	: Pacific Small Island Developing States
SBSTA	: Subsidiary Body for Scientific and Technological Advice
UNDP	: United Nations Development Programme
UNEP	: United Nations Environment Programme
UNFCCC	: United Nations Framework Convention on Climate Change
UNGA	: United Nations General Assembly
UNSC	: United Nations Security Council
USDA	: United States Department of Agriculture
WTO	: World Trade Organization

Chapter 1

Introduction

International politics and negotiations for climate change have developed an intricate relationship over a period of time. Climate change – which is a reality of the 21st century – is changing the way people live and governments govern. Agriculture is an imperative factor in the survival and continuance of human life and plays an essential role in ensuring food security and livelihood security. It is evident from the science of agriculture and climate change that there is going to be a significant transformation in the form, practice and production patterns of agriculture, which in turn will impact livelihoods. Reports of the Intergovernmental Panel on Climate Change (IPCC), the Food and Agriculture Organization (FAO) and the International Food Policy Research Institute (IFPRI), as well as several governmental and non-governmental reports not indicate but also substantiate the effects of climate change on agriculture.

Although scientific studies such as IPCC reports emphasize the impact of climate change on agriculture, political negotiations do not display a proportionate focus on this linkage. An example is the 2015 Paris Agreement which includes a mention of agriculture and food security (United Nations Framework Convention on Climate Change (UNFCCC) Paris 2015) not as a critical aspect but as something implicit in the central narrative. The threats to agriculture from climate change are more pronounced for small scale and marginal farmers who form a majority of the farming population in developing countries. The geographical regions likely to be affected the most – i.e. the arid and semi arid regions, which are primarily dependent on rainfed agriculture – are dominated by small and marginal farmers and are predominantly located in the developing countries. Regions of Africa – specially sub-Saharan Africa and Sahel – South Asia and Latin America, which have a majority of their populations engaged in farming for sustenance and survival, are especially vulnerable to the deteriorating effects of climate change.

The international policy response through the climate change negotiations addresses the intricate relationship between agriculture and climate change. These complexities have to be seen in the context of the North-South politics and the emergence of further division among the southern countries – between the emerging economies like India, China, Brazil, South Africa etc. and other smaller developing countries who have slowly diverged from

their unified negotiations path of the 1990s and early 2000s. These changes in political positions and negotiations have had a significant impact on how agriculture is seen in the climate change negotiations.

Negotiating climate change in an anarchic international system (Waltz 1979) is bound to be filled with complexities. The right to exploit natural resources lies with sovereign states while the effects of climate change are on a global scale affecting all countries by transcending borders. This dual nature of politics makes climate change negotiations, especially in the context of agriculture, more complicated. Agriculture as a sovereign subject of states deals with food security and raw materials for industries while obligations arising from the climate change negotiations impacting agriculture will entail compromising of policy making autonomy, particularly for the developing countries. The international negotiations dealing with the issue of climate change are focused on designing an overarching framework to address global warming through both mitigation and adaptation.

The countries of the North have tended to retain a focus on a mitigation framework whereas the countries of the South push for a more realistic adaptation framework. These divisions have not been good for the negotiations, in particular for agriculture, as the important issues to be addressed are sidelined.

Issues of food security and emissions reductions from agriculture constitute an important part of the climate change negotiations. Agriculture and its related activities is responsible for 24% of Greenhouse Gas (GHG)s (IPCC 2014: 27); any effort to mitigate these emissions will have an impact on food security (FAO 2016: 71-87), which will be felt more in the global South due to its population densities and levels of dependence on agriculture. These aspects form the core fundamentals of the linkage between the climate change negotiations and agriculture. Understanding the politics of agriculture in climate change highlights the paradox that while the international security community sees climate change as a security threat, it does not recognize the threats to food security emerging from the impact of climate change on agriculture.

The aspect of agriculture in the climate change negotiations appears in a specific way in the politics of states and world politics at large and finds mention in Articles 4, 7, 9, 10 and 11 of the 2015 Paris Agreement. Agriculture, unlike other sectors, is vital for food production and livelihood generation and sustenance, especially in developing economies that are hugely

dependent on the agricultural sector. Food security, which is essential for millions of poor and deprived populations, needs to be strengthened and assured for world populations. Climate change is likely to have a disastrous impact on food security considering the rise of conflicts in climate stressed environments for resources like water and land etc. The 2007-2008 food price crisis has shown how volatile developing countries with large populations that are poor and vulnerable are impacted by a spike in food prices. With societies turning unstable, a platform may be provided for extremist organisations to exploit the divisions to propagate terror, an example being the Boko Haram in the Sahel region of Africa.

The roles played by various state and non-state actors in negotiating agriculture in climate change are important in deciding the path of the larger climate change policy of adaptation and mitigation. The threats emerging from climate change are already forcing the international security community to take cognizance of the issue and act in ways to reduce the impacts; the United Nations Security Council (UNSC) has debated the issue twice, while the United Nations General Assembly (UNGA) has passed a Resolution recognising climate change as a threat to international security. There is a need to study the implications of climate change for agriculture and how this features as a security concern in the understanding of the international community. Going further than recognizing climate change as a security threat, the impact of climate change on agriculture, in particular, must be recognized as a security threat, given the linkage between agriculture and food security.

While addressing the problem of emissions is crucial for the global environment, any attempt to do so is likely to face a strong resistance from states due to their perceived autonomy over decisions relating to food security and livelihoods. Robert Putnam's (1998) division of politics into the 'international' and the 'domestic', with the two levels influencing each other and the domestic acting as the pressure zone for national governments, can be applied to climate change negotiations. Non-state actors have actively participated in and influenced climate change negotiations, and they have also worked to build support at the domestic level for climate change negotiations at the international level. The necessity of states to act on climate change and bring out solutions in this regard has brought Non-Governmental Organisations (NGOs) into the picture as they lend credibility to the negotiation process due to their engagement with the people at large. This has led to a situation where NGOs have acquired a role in developing frameworks within the climate change negotiations. The stance on the linkage between climate change and agriculture varies

across countries, based on differences in emissions and impact on the agriculture sector. The developed countries want agriculture included in mitigation, but the developing countries resist this due to the dependence of large populations as well as the economy on the agriculture sector. The politics of the North-South divide can be seen played out not only between states but also non-state actors, who are mainly issue dependent.

Untimely rains, droughts, storms, cyclones, increasing temperature, etc. affect agriculture in a multitude of ways, directly affecting food security. Agriculture is mechanised in the developed world while the developing world is predominantly labour intensive with small and marginal farmers taking up a majority of the stakes (FAO 2016). Developing countries, especially those in the tropical region and with huge populations, will witness a greater impact, considering the nature of sensitivity associated with agriculture and its role in the economy (IPCC 2014, IPCC 2007, 2014) (FAO 2016: 7-16, 19-25). The effect of climate change on temperature, rainfall, humidity is likely to bring in changes in other related resources like land, water and minerals, hence affecting the growth of crops such as rice, wheat and maize which are likely to have negative effects from the second half of the 21st century (FAO 2016: 21-28,128-136).

The linkages between agriculture, climate change and food security and their subsequent impact on social stability in countries already vulnerable to conflict is an emerging area of study. [The effort of UNSC and other organs of the UN like UNGA have to be seen in totality, especially in the context of the Small Island Developing States (SIDS), for whom climate change is an existential threat due to sea level rise. It is important to understand the reasons behind the securitisation of climate change and the dissensions among countries about the emerging security framework in relation to the threats emanating from climate change. Developing countries call for climate change to be seen as a socio-development problem unlike the developed countries which are pushing to expand the agenda to see threats of migration, conflict and rising sea levels as an international peace and security problem (UNSC 2007; UNSC 2009; UNGA 2009).

It is important to study these linkages and the politics guiding the political stances and negotiations to understand the role of agriculture in the larger picture of the climate change negotiations. The method and form of the policy response adopted will impact both the international security situation and the socio-economic development of countries in relation to issues of conflict, hunger, poverty etc. While identifying climate change as the sole reason

for conflicts in vulnerable regions may not be accurate, it would not be wise to ignore threats emanating from agriculture and climate change as important factors contributing to the changing security scenarios internationally.

This study aims to look into the specific role and influence of both states – who are primary agents in negotiations – and non-state actors – who are the agenda setters through domestic and international mobilisation – in international negotiations relating to climate change and agriculture. Among the state actors, there is a distinction between those who wish to see the agriculture sector being committed to emissions reductions (the Global North led by the European Union and the United States of America) and those who have greater stakes attached to agriculture due to food security concerns and the largely small and medium scale farming (African States, India, China and Brazil) and are therefore against any mitigation efforts that may impact agriculture. Non-state actors who are present in the negotiation process fit into these schematic divisions both in terms of North-South politics and as pressure groups, research collectives and negotiators.

The literature on the impact of climate change on agriculture can be sourced from reports of states (African countries, European Union and others) and non-state actors who have collated and published research that has influenced the negotiations on climate change [eg. reports published by parliamentary committees (Standing Committee on Agriculture India 2016) and policy statements of states (European Union 2008)]. Non-state actors such as international non-governmental organisations have also contributed to research on effects of climate change on agriculture. However due to the scientific nature of the studies carried out by both state actors and non-state actors, the important element of international politics is not adequately focused upon in the literature. For this, it is important to look at country positions at negotiating tables and the processes through which treaties and conventions are adopted.

Climate Change and Food Security: The increase in world populations from the present 7.6 billion to a projected 8.5 and 9.7 billion for the years 2030 and 2050 respectively United Nations Department of Economic and Social Affairs (DESA 2017) will pose a major and growing threat to global food security (FAO 2016) where there is a requirement of increase in the yields of cereals by 40%, net irrigated water requirement by 40-50% with large amounts of land i.e. around 100-200 million ha needed mostly in Asia, sub-Saharan Africa and Latin America (where large amounts of Amazon rainforests are present and creation of more land for agriculture means more deforestation hence more GHGs) (Spijkers

2011). IPCC reports – from the first assessment to the latest one i.e. the fifth assessment report (IPCC 2014) – are an important source for understanding the interface between agriculture and the climate change negotiations.

Food security is defined as “a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO 2002). The widely accepted parameters for defining food security are food availability, access, utilisation and stability (FAO 2006). Climate change is one of the factors that cause food insecurity. It is predicted that the drop in agricultural productivity in the least developed countries will lead to, or worsen, food insecurity with unsustainable rise in food prices across the board (European Union (EU) 2008). It is important to have a food systems approach to information relating to climate change as accuracy of information forms a critical aspect for people – especially the poor – in reducing their vulnerability (Gregory et al. 2005).

As agricultural production is projected to increase in developing countries, so are agricultural emissions as estimates from IPCC for N₂O show an increase of 35–60 percent by 2030 and CH₄ by 60 percent (IPCC 2007b). However with a decreasing area under cultivation, the increase in food grain production would have to happen with enhanced crop productivity (Ravindranath and Sathaye 2003). For example, rice production has to increase by 1% annually to meet the growing food requirement with most of it having to come from existing crop land in order to avoid environmental degradation (Mahbub et al. 2011) as rice production and livestock are the largest sources of methane (Selvaraju 2011). However emissions from the Agriculture, Forests and Land Use (AFOLU) sector have remained similar but the share of anthropogenic emissions has decreased to 24%, largely due to the increase in emissions from the energy sector (IPCC 2014).

The evolution of research on the effects on agriculture of climate change is interesting. The fact that the first assessment report (AR1) keeps agriculture limited to GHG emissions and the role it plays in adaptation (IPCC 1990) raises important questions about how agriculture was seen by the international community at that time. However with the coming of the second assessment report (AR2), the concept of food security was discussed for the first time with a separate section discussing agriculture in climate change (IPCC 1995: 444-460). Later in the third assessment report (AR3), agriculture was discussed in relation to mitigation with an emphasis on reduction of GHGs (IPCC 2007: 30-51). Higher latitudes will

benefit from increase in yields of crops due to higher temperatures with lower latitudes experiencing decline (IPCC 2007: 275-305). These analyses show a trend where agriculture as a sector is more vulnerable in the tropics, which comprise the countries of the global South, with the higher latitudes belonging to the more industrialised countries. Some countries in Africa are bound to face 50% reduction in rain-fed agriculture with Latin America too getting affected; however the higher latitudes such as Northern America projects an increase of 5-15% yields (IPCC 2007: 11).

The decline in productivity from agriculture will have an impact on low income households' access to food as fluctuating food prices will reduce their capacity to spend on food (Herel and Rosch 2010) and on world's small-scale farmers who would see reduced productivity due to limited adaptability (Selvaraju 2011). Close to 1.3 billion jobs (close to 40% of global employment) are provided by agriculture alone, with most of them being the working poor. Migration (internal), in particular labour migration, becomes an important aspect for coping with extreme weather events; as 2014 data shows, 19.3 million people were forced to flee to new places due to natural hazards, most of them being from the global south (ILO 2017).

The Intended Nationally Determined Contributions (INDCs) from COP21 show how both developed and developing countries are determined to address the interface between climate change and agriculture in terms of adaptation and mitigation (FAO 2016). Adaptation decisions work on the basis of how risk is perceived by the society, and in turn act as a barrier or limiting factor when society fails to see justification in action to counter a perceived risk (Adger et al. and others 2009). For better implementation of mitigation and adaptation measures, developing countries have to be guaranteed structural reforms in international trading, transfer of wealth and technology by more direct means (Eckersley 2009).

Disaster risk reduction as a mitigation strategy was for the first time adopted by the United Nations Framework Convention on Climate Change (UNFCCC) through the Bali Action plan in December 2007, calling for enhanced adaptation through policy instruments which share and transfer risks such as insurance and other disaster reduction strategies (Srivastava 2011). Weather based indices are being used by governments for accurate information regarding actions to be taken, however the problems in estimating the basis of risk, cost of risk, and administrative ability to deliver make weather based index a risky proposition for the farmer (Collier .et al. and others 2009). The literature linking agriculture

and food security to impacts on climate change is sufficient but the translation of this scientific knowledge into climate change treaties is characterized by North-South politics and is under-studied.

Agriculture in the Climate Change Negotiations: The Role of Various Actors:

The international climate change negotiations are similar to the regime complex of the 1970s where states represented the interests of the elites, thus making climate change a difficult problem to manage (Keohane and Victor 2011: 8-18) as climate and environment are issues related to the masses. The responsibility of governments to act on climate change emphasises the importance of domestic politics in international politics as disadvantaged countries will seek help and support from the rich to overcome their distributional inequalities (Keohane 2015: 20; Falkner 2016: 1). The possibility of a better outcome from the climate change regime is more if the domestic political systems around the world generate a strong demand for actions that will be complementary with one another (Keohane and Victor 2011: 19).

State and non-state actors have evolved particular positions in the climate change negotiations. The science part of climate change has been the zone of non-state actors where NGOs, through their research, have brought the question of climate change – and particularly agriculture – into the negotiations (Climate Change Action Network, CGIAR Research Program on Climate Change, Agriculture and Food Security, People’s Archive of Rural India, Centre for Science and Environment). Robert Putnam’s two-level theory (Putnam 1988) where both international politics and domestic politics constitute a level influencing each other at every stage is quite prominently visible in the politics of NGOs (Shiva 1993). The multiple interpretations of the Common But Differentiated Responsibilities (CBDR) principle demonstrate a lack of consensus among the developed and developing countries (Friman 2016).

Though having a presence in the climate change negotiations, environmental NGOs (ENGOs) have had limited success in bringing about a change in government positions (Pandey 2014). Their role in compliance as external pressure groups is more important than the punitive action mechanisms for fulfilling a country’s emission reductions (Hovi et al. 2007: 447). The division based on North and South is pertinent in negotiations as we see prominent groups like G-77 plus China, African Group of negotiators, BRICS (Brazil, Russia, India, China and South Africa), India and China (who act as individual countries and part of larger coalitions) with the US and EU being the major states for whom agriculture is

important. African states, as a group, address climate change by initiating larger coalitions formed with G77/China, AOSIS, and others before culminating into the African Group of Negotiators. COP 12 held in 2006 Nairobi, COP 15 held in Copenhagen 2009, and COP 17 held in Durban 2011 proved to be a game changer giving them an important role in the negotiations due to the fragmentation of negotiations (Roger and Belliethathan 2014: 92-96). However, even after such efforts, adaptation – which is a key feature for Africa – was neglected in the negotiations (Roger and Belliethathan 2014: 92-101).

In their submissions to the Subsidiary Body for Scientific and Technological Advice (SBSTA), the developing countries feel that due to the paucity of data and limited research on the impact of extreme events on agriculture, there is a lack of definitive adaptation programmes. There is a need for a participatory approach in EU for adaptation and mitigation as there has been no conclusive programme for deciding technical and financial feasibility (Subsidiary Body for Scientific and Technological Advice (SBSTA) 2016). Similarly, the US, in its submissions, suggests a sound plan to adapt to high heat resistant cattle breeds and crops but does not talk of transferring these technologies and know-how to the developing world (SBSTA 2017). CAN seems to side with the developing countries rather than the developed as it views adaptation as the policy for the former and mitigation to be taken up by the latter (CAN 2011: 1-2).

The issues of inequality, unequal development and injustice have been the central point of global climate politics (Sengupta and Hurrell 2011). The arena of climate change has Northern states for the first time explicitly demanding burden sharing from various subsets of actors in the South (Milkoreit and Hochstetler 2015). The efforts of developed countries to include mitigation in agriculture were resisted by the developing countries as the fear was that mitigation would entail additional costs and burdens for them. However, for sound scientific reasons, mitigation was included in agriculture only for the developed countries (Jayaraman 2015: 74-75). But with the failure of the UNFCCC to explicitly address the damage caused by climate change to agricultural systems, the North is provided with further ammunition to pursue an uncompromising strategy. On the other hand, coercive forms of power shaped by material self-interest and bargaining power (Sprinz and Vaahtoranta 1994: 78-81; Victor 2001), coupled with the global South's perception of Northern callousness and opportunism, have made cooperation difficult. Then British Prime Minister Tony Blair's efforts during the 2005 G8 summit to engage with leaders from Brazil, China, India, Mexico

and South Africa – the emerging economies and ‘big new emitters’ of greenhouse gases – showed how the global North was interested in shifting the global climate change politics in the post-Kyoto phase (Payne 2008: 530).

The “reasonable compromises” (Grubb 2004: 8) in the Kyoto Protocol meant the space given to agriculture was limited if not negligible. Article 2.1 of the Kyoto Protocol speaks of how each Party included in Annex I shall further and implement policies by national circumstances in which promotion of sustainable development is given as a responsibility in climate change condition for agriculture (Kyoto Protocol 1997: 3).

2.1 Each Party included in Annex I... shall:

- (a) Implement and/or further elaborate policies and measures in accordance with its national circumstances, such as:
 - promotion of sustainable forms of agriculture in the light of climate change considerations.

The historical contributions principle was over powered at the Copenhagen conference 2009 where the developed countries, with the support of small island states and least developed countries, pushed the bottom-up approach, i.e., voluntary contributions that are nationally determined and these were accepted as the future for climate change negotiations (Bodansky 2010: 234-38). This later got codified in the official treaty at Cancun (UNFCCC Cancun 2010) but had to wait till the Paris Agreement to be adopted and accepted by all countries (UNFCCC Paris 2015). The Paris climate change policy represents this hybrid multilateralism denoting a bottom-up climate policy arrived at through political agreement (Bodansky 2010).

At Copenhagen, non-state actors played the role of implementers, experts, and watchdogs. However, they have limitations regarding the accountability they can hold vis-à-vis states and IGOs for their inactions (Bäckstrand .et al. 2017: 569-71). The preamble of the Paris Agreement recognises the impact of climate on agriculture by “safeguarding food security and ending hunger and the particular vulnerabilities of food production systems to the adverse impacts of climate change” (UNFCC COP21 2015: 21).

The Paris Agreement does not deal with agriculture directly but recognises its critical nature through Articles 4, 7, 9, 10 and 11 for developing countries dependent on this sector (Verschuuren 2016: 3-5). Overall, the general disregard for agriculture in climate change negotiations is due to the problems related to agriculture at the national and global levels (Jayaraman 2015: 77). The Paris Agreement, which, for the first time, aligned international climate policy with the realities of international politics, will create a concern for food security as its afforestation programmes for carbon sequestration are bound to create food security concerns (Falkner 2016: 9). The Paris Agreement fails to change the troublesome relationship between agriculture policies and climate policies evident under the UNFCCC and the Kyoto Protocol, in which no powerful stimulus was provided for climate-smart agricultural policies (Verschuuren 2016: 3-5). The overlap between agriculture, trade and climate change has slowed down the progress in negotiations for agriculture in climate change as the heterogeneous stance between Annex I and Non-Annex I countries also effects the role of non-state actors as facilitators in negotiations who have expertise, knowledge and capacity building (Kalfagianni and Duyck 2015:4).

The state-centred character of Intergovernmental Organizations (IGOs) has prevented them from questioning and challenging the arrangements and institutions that are responsible for this situation in the first place (Shafer and Murphy 1998: 268-69). Non-state actors have not yet been integrated into the principal mechanism of compliance, illustrating the limitations of this formal space achieved by them (Dannenmaier 2011: 152-55). Similarly trade agreements like the World Trade Organization (WTO), although recognising the need to protect the environment through the Agreement on Agriculture and as a ‘non-trade concern’, giving exemption to developing countries through Article 6(2) for agricultural investment, research for farm practices for sustainable intensification and for policies and services that address climate change (like drought management) does not centrally focus on climate change and agriculture (Smith and Cardwell 2013: 678-89).

Climate Change and Agriculture: An Emerging Security Threat: The United Nations Security Council (UNSC) has been holding debates (2007, 2009, 2011) on the impact of climate change on peace and security with over 50 speakers from all over the world participating in the first discussion in 2007 (UNSC 2007) where agriculture and food security issues were raised and with another discussion in 2009 on the implications of climate change on international security (UNSC 2009). Similarly the United Nations General Assembly

passed a unanimous resolution on climate change as an international security problem (UNGA 2009). Conflicts over resources are going to increase due to heightened migration from falling agriculture productivity and increased flooding risk to coastal settlements causing political and security implications well beyond the borders of the countries affected, for the international system at large (Susan 2010). However Reuveny (2007) argues that environmental migration does not always lead to conflict but when it does, the intensity is high, leading to resident-immigrant ethno-religious tensions resulting from competition over resources, increasing the chance of conflict, both interstate and intrastate.

The role of agriculture in climate change as an emerging threat is implicit in the security discussions of climate change like the case of Palestine where climate change will affect rain-fed and irrigated lands of Jordan and West Bank on which semi nomads are dependent (Feitelson et al. 2012: 251-53). Similarly, internal migration due to climate change (Nordas and Gleditsch 2007) will create resource scarcity (Raleigh and Urdal 2007, Reuveny 2007), increasing population pressures especially in those economies where dependence on agriculture is high (Marchiori and Schumacher 2011: 573). Where there is scarcity of productive land, low agriculture yield and declining agricultural wages, there is more possibility of organized armed conflict (Urdal 2005: 2006). In order to address climate change, the required measures and policies may result in worsening food insecurity through policy shifts in the agricultural sector at least in the short-term (Detraz 2011: 113).

In 2007, the United Nations declared that except for one, all other emergency appeals it responded to for humanitarian aid were climate related (Susan 2010). Weak or failing states may see increasing instability due to climate change triggering or leading to conflicts between ethnic and religious groups ending up in political radicalisation (EU 2008). In North Africa, where dependence on agriculture is high, climate change will make countries vulnerable to conflict due to lower adaptability (Scheffran and Battaglini 2011: 31). By bringing agriculture into the security realm there would be a heightened sense of urgency to methane global mitigation and adaptation (Scott 2012) with focus shifting to emergency politics leading to exclusionary practices where focus would shift away from reducing GHG emissions to fighting indirect causes (Lucke. et al. and others 2014).

The literature shows the scientific nature of the focus relating to the interface between climate change and agriculture, while the international politics of negotiations is found in the declarations, positions and treaties adopted and implemented. The gap in the literature

pertains to the role that states and non-state actors play in addressing the interface between agriculture and the climate change negotiations. Similarly, in the security realm, though the security community has recognised climate change as a security threat, agriculture seems to be an implicit category rather than an explicit one. It is important to know whether this position given to agriculture in the international security debate is due to the politics of international climate negotiations or a natural emerging proposition. The literature does not provide an explicit answer to these questions, hence making a case to study these aspects as a focus of this research.

The study will look at the impact of climate change on agriculture and understand the dynamics of international politics in the provisions relating to agriculture in the climate change negotiations by analysing the role of states and non-state actors. Initially, the study will look at the various effects of climate change on agriculture with a broad focus on existing scientific knowledge on food security. The negotiations aspect of agriculture in climate change will be the principal focus. States are recognised as the basic and sovereign units of international politics. IGOs are the international organisations set up by states to pursue common objectives and agendas. NGOs are those which are recognised as so by the UNFCCC framework – Climate Action Network (CAN), Centre for Science and Environment (CSE) etc. These actors will be studied for their role in agriculture negotiations within the climate change framework through the lens of the politics of the global North and South. ‘Global North’ means the developed countries – those that were the Annex I countries in the Kyoto Protocol with the global South being the non-Annex I countries –broadly the developing and underdeveloped countries. Studying the nature of the impact on the agriculture sector and the climate change negotiations will be incomplete without an understanding of the impact this has on international security. By understanding the nature of the agriculture-climate change linkage, the study will try engaging with the impacts agricultural threats have on international security.

The key questions that this study seeks to raise are (1) How has North-South politics defined the agriculture-related discussions at the global climate change negotiations? (2) Have developing countries being able to prioritize agriculture in the climate change negotiations? (3) What role have non-state actors played in taking forward the agriculture-related discussions within the climate change negotiations? (4) What is the nature of the impact of the voluntary emissions reduction mechanism under the Paris Agreement on

agriculture? (5) What are the international security implications of the agriculture-climate change interface?

The study broadly tests two hypotheses which are formulated as follows: (1) Despite the scientific literature having definitively linked climate change and agriculture, the North-South politics in the climate change negotiations has prevented an adequate recognition of agriculture-related concerns in climate change negotiations; and (2) Non-state actors have played a role in strengthening the role of domestic politics in the international climate negotiations.

The study adopts a qualitative method of research. It is inductive so far as observation precedes theory with an explicit focus on the nature of politics affecting the negotiations on agriculture in climate change and then developing a more general framework for theory. International climate change negotiations are divided between global North and South with various set of actors being part of this divide. This division of international negotiations becomes the dependent variable for the study with various actors like states and non-state actors becoming the independent variable to look at the negotiations for agriculture in climate change. The understanding from the above study is used to look at the debates in international security on the threat emanating for agriculture by climate change. Through these understandings the study also comments on how agriculture plays out in the international security debates.

The study utilizes a wealth of primary sources available in the form of reports from the Food and Agriculture Organisation, United Nations Environment, Intergovernmental Panel on Climate Change, United Nations Framework Convention on Climate Change, United Nations Security Council and other related international and national organisations for climate change. The secondary sources include books, edited books, and journal articles.

This research is divided into the following chapters that deal with the questions raised above in a detailed manner. Chapter 1 is the 'Introduction', which provides an overview of the theme of the study and the rationale and justification of the study. It outlines the structure of the proposed study, identifying existing literature, and formulating research questions and hypotheses. Chapter 2 titled 'Climate Change, Agriculture and Food Security: A Study of Linkages' constitutes a study of linkages between climate change, agriculture and food security through a detailed survey of linkages, relationships and various other factors

affecting food security in the context of climate change. Chapter 3 is titled ‘The International Politics of Agriculture in Climate Change Negotiations: The Role of Various Actors’ and it focuses on the international politics around climate change negotiations in agriculture that need to be studied in order to understand how effective the adaptation and mitigation efforts of the climate change regime will be in limiting the climate change threat. The roles of various actors – state and non-state – are studied in order to understand the role of agriculture in negotiations of climate change. Chapter 4, titled ‘Agriculture in Climate Change as an Emerging Security Threat’, discusses threats emerging from the affects of climate change and contextualizes them in the international security framework. The role of agriculture in the assessment of these threats is studied in this chapter, which looks at the linkages of these threats and tries to understand whether and how the international security debate sees agriculture as an emerging threat in the climate change arena. Chapter 5 is the ‘Conclusion’ and constitutes a summarisation of findings relating to the role of state and non-state actors in dealing with agriculture in climate change negotiations and the international security debate.

Chapter Two

Agriculture and Climate Change: The Scientific Backdrop

The aim of this chapter is to provide a backdrop of the much before the climate change negotiations began, there has been well documented research on the impacts of climate change. However, the specific impact of climate change on agriculture was studied only in a limited way. Various reports have been prepared and presented by intergovernmental organizations (IGOs), national governments and non-governmental organisations (NGOs) . While the range of the literature is huge, this chapter will limit itself to focusing on the science behind the impact of climate change on agriculture. The chapter will look into the scientific information available on the impacts of extreme weather conditions, the role of crop productivity in ensuring food security, changing hydrological cycle and its impact on agriculture, and other related direct and indirect impacts on food security and agriculture.

The chapter is divided into five subsections. The first section – “Climate Change Science: Locating Agriculture in the Scientific Literature” – analyses the reports of the Intergovernmental Panel on Climate Change (IPCC) and other international organisations on climate change and locates the science behind the impacts of climate change on agriculture. The second section – “Climate Change: Impact on Food Security” – will look at the effects of climate change on food security and how directly and indirectly food security gets compromised due to climate change. The third section is titled “Climate Change and the Impacts of Droughts, Floods and Water Stress on Food security” assesses in detail the direct and indirect impact of climate change on food security and agriculture. Not only that but the impact on the non-Farm Sector directly and indirectly due to floods, droughts and climate extremities will be looked into from the perspective of climate change. The fourth section – The fourth and last section focuses on the issue of “Global Green House Gas Emissions and Agriculture’s contribution to GHG’s”, the dangers emanating from the agriculture sector for total GHG emissions and the politics behind prioritizing mitigation over adaptation.

2.1 Climate Change Science: Locating Agriculture in the Scientific Literature

Climate change is a reality of the post-industrialisation 21st century. However the science behind this reality is not unequivocally accepted. Its challenged, ridiculed and even relegated to margins by scientists, world leaders and people with vested interests. Biggest of all sceptics Donald Trump, President United States of America withdrew US from the Paris climate pact. Though the reasons indicated revolve around the aspect of US bowing down to other global powers but deep beneath lie ripples of diffidence towards the science. However the acceptance of climate change is growing day by day with the reality of it becoming a daily experience. Changing weather patterns, rising temerity of heat waves, irregular rainfall and other events have corroborated the science with everyday experience forcing governments to change their positions towards climate change and act quickly.

Global warming, rising sea levels, changing precipitation patterns are set to wreak havoc by replacing certain and predictable weather patterns with uncertain and erratic weather. Though the impact is ubiquitous – spread across all sectors, agriculture stands out due to the importance it has in food production and supply of raw materials for other industries. The science behind climate change has existed since the past three decades. It is important to locate agriculture within the science of climate change, especially focusing on the role it will play on food security. Nation-states have been trying to understand and devise policy responses to counter the effects of climate change. Their actions and understanding are based on scientific literature produced and researched by scientists and collated by intergovernmental organisations like the *Intergovernmental Panel on Climate Change* (IPCC). Though the IPCC's role is of an assimilator at a global level rather than of a primary generator of research, it has been guiding and feeding into the international negotiations on climate change as well as the responses of various actors over the past three decades.

Agriculture, despite its critical importance for both industry and food production, has not found enough space in the discussions and negotiations around climate change. It is relevant to ask whether this is a result of the absence of science establishing the linkages between agriculture and climate change or the absence of policy response to the available science.

Agriculture is a major contributor to the economy in the developing countries, in terms of GDP, employment and food production. The rising global Green House Gas (GHG) emissions have drawn attention to the role of agriculture in contributing to the overall emissions. Cropping patterns, energy usage, farming practices, livestock rearing and other aspects of agriculture have had a significant impact on global warming and GHG emissions. However, it would be unfair to look at this sector only from the aspect of emissions as the necessity of agriculture lies in ensuring food security for populations not only in the developing countries but also world over.

The average share of agriculture in the GDP of developed countries is 2% as compared to 13% in developing countries (IIASA 2002: 16). Countries in western, eastern and central Africa and South Asia have agriculture sharing 31% and 25% of their respective GDP's. Moreover, nearly 25 countries share a cumulative GDP share for agriculture ranging from 40-60%, making them highly dependent on agriculture for their livelihoods and food security. Nearly 75% of the total population of the poor globally reside in the rural areas, making them vulnerable to the impacts of climate change (International Institute for Applied Systems Analysis (IIASA) 2002). "Cascade of multiplicative uncertainties" defines the complexities in understanding the impacts of climate change on various climatic variables acting in local conditions. These variables range from livestock systems responses to biological changes, uncertain projections, cropping patterns and "the potential benefits and cost of adaptation responses to climate change" (OECD 2014).

In the early 1990s the scientific literature relating to climate change did talk about agriculture but, interestingly, from the perspective of the impact of agriculture on climate change.. The IPCC reports spoke of increase in nitrous oxide quantities in the atmosphere to the tune of 8% since pre-industrial times. This statistic indirectly pinned the onus for these rising emissions on the agriculture sector (IPCC 1990: 23-44). Similarly, the atmospheric concentration of various gasses like methane, nitrous oxide and carbon dioxide grew significantly from 700 to 1720 ppmv³, 275 to about 310 ppmv³ and 280 to almost 360 ppmv³ respectively by 1995 due to fossil-fuels, anthropogenic activities, and agriculture and changing land activities (IPCC 1995A: 4). Other climatic variables like soil moisture and precipitation were studied in detail as their role in the maintenance of agriculture and other ecosystems was necessary;

few model studies, however, were taken up to understand the impact of climate change on agriculture. (IPCC 1990: 55-254). Experiments did show an inverse relationship between increasing GHG gasses and falling soil moisture, correlating to less precipitation (IPCC 1990: 55-254). While this focus on rising emissions is not uncalled for, but its limited focus was a problem with the scientific literature of the early 1990s.

The second IPCC report (1995) and the post-Rio conference scenario changed how agriculture was looked at by the scientific community as the element of uncertainty was given primacy while studying climate change and agriculture. Though agriculture was no longer overlooked in the context of climate change, there was uncertainty about the nature of the linkage – as for “...climate impacts on agricultural production, it is not possible to distinguish reliably and precisely those areas that will benefit and those that will lose” (IPCC 1995B: 429). This uncertainty can be attributed to the unreliable predictions of climate change models and complexities arising out of estimations in various regions. The second IPCC report did recognise the vulnerability of low-income populations like the previous report, especially in the Pacific Island countries, Sub-Saharan Africa, Latin America, South and Southeast Asia where populations are dependent on semi-arid and arid regions and dry-land systems of agriculture (IPCC 1995B).

All these reports were uniform in their predictions about the variance in effects of climate change across climatic zones and latitudes, predicting no effect on food production globally but regional impacts such as a fall in food grain production in the tropics. The maintenance of baseline production does not guarantee food security as these regional discrepancies will increase the chances of famine and hunger where there is a shortfall (IPCC 1995A: 7-25). It is important to note that the tropics have already reached their threshold temperature tolerance and any increase in temperature would adversely affect the food production, hence impacting food security (IPCC 2001C: 11). The reason for yield reductions lies in the science of photosynthesis and the type of crops grown in these regions. The distinction among C₃ and C₄ crops lies in the amount of carbon storage the plants hold where the C₃ variety have three carbon atoms incorporated into the first compound of carbon dioxide against four carbon atoms for C₄. The former are important tree species such as barley, wheat, rice, potato

and cassava and the latter include sorghum, sugarcane and maize. Where the former include important tree and crop species, such as wheat, rice, barley, cassava, and potato, the latter grow in much warmer conditions, include crops like maize, sugarcane, and sorghum. Due to the variation in usage and storage of carbon dioxide, increase in temperature reduces the yield in crops in the tropical regions and will affect the C₃ due to their photosynthesis processes (IPCC 1995). This change in crops, accompanied with reduced soil moisture and soil degradation due to climate change, will impact food production and endanger the food security of large populations (IPCC 2001C: 30-45).

Agricultural production is not going to get affected uniformly; there is going to be a difference in the impacts it will have on rain-fed areas and irrigated lands, high latitudes and low latitudes and with various regional and local variations across continents. Due to land degradation, regions in the arid and semi-arid areas of Africa will face a reduction in agricultural land for cultivation, productivity and duration of the agricultural season. Their dependence on rainfall for production crops affects them more adversely than other regions. The threat to degradation is not just inland; coastal areas especially the mega-delta regions of South-East, East and South Asia will be impacted most due to inundating sea water resulting from rising sea levels, affecting food production at large and food security of millions. In contrast, the higher latitudes will see a rise in production, especially the northern European countries who will benefit from rising temperatures in the agricultural domain, with southern Europe bearing the brunt of productivity loss, drought and floods similar to the lower latitudes (IPCC 2007: 1-14).

Climatic conditions and weather patterns are changing; Asia with the world's largest population is already witnessing these changes. The Arabian Sea, Pacific Ocean and Bay of Bengal – the origin of cyclones hitting South, East and South East Asia – are already seeing the intensities of these cyclones grow. When these strong intensity cyclones mix with natural phenomena like El-Nino and ENSO, a deadly combination of floods, landslides and mudflows occurs, damaging agriculture and food production. Similarly, when countries are affected by drought, the severity is above normal, destabilising crop production and in turn impacting food prices. The last three decades have seen a rise in the number of heat waves, with a decrease in a

number of rainy days. These prolonged heat waves coupled with increasing water stress have been responsible for falling productions of wheat, maize and rice in regions of Asia (IPCC 2007: 461-478).

Considering the state of dependence of African economies on agriculture, which ranges from 10% to 70% of GDP with an average of 21%, climate change will have an adverse impact on their agriculture as losses are estimated to spike up to 50% by 2020 especially in rain-fed areas (IPCC 2007: 59). The slightest of temperature increase in the tropical countries will have an adverse impact on food production due to the thermal threshold reached by food crops in these areas. Scientific studies have a common denominator about the negative effects on crop production of rice, wheat and maize taking into account – for both temperate and tropical regions – a two degree Celsius rise in temperature locally from a pre-20th-century baseline. Considering the other elements of rising demand for food, population growth and water stress, a degree Celsius rise will be disastrous for the poorer countries. Irrespective of the temperature rise, the clear indication of the scientific study is of the dangers posed by climate change to food security, impacting food production, food price stability, and access and affordability to food (IPCC 2014: 71).

The stress resulting in the tropical areas in the production of staple food crops such as maize, wheat and rice will be borne by marginal and smallholder farmers, not only in the form of reduced production but also falling incomes and reduced affordability and access to food, making the situation food security worse for the vulnerable (IFPRI 2016: 13-21). Productivity losses in the Asian countries, especially the Southeast Asian region, range from 2% to 26%. Vietnam will see losses due to climate change about 2-15%, Thailand 26%, 2–15% in Vietnam, Indonesia, 6-18% and 12–23 % in the Philippines. Being coastal countries, there is an estimation of 33 centimetres rise of sea level by 2050 with a 2.5-degree increase in temperature in the Mekong River Delta and salination of soil in the elta regions (IFPRI 2010: 7-10). These regions account for major food production and will affect food security in the region. Smallholder agriculture is likely to be affected world over, with the most vulnerable and neglected groups suffering from acute hunger and poverty. Nearly 500 million farm owners are smallholders, and 80% of food is produced by them in Africa and Asia. Climate change magnifies their vulnerabilities in relation to food security

and livelihood (IFPRI 2016: 13-35). By 2080, FAO estimates that climate change-induced droughts will affect 20% of arable land, turning them into deserts and intensifying the process of desertification. Three billion people are at risk from the impacts of climate change, especially smallholder agriculturalists who occupy 40% of the world's drylands where nearly 12 million hectares of land is lost annually to desertification (IFPRI 2016: 13-35).

According to the *International Model for Policy Analysis of Agricultural Commodities and Trade* (IMPACT), food grain production in the developing countries should increase 60% compared to 2010 levels; however there is a 10% reduction if we take into account the impacts of climate change. Similarly, other studies indicate that though per day consumption of calories sees a 9% growth, nearly 500 million people go hungry. When we account for the impacts of climate change, the “differences in access to food within and between countries” (IFPRI 2017: 109) will bring a greater cause of concern.

Climate models predict a gloomy picture for staple crops over the years. By 2050, rice, a staple crop for the developing countries, will see marginal growth in production for developing countries and falling growth in middle-income and developed countries. However, this scenario changes with mitigation, with rice production increasing in the range of 17-33% in low-income countries, taking over the growth of wheat in developed countries in similar circumstances by a growth rate of 11-24%. With perfect mitigation, developing countries will see the highest growth rate for wheat production, i.e. 41-94%. On the other hand, maize does relatively well even with climate change, with its production increasing in the range of 20-59% for both developing and developed countries. What is dangerous from the picture that emerges is the reduction in production of wheat and rice, which are the staple food for the developing and poor countries (IFPRI 2010: 36-41). Taking into account the projected population growth to 8.5 billion by 2030 and 9.7 billion by 2050, most of it located in the developing countries, not only complicates food security but demands a perfect mitigation scenario.

The role of IPCC has been critical in ensuring the scientific linkages of agriculture and climate change. However the role of FAO, IFPRI and ILO are overshadowed by the contributions of IPCC. FAO through its annual reports, special reports and its other policy papers has ensured the science of climate change on agriculture be specific and emancipatory for the vulnerable sections of society especially the smallholder farmers. The significance of FAO lies in its advocacy through science explaining the dangers to the smallholder farmers in arid and semi arid regions of tropical areas specifically developing countries. Similarly IFPRI significance lies in concentrating on the effects of crop losses on food security for developing country populations and how climate change scenario will bring hard policy choices for developing countries. However, ILO sees the science behind climate change in agriculture as a threat to food security from the perspective of migration, livelihood loss and pressure on existing lands for both employment and food production. Out of the all it's the role of FAO that is critical due to the engagement it has established with smallholder farmers of developing countries but due to this importance it's the least preferred as a dependent model for climate change negotiations. IPCC predominance on GHG's make it convenient for developed countries to give it primacy and coopt its science as acceptable unlike the FAO's and other international bodies.

Table 1: Agriculture in IPCC reports

IPCC Report	Significance for Agriculture
First Assessment Report 1990	<ul style="list-style-type: none"> • The talk about Agriculture was limited to growing GHG emission like Nitrous Oxide, Carbon Dioxide • The focus was primarily limited to GHG emissions contributions. • The only scientific linkages about the dangers to agriculture from climate change were found to be decreasing soil moisture due to increasing GHG gases in atmosphere.
Second Assessment	<ul style="list-style-type: none"> • The focus on GHG emissions aspect from

<p>Report 1995</p>	<p>agriculture continued even in this report. However there was recognition of threat to food production due to impact of climate change on agriculture.</p> <ul style="list-style-type: none"> • There is recognition of these impacts being of varying impacts in different regions. Production might increase or decrease depending upon the local settings. • The threat to semi-arid, arid regions, subsistence agriculture (10% of world population depends on it) and rainfed farming of the world is recognised as food production is estimated to reduce in these regions and practices. • Talks of increasing technology and the necessity to implement adaptation mechanisms in agriculture to deal with the impending threats from climate change. • Threat of sea level rise to salinity of soils especially in coastal areas like in countries like India which have long coast lines and dependent on delta regions for food productions will be affected due to climate change. • Requirement for water and migration from drier pastures will put pressure on water requirements and wet lands damaging the prospects of food security. • There recognition about the lack of resources with the vulnerable section of population and regions of the world to use the technology to adapt hence “availability of financial resources, technology transfer, and cultural, educational, managerial, institutional, legal and regulatory practices, both domestic and international in
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	<p>scope”. (IPCC 1995: 40-60).</p> <ul style="list-style-type: none"> • Increasing temperatures, changing precipitation will put pressure on energy requirement for irrigation in return having an on agriculture through aggravation of impacts climate change. • Threat of extreme climate events on agroindustry and agriculture is discussed and how adaptation is key to deal with the crisis. • Conflict and migration will impact food security and food production especially in developing countries with unstable societies. • There will large-scale impact of El Nino and ENSO, growing cyclones on agriculture production. • Livestock rearing will be affected. • Insects, pests and diseases will increase due to rising temperatures, climate extremities, changing rainfall and other related events impacting agriculture production. • Populations in South Asia vulnerable due to high dependence on agriculture, similarly the regions of sub-Saharan Africa too will be affected. North Africa and West Asia will see impacts of climate change increasing on agriculture as threshold to temperatures is already reached due to their climatic conditions. • Canada, the USA, Oceania and Europe due to their low share of dependency on agriculture and high Gross National Product (GNP), their vulnerability to climate change on agriculture, hunger and severe economic stress reduced. • SIDS countries particularly vulnerable from both climate extremities and sea level rise to food
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	<p>production.</p> <ul style="list-style-type: none"> • Greater dependence of country's economy on agriculture increase threat to impacts of climate change on agriculture.
<p>Third Assessment Report 2001</p>	<ul style="list-style-type: none"> • This report is an extension of Second Assessment Report 1995. It aims to develop on the science aspect of impacts on climate change on agriculture. • Though increase in carbon dioxide helps in crop production but there are limitations to this benefit as greater increase will destroy the ability of plant to produce better yields. • In tropical areas there will be production losses and lower yields due to reaching to maximum temperature tolerance reached by some crops. Any increase in temperature will affect productivity and production negatively. Similarly any decrease in rainfall too will have significant if not greater losses to productivity and production. • Growth of average mean global temperature will increase food prices, reduces supply in terms of increasing food demand affecting food security holistically. • Africa, Asia, and Latin America are considered having low adaptive capacity due to lack of resources and technology compared to high adaptive capacity of Europe, Australia and New Zealand, North America. • Desertification will increase in Africa, Increase in droughts, floods, and other extreme events would impact food security in Africa, Asia and Latin

	<p>America. Northern Asia will see increase in food production. Adaptation has possibility to reduced this impacts and ensure food security.</p> <ul style="list-style-type: none"> • Leaving the risk of coastal flooding North America, North Europe, Australia and New Zealand will benefit from positive impacts on agriculture production. • Positive impacts on agriculture in higher latitudes and negative impacts on lower latitudes due to climate change. • High uncertainty about the nature and range of impacts on agriculture makes it difficult to give confident certain reports. • Its contentious to say that the advantages of increase production in temperate agriculture will compensate for the losses resulting in the tropics or elsewhere like the sea level rise in Bangladesh. In climate change “winner doesn’t compensate the loser” (IPCC 2001: 97). • There is uncertainty about the how much price rise will happen in a climate change scenario. But there is a prediction of 80 million extra people going hungry by 2080 with 70-80% of them being from Africa alone. • Agriculture contributes 20% of GHG’s and have to be controlled through technological interventions like carbon sequestration, conservation tillage, enteric methane control and others
<p>Fourth Assessment Report 2007</p>	<ul style="list-style-type: none"> • Reiterates the previous reports predictions about crop losses, food security, regional variances and with advanced estimates for 2030.

	<ul style="list-style-type: none"> • It is certain that agriculture productivity will increase in the colder environments and decrease in warmer environment. • It is very likely that warmer regions will face the lower yields due to increasing heat stress. Crop losses will increase with incidents of soil erosion also on rise. • Areas affected by droughts, cyclones and climate extremities likely to increase livestock deaths, land degradation, wild fires, damages to crops, sea water inundation, and increased salinity of soils in coastal areas and fall in food production.
<p>Fifth Assessment Report 2007</p>	<ul style="list-style-type: none"> • An increased Methane emission in atmosphere is primarily due to agriculture and fossil fuel usage. Methane emissions growth rate has considerably decreased post 1990, however nitrous oxide emissions are primarily associated with agriculture. • By 2020 Africa will see 50% fall in production in rainfed agriculture systems. Cost of adaptation for Africa falls under 5-10% of GDP. • Central, South, East and South-East Asia, will see its freshwater availability decrease and become limited by 2050 especially from river basins. • Southern Europe, Eastern and Southern Australia will face severe crisis from fall agriculture production with high temperatures droughts being the reason for former and forest fires and drought being for the latter. • Talks about improved mitigation strategies available for countries which are successful in reducing GHG emission from agriculture.

	<ul style="list-style-type: none"> • Between 1970 and 2004 the growth rate of GHG emission from agriculture were less as the leaders in emissions were the residential and commercial buildings, transport and industry.
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Source IPCC Assessment reports 1990, 1995, 2001, 2007, 2014.

2.2. Climate Change: Impact on Food Security

All four aspects of food security – availability, accessibility, utilisation and stability – will be affected by climate change. The Food and Agriculture Organisation defines food security as “...a situation that exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets the dietary needs and food preferences for an active and healthy life” (FAO 2001: 49). Climate change is likely to disrupt the stability of food supply due to climate variations coupled with increasing demand on limited food resources (Selvaraju 2011: 187-211). To meet with the demands of the growing population both food production and cropping area will need to be expanded –an additional 185 million hectares of rainfed cropland (+19%) and an additional 60 million hectares of irrigated land (+30%) will be needed (IPCC 2007). According to FAO estimates, the overall food production needs to be increased by 70% to feed 9.1 billion people by 2050 (FAO 2009). Poor households are dependent on agriculture for around two thirds of their income, directly or indirectly, making them vulnerable to any discrepancy in production or rise in prices of food stock. It would also affect their ability to access food since a large majority of the world’s poor reside in rural areas and depend on agriculture for their livelihoods. It would also become difficult to ensure food security and access to populations who are not engaged in primary activities (Lobel and Burek 2010: 22).

Climate change will hit those living closer to the equator hardest. Coincidentally, it is in this region that the most densely populated countries fall. This is also home to the world’s poorest and most vulnerable. The primary source of food in these countries is wheat, rice and maize. Any fall in production of these crops due to climate change could lead to a humanitarian catastrophe. It has been suggested that

to keep up with the population growth, the production of foodgrains needs to be doubled by 2050 (Trethowan et al 2010: 155). The developing countries need to increase the demand for cereal yields by 40% and their net irrigation by around 50%. There is also a need to bring 100-200 million hectares of land under harvest in Asia, Latin America and sub-saharan Africa (Spijkers 2011: 217-229). Populations in this region run the highest risk of loss of livelihoods resulting from temperature increase, weather extremities, change in patterns of rainfall, shifts in growing season, and degradation of natural resources. (Sivakumar and Stefanski 2011: 13-23).

A rise of 4-degree Celsius temperature would have dire consequences for agricultural production and could severely affect the nutrition of the global population. The World Bank has also expressed its apprehension about this global temperature rise. However, this concern is not shared globally since the scientific literature on agriculture, nutrition and climate change fails to grasp the severity of the situation and remains mostly conservative. The IPCC is apprehensive about the situation and has suggested that temperature increase be contained to below 2 degree Celsius from the pre-Industrial period. A report published by the IPCC has predicted a slight increase in global food production but only if the global average temperature does not increase beyond 3 degree Celsius. The basis of this prediction is an expectant assessment of the carbon fertilization effect on agricultural production and keeping the extreme weather events away from the assessment (Butler 2015: 275-279). The optimistic assessment by the head of the World Food Programme (WFP), Josette Sheeran in 2011, that predicted an increase in food production per person, fails to take into account the diversion of food crops into biofuels. In the US, more than 40% of the maize goes into the production of biofuels while more than 98% of Brazilian sugarcane is also used for biofuel production. These crops cannot be accounted as food crops since they are not for human consumption and are essentially “food fuels”. The increasing food prices since the prediction made by Sheeran further challenged his optimistic assessment about the increase in food production (Butler 2015: 275-279).

A record increase in the frequency of heat waves has been noted in Europe, Asia and Australia and research indicates that this could give rise to the extreme heat wave phenomenon that was only witnessed twice in a century earlier but could now occur

twice a decade. This phenomenon has been attributed to climate change and has affected the future policy directions in Europe since 2003. Such heat waves have killed 30,000 and led to an economic loss of US\$ 14.7 billion to the agriculture sector of the European Union (UNEP 2016: 46). Typhoon Haiyan (Yolanda) in 2013 was a catastrophe of monumental scale, especially for agriculture in coastal areas. Nearly 8,00,000 people were displaced with 6,300 dead and 2,60,000 tons of rice produced got destroyed due to the havoc caused by floods and strong winds. In another development, glacial melting is increasing due to warmer winters, causing sea level rise and increasing height of storm surges. The Philippines, for example, has been witnessing surges which are 30 centimetres higher than the 1993 sea level (UNEP 2016: 46). The talk about adaptation post disaster and strategies with futuristic predictions provides no relief for agriculture from these climate extremities.

Households in the Horn of Africa and the Sahel region, who were severely affected by drought-related famines in the 1980s, have seen damages to their economic and health status. Some writers wonder whether, with climate change setting in, such kind of indemnities will become a permanent feature for the vulnerable (Lobel and Burek 2010: 135). South Asia will be worst affected due to the tolerance threshold being reached by crops in relation to rising temperatures. Any changes will have adverse impacts not only in the form of intense cyclones but also productivity of food crops affecting food security. Lack of financial and technical assistance to deal with rising pests and diseases due to incidence of climate change will affect the profitability and sustainability of the small-holder rainfed farmers who constitute the majority. In order to ensure food security and proper protection to these farmers, there need to be policies to ensure adaptation practices (Sivakumar and Stefanski 2011: 13-23). There is likely to be a greater amount of disaggregation in South East and South Asia within the agriculture sector due to requirements of land from other sectors; however there will be an increase in acreage in Africa as compared to other regions and developing countries. This limitations in South Asia will influence food prices, increasing the constraints on agricultural land expansion (Wiebe .et al. 2015: 7-10).

The impact of climate change on food security is accepted; the differential impact on different actors is now a topic of concern. Smallholder farmers from the

tropics, especially from the arid and semi-arid regions, will be the worst effected not only due to crop losses but due to increase in food prices affecting their access, affordability and availability.

2.3. Climate Change and the Impacts of Droughts, Floods and Water Stress on Food security

A factor that differentiates farm households and non-farm households in terms of their being affected by climate change is that while the latter are not directly affected by it (being dependent on different sources of earning) the former are because of their dependence on the primary sector. In case of agriculture being the major or dominant employer, those non-farm households which don't depend on it (especially the ones with unskilled workers) will still have a bearing effect on their incomes due to the increase or decrease in wages in agriculture sector . Therefore, the changing prices and productivity may induce a ripple effect regarding earnings and subsequently food security for the poor. Thus, climate change induced uncertainty has a tailing effect on wages and food security (Hertel and Rosch 2010: 367-370). Climate change, therefore, has a bearing for all sections of society but for [these vulnerable smallholder farmers in particular compared to the non-farm households are comparatively at a higher risk of damage and danger posing a further risk to global food security (CAN 2011).

Moving further, the smallholder and subsistence farmers would be affected even harder as in their context, climate change induced impacts would be of local nature and hence more unpredictable. A combination of factors like smaller farm size, choice of crops and livestock species for the households and their non-market interaction will only make it more difficult to predict the impact of climate change and the extent of its complexity. The vulnerability of such households is further deepened by elements such as low technology, lack of capital, smaller farms and a myriad of non-climate stressors (Morton 2007: 1-6). According to IFAD (International Fund for Agricultural Development), in developing countries, 50% of the rural population constitutes of smallholders, i.e. owning just three hectares or even less cropland. This section and the landless population – which is around 25% – are involved in many other occupations (Morton 2007: 1-6). It is important to note that small-scale and local food producers comprise the majority of global food production (CAN 2011).

In the arid and semi-arid climatic regions of the world, due to the extreme weather patterns, water stress is of concern as it remains an essential component of domestic, drinking, agricultural and industrial use. It is estimated that an amount of 5600 km³/yr of consumptive water will have to be added to fulfil the food requirement by 2050. Going by the present levels, it would mean doubling the present amount of 6800 km³/yr.* as 5600 km³/yr needs to be added to meet the requirements of food production by 2050. Compared to the domestic water supply, the usage of water for a single person will cost 70 times more if the acceptable nutritional diet is considered (Falkenmark 2007: 10-15).

Conflicting tendencies have come into play due to lack or absence of proper debate on the issue of global food security. For instance, in the quest for raising the nutritional levels and simultaneously adding the quantity of feed to fulfil the requirements of the rising population, there has been a shift towards more water-intensive foods like meat. Besides, with ever-increasing urbanisation and subsequently, due to increased stress on surface water and consistently shrinking groundwater levels, the productivity level of land has been decreasing as it is becoming more saline or facing erosion. This has added to the complexity of the issue of food security Falkenmark 2007: 10-15).

As per WFP's (World Food Programme) 2011 report, because of natural calamities like drought, flood and other emergencies, almost one-third to one-half of populations in South Asian countries were effected directly or indirectly due to their dependence on agriculture (World Food Programme, 2011a). South Asian countries' over-dependence on monsoon for its water and other agricultural needs exposes them to the uncertainties of floods and drought. Monsoon flooding also affects the coastal areas and plains of Bangladesh and India, with severe landslides and cloudbursts in the Himalayas causing distress in most of northern India and Nepal, primarily due to floods (ReliefWeb 2011). The practice of using groundwater for irrigation as well as other agricultural purpose has created "colossal anarchy" in India (Shah 2009), creating immense pressure on arable land, both extensively and intensively. This over-reliance on groundwater has made a shift from traditionally used large-scale irrigation methods through canals and other irrigation delivery mechanisms to groundwater (NRC 2007: 87-127). In such a groundwater dependency scenario, the

effects of climate change will complicate the matters of food security. Small farmers who are already vulnerable to fluctuating costs and changing dynamics of resources will have to face terminal debts to save their livelihood. Similarly, data from the preceding century shows that in the South Asian region, natural disasters have been dominated by floods; both in intensity and frequency, but if viewed in terms of lives lost due to natural disasters, famines and drought emerge as a dominant cause (NRC 2007: 87-127).

Climate change has multidimensional effects on agriculture. Cyclones, drought, floods, heat waves and other severe weather events have a cascading effect on agriculture, either directly or indirectly. For instance, the Himalayas have abundant glaciers and are a lifeline to the majority population of the Northern Plains due to the fact that many major rivers originate here. Reports indicate that from the 1960s the Himalayan range has lost about one-fifth of its ice cover. The Gangotri glacier (30km long ice block), which is responsible for the origin and survival of numerous rivers downstream in the northern plains, is retreating @ 22m/year, and has lost about 5% of its length from 1934 to 2003. Some authors might disagree with this glacier melt argument, arguing that rivers shore up their water from monsoonal rains and do not depend only on glaciers (Lal 2011: 3-13). However, rising temperature is causing fluctuations in monsoon rains, causing extreme floods and droughts, thereby affecting agriculture and food production in the arable river belt (ReliefWeb 2011).

The ENSO (El Niño-Southern Oscillation) occurs in every two to seven years because of the warming of the tropical Pacific Ocean, and lasts for six to twenty-four months, resulting in cyclones, droughts, floods, forest fires and extreme rainfall. The last ENSO was the fiercest in the last 100 years, inflicting huge damage to crops, livestock and livelihood worldwide and placed about 60 million people's food security and nutrition under threat (FAO 2016: 25-37). The effect of extreme weather events on agriculture is also cascading. In developing countries, agriculture and allied sectors bore a damage of 30 billion dollars during 2003-2013. This shows that agriculture on an average, "absorbs 22 per cent of the total economic impact caused by natural hazards" (FAO 2015: 5-6), out of which crops bear 42% of the damage and livestock 36%. As examined from 2003 to 2013, agriculture production of these developing countries faced around 25% of the total economic impact of climate-

related disasters; and when only drought was counted, the share of economic loss for agriculture went up to 84% (FAO 2015).

For countries like “Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Ethiopia, Kenya, Mali, Mozambique, Nepal and Niger among others, agriculture alone contributes as much as 30 percent to their national GDPs”. In countries such as “Bolivia, Cambodia, Cameroon, Guatemala, India, Indonesia, Nicaragua, Niger, Philippines, Sri Lanka, and Viet Nam, and over 60 percent of people in Burkina Faso, Ethiopia, Kenya, Madagascar, Mali, Tanzania, Uganda and Zambia” the share of agricultural labour in overall employment stands at 30 percent (FAO 2015: 1-16). Most of these countries either have coastal climates or are part of arid and semi-arid regions. IPCC and other reports have shown how due to increasing heat there will be changes in precipitation hence increasing the frequencies of extreme weather conditions like floods and droughts. The FAO study found 60% of the damages caused to crop subsector are from floods, followed by storms with 23% (FAO 2015: 1-16).

Many parts of Asia will be confronted with extreme events of rainfall that too with an increase in frequency as per the fourth assessment report (AR4) of the IPCC. This will cause an increase in other natural calamities like severe floods, landslides, debris/mud falling etc. Further, these events will take place simultaneously thus reducing the number of days of rainfall and hence reducing annual amount of rainfall (IPCC 2007). This will wreak havoc on farmers. First, people depending on rain-fed agriculture will be severely and directly affected, and second, there will be an increase in crop losses and damages due to the rainfall being concentrated on very few days (IPCC 2007; Sivakumar and Stefanski 2011: 16-19). According to the UNEP analysis of 50 years of India’s rainfall data, the frequency of severe rainstorms has increased. It also highlighted that for some of the storms, there had been a 10% increase with a rainfall of more than 100mm within a day (UNEP 2007).

In the recent decades, an increase of 1-3 degree Celsius in temperature has been observed in some parts of Asia. There has also been a trend of spatial variability in rainfall with coastal belts witnessing inter-annual and inter-seasonal variations while areas such as Bangladesh are seeing an increase and arid plains of North East India and Pakistan have seen a decrease in mean annual rainfall (Sivakumar and Stefanski

2011: 13-23). Amongst all the people, it is the rural population of around 2.6 billion that, because of depending on agriculture for its survival as well as livelihood, remains the most vulnerable to climate change and is adversely impacted by it (Selvaraju 2011: 187-211). In developing countries and small islands, 50% or more of the total animal protein intake is fulfilled by aquatic animals (FAO 2008d).

Biofuels have emerged as an alternative to counter the the rising emissions of GHGs from fossil fuels. However, what is overlooked is that these biofuels grow on the same lands used for the food crops, thereby reducing the total acreage of croplands and even hampering food crops. As per an estimate, because of the associated technologies, feedstocks and biofuels, the emissions reduction from maize would be the smallest with around 10%-30% while from the second generation sugarcane biofuels, these reductions would be the largest (FAO 2009). What is overlooked here is that biofuel production may entail clearing of forests, releasing emissions (Selvaraju 2011: 187-211).

The Food and Agriculture Organisation of the United Nations (FAO) argues that in the alleviation of poverty and rural development, the role of bioenergy has an important role to play. It has risks associated with it for food security and potential for opportunities for increasing investments in agriculture as increasing consumption of these products by the energy industry will rejuvenate the policy responses towards agriculture. However, there is also a risk of its possible disastrous effects on food security if not handled appropriately (FAO 2008). The challenge of achieving food security in the time of climate change is further sharpened with the addition of bioenergy and its growth. A sustainable path has to be laid to ensure that the role of agriculture as a supplier of fibre, food, fodder and now energy is balanced without compromising food security (FAO 2008) as it crowds out limited resources.

This dilemma and complexity about the threat to food security from rising biofuel production has been addressed to an extent in Brazil, where biofuels are their future not only to reduce GHG emissions but also to ensure food security. Brazil does not see any conflict between the usage of farmlands for biofuel production and ensuring food security and the Brazilian government launched and supported programmes like ‘ethanol diplomacy’ under the leadership of Luiz Inácio Lula da Silva Prime Minister during 2006 who gave more priority to reducing GHG’s in the

energy sector (Aamodt 2015). Biofuel production is not free of GHG emissions as it requires land to grow and it also contributes to growing emissions. The price a country pays for biofuel production comes from clearing grasslands or forests or diversion of land from food crops. Keeping the diversion aspect aside, any attempt to clear forests or grasslands will add to mounting cost of emissions as such practices release stored carbon, methane and other GHG's from the soil. Food security will get impacted due to this diversion and clearing of forests as this would have a direct and indirect impact on precipitation patterns. The pricing of food crops is also significantly affected; various studies have shown how soybean prices increased with the clearing of the Brazilian rainforest (Searchinger 2008: 1-4).

The biofuel industry has grown significantly over the years, especially with the rising impacts of climate change. The experience of Brazil in understanding the complex relationship between consumption, water, food production and energy is significant, , especially with increasing water scarcity due to falling levels of water in dams, reservoirs and rivers. In this situation, Brazil finds itself in a unique position where the necessity to ensure food security competes with the interests of the growing biofuel industry. When compared with Brazil's position as one of the top exporters in agricultural products, these agricultural practices of biofuel production challenge the viability of sustaining these food exports, hence also resulting in economic changes. Meat and soya, which form an important component of the food export basket of Brazil, expose its vulnerability towards the Food-Water-Energy (FEW) nexus complexes, hence pressuring its efforts to reduce GHG emissions and also to sustain food security. Any possible change in this production complex will have a significant impact on food prices globally due to the dominant role of Brazil in food exports (Mercure 2015: 1-5).

Freshwater availability will be diminished for consumption and agricultural use due to change in precipitation patterns resulting from climate change. Three billion people will be experiencing water stress by 2025, with the classification of water-scarce countries including 14 additional countries (UNDP 2006) and by 2080, the number of people experiencing water scarcity will increase by 1.8 billion (UNDP 2008). Climate change will act as an aggravator for such impacts increasing the impacts of water stress and will become a burden if we consider the role of

urbanisation, changing land-use, shifting economic activity and population growth (IPCC 2007: 174-210).

The changing nature of the threats and the emergence of technology have brought two distant threats to constitute a cohesive danger for agriculture, i.e. the risk of extinction of genetic material due to erosion arising from climate change (FAO 1997). The vulnerability of a crop increases with rapid changing climatic conditions leaving a wide scope for the extinction of a livestock or crop variety. This is nothing but genetic erosion as the livestock or crop variety has lost a significant amount of genetic resource. The role of climate change in contributing to such genetic extinction is that of a catalyst for both animals and plant genetic material, because of the changes brought about in the availability of water, changing temperatures and other factors increasing vulnerability. These would have a significant impact on the management of diseases and pests hence affecting the balance of water and nutrient cycles (Selvaraju 2011: 187-211). The dangers from climate change enhance the vulnerabilities of crops to diseases, weeds, pests and infections, especially in the higher latitudes. The changing climatic conditions in humid and warmer areas increase the susceptibility of crops to pests hence damaging the food production systems also due to the rising resistance to pesticides developed by these crops. When such susceptibility changes, food security gets affected by the increase in vector-borne diseases in plants (Garrett et al. 2006).

The impact of climate change on the export side of agriculture, especially relating to pricing and market access, is greater than what is imagined. What is underreported and understudied is this role in pressures on food production and food security domestically. These changes will not only impact production but also will aggravate the falling value of export, mounting dependence on imports and falling worth of exports affecting the ability of poor to overall access and affordability (Spijkers 2011: 217-229). Added to the pressure on domestic markets due to increasing imports due to falling production, the increase in pressure on the water resources and arable land present coupled with the changing rainfall patterns, increasing sea level and changing sea surface temperatures will have disastrous effect on mangroves and coral reefs through the coast line, hurting the food production as these rising waters will inundate river deltas (Spijkers 2011: 217-229). The Indian

case is an excellent illustration to demonstrate these effects, especially with a 7,000 km plus coastal line as change in sea level due to climate change, is going to impact the availability of fresh water by 47%.

Further extended impacts include the persistence and rise of diseases and pests of a transboundary nature, invasion of saline water into freshwater and increasing soil salinity affecting arable land and food production in deltas. However, the true impact will be felt on the demands of irrigation – especially in a country like India where farmers in semi-arid and arid regions mostly dependent on groundwater – which are likely to amount to an increased demand of 10% with every one degree Celsius rise in temperature. The other threats to food security come from the increasing dry summers acting like a catalyst to forest fires which in turn threaten not only rural livelihoods but also destroy arable farmland hitting food security (Spijkers 2011: 217-229).

Peoples diet is excessively cereal dependent making it a major chunk of their food consumption. Any hindrances to their food supply access in a situation of varying production across different regions will impact global food security (Sinha et al. 1988). Considering the increasing impact of climate change, the stress over this system will increase making it even more evident in the food security sector. These dangers were adequately raised by IPCC in its 2007 report, where it categorically argued how a change in agro-ecological conditions would have a significant impact on food production, income generation and growth getting affected indirectly. In a local setting, agriculture and food security face greater dangers of uncertainty due to changing production, failing and fluctuating crop yields and falling and variable distribution of incomes among farmers (IPCC 2007).

The role of floods and drought in causing damage to agriculture is well documented; however, their impact on the economy of agriculture especially in times of climate change is an important aspect that cannot be ignored. Bangladesh, which is a host to many cyclones and floods every year with a predominant dependence of population on agriculture(18%) is a good example. Floods in Bangladesh not only create a humanitarian catastrophe but also damage the economy as well as the agriculture sector. After the 1998-1999 floods in Bangladesh, GPD fell to 5.2% from a good growth of 6.6% the previous year. The sectors that are hit hard are

transportation infrastructure, housing, agriculture and industry especially in Meghna Brahmaputra Ganga basin (Mirza et al. 2005: 55-75).

American agriculture is big business in the USA, with the agriculture sector contributing 100 billion dollars to the economy every year and over one million people employed in it. Agriculture consumes 80% of consumable water in the United States. All this changed with the 2012 drought considered as the worst in last 25 years affecting the Midwest and the country at large. The heat waves and drought caused insurance companies indemnities ranging up to 16 billion dollars. Nearly 2000 counties were designated drought hit affecting major crops like soybean and corn, causing skyrocketing prices and food insecurity across the country (Chou 2013). India, the land of monsoonal rains, has seen droughts dent food production and food security. A detailed study of AISMR (June to September) between 1950 to 1997 on the occurrence of floods and droughts put their frequency at 8 and 11 respectively. The 48-year data observed normal, drought and flood years and saw a decrease in food grain production in a drought year in nine out of 11 years, i.e. up to 24%. The role of drought is versatile and its coverage more synonymous with equal damage, unlike floods which have a positive and a negative aspect for areas with scanty rainfall and higher rainfall across regions. The former sees an increase in production due to these untimely rains and the later sees a drop in production due to excessive rains (Singh et al. 2011: 423-430).

Mozambique an African country had a survey done on the role of floods and drought in inflicting damage to households. In a case study done in four districts, 303 households were selected and the results corroborated what FAO and IPCC have been arguing i.e. the increasing vulnerability of the food security realm, and the dangers posed to the poorer households. Due to floods and droughts, only 3.9% of families had an enhanced production with 93.1% seeing a fall in crop production. They lacked diversification in their work with most of these poor households completely depending on agriculture hence limiting their non-farm livelihood options. Major livelihoods affected are "...crop production (100%), foods prices (83%), livestock (35%), fishing (23%) and houses/assets (12%)" (Brida and Owiyo 2013: 518-520). Floods and droughts had varying impacts on households with crop production getting affected by both; nonetheless drought had less impact than floods on fishing.

However, floods had an impact on fixed assets like houses more than drought, which impacted consumables like fish. 37% of houses were affected due to floods unlike 1.4% due to drought. There is no great difference between the role played by floods and drought in the spiralling of food prices in rural areas as they tend to affect the production, distribution and access to food. Flood had a 31% impact on livestock prices compared to drought's 37%, and the prices of food commodities saw floods affecting it by 79% as opposed to about 85% impact of drought (Brida and Owiyo 2013: 518-528).

The Indian case of impacts of climate change is interesting to note. The Southwest monsoon – the lifeline of Indian agriculture – is showing “definite changes” in its rainfall pattern, spread, intensity and other parameters. The agriculture year in India is mainly divided into three cropping periods, i.e. Kharif season from July–October (during the south-west monsoon), the Rabi season from October-March (winter) and the Zadi season from March-June (summer). Over the period of 1961-1990, compared to 1901-1930 or 1931-1960 there is “no consistent long-term trend” detectable; however there is an evident change in the intra-region distribution of rainfall and intensity within India (Standing Committee, Parliament of India 2016: 12). In relation with the increasing temperatures in the North Western, Central and eastern/northeastern part of India, the monsoon rainfall is showing an increasing trend over “Gangetic West Bengal, West Uttar Pradesh, Jammu and Kashmir, Konkan and Goa, Madhya Maharashtra, Rayalaseema, Coastal Andhra Pradesh and North Interior Karnataka” (Standing Committee, Parliament of India 2016: 13-14).

The North West region of India with Punjab, Western UP and Haryana is the grain belt of India and any changes here will have an adverse effect on the production of food grains. This is substantially noted by the standing committee of parliament report of India (2016) which predicts increasing winter temperature in the country, especially in the North Western region, increasing stress on wheat production which is a staple crop for Indians affecting the food security of the country (Standing Committee Parliament India 2016: 12-14). Production of major crops in India like rice, wheat and maize will see decreasing yields post 2030 with chickpea, ground and soybean seeing a marginal rise in production (Standing Committee Parliament India 2016: 12-14). However, the decrease in production of staple crops rice, wheat and

maize is alarming and dangerous for India due to a large number of small and marginal farmers.

The nature of the Indian monsoon is also changing with very light and light to moderate rain decreasing broadly over the country and the frequency of very heavy and extreme rainfall events on the rise in northern parts of country, i.e. rainfall exceeding 15cm in 24 hours increasing by 6% a decade between 1901-2010 (Standing Committee Parliament India 2016: 12-14). This, along with the increase of 0.2 degree Celsius mean temperatures per decade post-1980, will have a significant impact on crop production and food security as the rise in temperatures in the post-monsoon season will impact the wheat crop harvests (Standing Committee Parliament India 2016: 12-14).

There has been an annual decline of 86 cm rainfall between the 1970s and the last decade *kharif* rainfall seeing 26 millimetres decline and *rabi* witnessing 33 millimetres fall (Economic Policy India 2018: 105). This can be linked to the rising temperatures in respective seasons by 0.63 degrees and 0.54 degrees respectively (Economic Policy India 2018: 105). The problem associated with understanding climate science regarding climate change especially in India is the impact of temperature and rainfall is non-linear. The impacts of such a phenomenon are only felt when there is extremity in both temperature increases and rainfall shortages. Time and space of these impacts too vary like the contrasting effects between irrigated and unirrigated areas with the latter getting impacted twice as high as the former, prominently exposing crops that are rainfall dependent to further vulnerability (Economic Policy India 2018: 109).

Similarly, the production losses estimated for staple food crops in lieu of rising temperature patterns from the past decade forecasts a disturbing future however the was no great difference in eventualities caused by rainfall extremities on food productivity losses has remained. For example or example, as shown by Swaminathan et. al. in his research in 2010 that wheat production falls by 4-5 % with an increase of 1 degree Celsius similar to the conclusion from studies of Kurukulasuriya and Mendelsohn (2008) who found similar results after analysing 11 African countries conditions where a Celsius degree rise contributed to 6% loss in production (Economic Policy India 2018: 110).

In India, close to 52% of the area is un-irrigated and rainfed, i.e. close to 73.2 million hectares out the total 141.4 million net sown areas (Economic Policy India 2018: 102). Extreme rainfall shocks and extreme temperature shocks have yielded considerable production losses during *kharif* and *rabi* season. Extreme rainfall contributed to 12.8 % and 6.7% loss respectively with extreme temperature shocks contributing 4% and 4.7% declines in yields (Economic Policy India 2018: 110). The maximum damage caused is in unirrigated areas which have borne the effects of both temperature and rainfall extremities with considerable losses ranging from 7% and 14.7% for *kharif* and 7.6% and 8.6 % for *rabi* respectively (Economic Policy India 2018: 111).

Despite having an extensive understanding and reporting about the threats to agriculture from climate change, the realisation to this reality has been late from the Indian government side. Being a tropical country with huge population dependent on agriculture with majority of them being small and marginal farmers, the science on linking agriculture to climate change was only taken serious after the Standing Committee on Agriculture Parliament of India report in 2016. Before which India had a policy on climate change called as National Action Plan on Climate Change (MoEF 2008). Though document recognises the threat to food security due to climate change and destruction to land due to climate extremities, but a comprehensive relationship is not built of the evidence that the document puts out (MoEF 2008: 16-17). From the inception of acceptance of linkage between climate change and agriculture it was not until 2016 i.e. post Paris climate change treaty, there was no comprehensive reporting and policy about the science and policy to deal with the exigencies. What is interesting is the lack of inventiveness on part of the Indian government even after sufficient proof of economic damages due to impacts of climate change on agriculture. The importance of this linkage was not materialised until 2017-18 Economic Policy of India document. The absence of strong movement among NGO's and pressure groups about science of linkages between agriculture and climate change has failed to bring about momentous interventions from the government side too.

It is interesting to note that with increasing intensities of climate extremities there are also predictions of increased meet demand. Increasing stress and pressure on land, resources and water requirements affects the food security as food production

will see a competition for resources from increasing livestock to feed the growing population. This negative effect due to the competing requirement of livestock and crops will aggravate the situation of food security in developing countries (Thornton and Gerber 2010: 169–184). When seen in relation to the growing competition between bioenergy sector for biofuels and livestock sector for food security, the increasing stress factors to cater to both the needs of crops for energy and feed for livestock limits the flexibility available to countries, forcing them to choose one over the other hence contributing inadvertently to food insecurity.

Valuable human resources, finances and land resources are taken away from population intense and agriculture-dependent South Asia, where the necessity for a balance between requirements for food production and livestock is difficult to maintain due to the limited availability of land. The pressures to reduce GHG emission from agriculture add a complex relationship with the above necessities only affecting food security in the long run (Thornton and Gerber 2010: 169–184). Countries and regions affected with malnutrition, hunger and extreme deprivation will see increased vulnerabilities due to existing trends of stresses and pressures over resources allocation and usage, further increasing the risk of agriculture losses (Spijkers 2011: 217-229). Out of the 1.3 billion poor people residing in the world, nearly 600 million are dependent on livestock rearing. Increased GHG emissions due to increased demand for livestock not only makes the case of mitigation difficult but puts 90% of this livestock rearing poor population residing in sub-Saharan Africa and Asia at the risk of economic loss and affects their food security (Thornton .et al. 2002).

There is an overarching shift in cropping patterns in the developed world where cereal production is being gradually replaced by other crops. The total harvested area in Europe for wheat has seen a drop of 37% with a cropping area for wheat in Canada recording a minimum reduction; however, maize has seen a comparative rise in land devoted to its production. Sorghum and millets which form the major component of food production systems of sub-Saharan African even till date are seeing a drop in land devoted to them being shifted away in rest of the areas of the world. China now has only 1% cropland for producing sorghum and millet compared to 15% earlier. Similarly countries and regions in Southeast and South Asia are seeing an overall

trend of decreasing acreage for these crops with increasing acreage for these crops in North Africa and West Asia (UNFCCC 2008).

The overt dependence on agriculture in developing countries is going to cost them a share of their economy with their GDPs taking a hit due to stresses from global markets in the year 2100 according to estimates from different modelling exercises (Erbas and Solakoglu 2017). The richer countries are on the safer side as they are not as climate sensitive to agriculture like the poorer ones, hence putting crop responses and agriculture in an inverted U-shape relationship (Erbas and Solakoglu 2017). The growing water stress will make ensuring food security a difficult task as its availability and accessibility to agriculture will be impacted with varying rainfall patterns and rising temperatures in mid and low latitudes affecting rates of evaporation for crops, especially in rainfed areas. The poorer occupations like aquaculture and inland fisheries, on which the poor farmers are dependent, will be worst affected due to the proportionality principle as any small change in the hydrological cycle will not only threaten their occupation but will pose a serious food security threat for the populations (FAO 2011: 23-27).

Irrigated agriculture produces more food globally than rainfed agriculture; thus there is a necessity of large chunks of water for food production. 20% land under cultivation for food production guzzles up nearly 70% of water consumable for human need producing 40% of the global food. Ensuring continuous supply and availability of water for irrigated systems which produce nearly half of the world food production but uses up two-thirds of water available for human consumption is a challenge in itself, compared to the worst affected areas, i.e. semi-arid and arid regions with small and marginal farmers dependent on rainfall (FAO 2011: 23-27). The larger challenge of choosing between the two impacts food security as it would be difficult to choose over irrigated systems that have a larger share in the global food production system. Countries like India, Pakistan and China which have nearly 40% of the world population also hold half of the world's total irrigated lands "34%, 80% and 35%" respectively (FAO 2010).

The *International Institute for Applied Systems Analysis* (IIASA) with a baseline scenario predicts that climate change will impact future food demands considerably if not taken into the picture. Africa, Latin America and South Asia will

be seeing a rise of their irrigated land to 45%, i.e. 393 ha without a climate change scenario. However, the demand arising from 45% increased irrigated land will effectively translate into 66% more water usage. Considering the rising temperatures, changing precipitation patterns and aggravating impacts of other climate change factors on crop production, this is a grim situation (FAO 2011: 60-75). In the 2000s, the average water efficiency after transpiration globally was 50%. Considering the two-thirds increase in demand for water in irrigated systems the question of how crops will ensure maximum efficiency with rising temperatures and still hold on to produce more yields is a dilemma for countries to tackle (FAO 2011: 60-75). Predictions about the amount of land required for meeting global food security needs do not seem to vary that much. FAO estimates that by 2030, the agriculture sector would need 40 million ha of land additionally (FAO 2002) as compared to the IIASA estimate of 122 million ha by 2080 is a corroboration of FAO estimates (FAO 2011).

Talking about irrigation, its most important component is groundwater. Most of the irrigated lands in developing countries use groundwater not only adding stress to limited available resources but also spending a lot of fossil fuel energy in the process of extraction. In the US, the maize and wheat production uses up three times more and 4.2 times the energy used by rainfed production systems (FAO 2011). Acknowledging the heavy dependence of water for agriculture, there is high variance across crops in this sector, and climate change will impact disproportionately across this range of usage affecting crops requiring more water as availability and accessibility gets stressed about other sources. Crop water requirement which means, in a given field condition, the minimum amount of water needed for normal growth of a crop (FAO 2008) is going to remain across crops and regions. In rainfed regions, where this crop water requirement will be affected due to rising temperatures and changing rainfall, water deficit needs to be fulfilled through the use of irrigation. Use of irrigation to compensate for higher evapo-transpiration than precipitation in arid and semi-arid regions will increase stress on water availability, affecting crop production (FAO 2011).

The role of floods, droughts and climate extremities is clear as they not only impact agriculture directly through crop losses, destruction, land degradation etc. but have a significant indirect impact. Increasing temperatures and changing precipitation

also have varying impact internally for plants and has a cascading effect on food security by impacting income generation and sustenance. What is clear is the impact on the developing countries especially in the tropical region with smallholder farmers losing out the most. This has a holistic impact on ensuring food security and food production according to the needs of the growing population.

2.4. Global Green House Gas Emissions and Agriculture's Contribution to GHG's

Climate change has an impact on agriculture and agriculture has its share in the global GHG emissions. In one way or the other, it contributes toward significant emissions of three major pollutants, i.e. carbon dioxide, methane and nitrous oxide. Moreover, it emanates an enormous amount of GHGs into the atmosphere, especially the excessively input driven intensive agricultural practices of the industrialised countries (CAN 2012). According to the IPCC, emissions from agriculture are classified under agriculture, forestry and other land use (AFOLU) with the prime cause of emissions being deforestation, livestock production and soil and nutrient management. AFOLU contributes approximately 21% of total GHG emissions and this is a reduced share of 27% as in the 1990s. However, this is not a result of lower emissions from AFOLU but it is because of the increasing share of other sectors, especially the energy sector (FAO 2016). Interestingly, pre and post production emissions from the agriculture sector originate from the modern food supply chains in the form of production of synthetic fertilizers and use of machinery in farms (energy consumption) (FAO 2016).

Agricultural emissions play a considerable role in increasing GHGs. However, it is Asia with 44% and the Americas with 26% that contribute the most to global emissions, with Africa and Europe (15% and 12% respectively) ranking lower. Even within agriculture, the sub-sectors that contribute the highest toward emissions are enteric fermentation (that forms the largest with 40%) followed by manure left on pasture (16%), synthetic fertilisers (13%), rice cultivation (10%), manure management (7%) and burning of savanna (5%). By 2030 and 2050, global agricultural emissions are estimated to grow at a rate of 18% and 30% respectively (FAO 2014). Similarly, the non-Annex I countries contribute up to 95% of emissions from global rice cultivation emissions of 10% (FAO 2014). Synthetic fertilizers, being the base for modern day agriculture, contributed 14% of total emissions from

agriculture with non-Annex I countries having a share of more than 70% and Annex I countries reducing their contributions to emissions between 1990-2011 by 14% (FAO 2014)

.Regions with high altitude and mountainous terrain strongly limited by low temperatures, are bound to see an increase in crop productivity in broad terms and decreasing crop productivity in certain areas can be deviant depending upon local conditions. Research establishes that oilseeds and rice will be adversely impacted due to climate change with less extreme impact for wheat and coarse grains. This modulation is consistent with “the AgMIP/ISI-MIP globalgridded crop model ensemble analysis for RCP 8.5 (Rosenzweig et al 2014), where all individual models except for one (GAEZIMAGE), project larger yield declines for soy and rice than for maize and wheat, when assuming no CO₂ fertilization effects” (Wiebe et al. 2015: 9). The effects of climate change on crop-specific patterns do hold true across regions, but there are mild variations like in the case of soya that could see yield increases in colder regions due to warming. But wheat needs colder regions and it will experience a fall in production due to rising temperatures. Though the IPCC 2014 prediction about crop yields is difficult to compare as there are differences in methodology, yet similar conclusions can be made. For example, rice crop will see the highest increase in price while oilseeds seeing a reduction in productions (Wiebe et al. 2015: 7-10).

The focus on GHG emission reductions from agriculture comes at a cost borne by food production and availability in the form of uniform carbon tax across sectors, or other similar policies impacting the equilibrium of market and prices of food grains. An understanding of the GLOBIOM dataset reveals that if non-CO₂ (N₂O and CH₄) emissions are directly taxed from the crop production and livestock sectors, prices of ruminants and rice will be substantially higher while the prices of other crops and poultry will moderately be altered due to lower emission intensity (GHG emission per output unit produced). Interestingly, the food price index across the globe has minimum impact in regions of North America and the European Union, with highly efficient production systems and a food basket that is devoid of GHG intense products. The regions that are expected to experience increases in prices are the inefficient production systems of Sub-Saharan Africa, South Asia, and South East

Asia, where productivities are poor with higher per unit output of GHG emissions, especially in the livestock sector (Frank .et al. 2017: 5-12).

Nitrogen fertilizer is a significant resource in food production (i.e. nearly 50%) with another 50% coming from animal manure, the tissues of nitrogen fixing plants, wastes and composts, crop residues and soil. Even though it is an essential requirement for agriculture, nitrogen is prone to easy loss through leaching and volatilization of environment from agriculture causing environmental damage that equals monetary benefits that it accrues from food production as fertilizer. If this goes unchecked by 2030 and 2050, then it is estimated that 6.4 and 7.5 million tonnes of nitrous oxide respectively will be emitted into the atmosphere from the present 4.1 million tonnes. Its role in photosynthesis, carbon sequestration and biomass production makes it an essential element in agriculture while on the contrary it is also responsible for ozone depletion and is the third most significant greenhouse gas (FAO 2016).

The challenge is in reducing the GHG emissions from agriculture while maintaining food security. It will be interesting to see how developing countries and especially those in tropical regions will rise to this challenge of climate change in agriculture as they are set to be the ones most affected by it. Increasing populations, growing need of food grains, livestock and fishery, and the issue of climate change will pose challenges to developing and poor countries. The science of climate change demonstrates that countries at higher latitudes i.e. the global north, are going to benefit from the increasing temperatures as there exists a positive correlation with its food production. However, given the requirement of biofuels, stresses from water, land and other resources, and lack of financial and technological resources to adapt to the challenging situation, leaves developing countries vulnerable to climate change.

The primacy given to GHG emission in agriculture point to an agenda of pushing mitigation as a policy measure rather than adaptation for developing countries. The science of climate change talks of how emissions from agriculture will add to the total GHG emissions and how important it is to tackle them. However the subtleties of the challenges faced by the agriculture sector – o the push to create space for biofuels and new technologies at the cost of small and marginal farmers – are not adequately underscored. An increasing focus on mitigation measures sidelines

adaptation as a policy measure and dilutes the overarching framework of the emissions reduction program. The science is clear about the dangers to agriculture and food security from climate change due to climate extremities, rising temperatures, sea levels and changing precipitation patterns.

Chapter 3

The Politics of Agriculture in the International Climate Change Negotiations

The manner in which agriculture makes an appearance in the climate change negotiations can be better understood by assessing the role of state and non-state actors. A good place to start understanding these relations come from Robert Putnam's work on the logic of two-level games (Putnam 1988). The reason for choosing Putnam's framework lies in the nature of the climate change negotiations where the international diplomatic arena and domestic politics interact in a dynamic way, with influences from both state and non state actors playing a significant role in deciding the outcomes of international agreements.

Agriculture forms an important base for any economy due to the food production aspect as well as raw material supply for industries. For developing countries, the importance of agriculture is more important due to larger populations dependent on it directly or indirectly for employment and food security. Climate change is a reality and with scientific literature predicting agriculture to be worst effected especially in developing countries (as discussed in Chapter 2), it becomes even more important to see its place in the climate change negotiations and the politics surrounding it.

Through the frame of the two-level game of Robert Putnam, this chapter examines the politics of agriculture in the climate change negotiations with the role of various state and non-state actors (Putnam 1988). National governments negotiate at the international level for an agreement which cannot be successful without domestic acceptance. To gain domestic acceptance, the influences and negotiating stances governments make in accepting and pursuing demands affect international outcomes which also has interests, influences and politics at stake. The chapter attempts to present the picture of the linkages between agriculture and climate change through the following sections. (1) The place of agriculture since the inception of the climate change negotiations. (2) Negotiations relating to agriculture at the *Subsidiary Body for Scientific and Technological Advice* (SBSTA) based on the country positions and

behind the screen negotiations for agriculture as it was mandated by the Conference of Parties to bring out a detailed plan. (3) The role of non-state actors – NGOs and political parties. This section has two subsections – (i) political parties and (ii) farmers’ organisations. It is important to understand the domestic influences in order to get the bigger picture at the international level right. (4) The Role of the Global North in climate change negotiations for agriculture. In this section the role of US and UK are studied due to their influence and leadership in the climate change negotiations. (5) Climate-Smart Agriculture (CSA) – a term coined and promoted by the World Bank and FAO in a bid to bring mitigation back into prominence. This section looks at the politics around CSA and the role it is likely to play in future negotiations. This chapter will study the internal dynamics of BASIC countries as they form an important block in climate change negotiations due to their emerging economy status and share of GHG emissions. (5) World Trade Organisation (WTO) and climate change in agriculture. It is important to understand the role of the WTO Agreement on Agriculture in the context of climate change.

3.1 The Place of Agriculture in the Climate Change Negotiations

Population growth and demand for food lend importance to the field of agriculture, especially in the developing countries, where the population is expected to grow at greater rates than developed ones. To allow this growth, a certain amount of increase in GHG is likely, hence contributing to climate change (Meridian Institute 2011: 5). The policy responses on mitigation cannot be homogenous as the costs of mitigation and damage are distributed unevenly. The distribution of interests domestically questions the rationale of ‘national interests’ as the sole reason for committing to mitigation or to other measures. Other than self-interest, countries also depend on norms and values in negotiations, applying various processes, belief systems and preferences in decision making. Similarly, the nature of the political system and the autonomy and power given to various local units of governance also matter in deciding the nature of policy responses in negotiations (Bang et al. 2015: 4-7).

The United Nations Framework Convention on Climate Change (UNFCCC) adopted in 1992 at the Earth Summit had hardly any mention of agriculture. Article 4(1)(c) and 4(1)(e) of the UNFCCC indicate how agriculture was only seen as supplementary to mitigation and adaptation, that too indirectly through coastal

regulation, forestry, waste management etc. (UNFCCC 1992: 6). Agriculture was not given sufficient recognition in the UNFCCC even though sufficient scientific literature (*see* Chapter 2) existed, showing the effects of climate change on agriculture.

The Conferences of Parties (COP) – starting from Berlin in 1995 till the recent twenty-first meeting held at Paris in 2015 – represent a story of marginalisation of agriculture in the climate change negotiations, especially in relation to adaptation. Upon donning the presidency of the first COP, then Federal Minister of Environment, Nature Conservation and Nuclear Safety for Germany, Angela Merkel, in her inaugural speech said there was a need to change radically the “patterns of behaviour, consumption and production and in lifestyles” with the aim of making a difference through sustainable development (COP 1 1995A: 3). However, these words were not translated into anything meaningful for agriculture in this COP and the several others up to Kyoto.

The second COP at Geneva in 1995 made mention of mitigation and adaptation for agriculture in a very limited way by mentioning the national communication under revised guidelines for Annex countries. Mitigation requirements were needed for annex I countries for reducing carbon dioxide, methane and nitrous oxide and national plans to be taken up by non-annex I countries for adaptation had to be communicated to UNFCCC (COP 2: 1995B: 18; 26).

Agriculture got prominence only in the late 2000s in the climate change negotiations. The Kyoto Protocol in 1997 did make a mention of it but not in a significant way. Article 2.1 of the Kyoto Protocol categorically calls upon the Annex I countries to:

(a) Implement and/or further elaborate policies and measures in accordance with its national circumstances, such as:

- promotion of sustainable forms of *agriculture* in the light of climate change considerations (Kyoto Protocol 1997: 3).

This “reasonable compromise” (Grubb 2004: 8) seemed of have allowed agriculture to take a backseat at the initial stages of the negotiations, preventing the development of a possible framework to address climate change effects on agriculture. This position of reasonable compromise on Annex I countries was a follow up to the agenda of national plans regarding emission reductions discussed for annex I countries to implement in the second Conference of the Parties (COP) (COP 2: 1995B: 18). The following COP meetings and subsequent decisions taken in climate summits left out agriculture altogether. The seventh COP meeting held in 2001 after the Kyoto Protocol talked of establishing a “special climate change fund” to finance activities, programmes and measures relating to climate change that are complementary to those funded by the resources to the climate change focal area of Global Environment Facility (COP 7 2001: 45).

It was at ninth COP session that the SBSTA, at its twentieth session, got a mandate “to initiate its work on scientific, technical and socio-economic aspects of impacts of, and vulnerability and adaptation to, climate change, and on scientific, technical and socio-economic aspects of mitigation” (COP 9 2003). This mandate was taken forward by the Ad Hoc Working Group on Long-term Cooperative Action (AWG-LCA), which in its pre-Copenhagen discussion, requested COP-15 to establish the thirty-second SBSTA session on agriculture (AWG-LC 2009: 43).

SBSTA, in its 27th session, reported on “the workshop on adaptation planning and practices” for the Nairobi work programme on impacts, vulnerability and adaptation to climate change (SBSTA 2007). A comprehensive discussion and consensus was reached with regard to the nature and importance of adaptation. The importance of adaptation was recognized as was the need to focus on the local, sub-national regions, to narrow plans for both long-term (poverty elevation) and short-term (disaster preparedness) planning for adaptation, to diversify agriculture systems and knowledge, to support research and development and to build linkages with farmers’ organisations in order to prepare them for climate change. Thus, the problem has never been with consensus building but the politics of climate change negotiations] (SBSTA 2007: 4-6).

The Common But Differentiated Responsibilities (CBDR) (UNFCCC 1992) Principle was diluted by the time of the Paris Agreement in 2015. The UNFCCC fifth

session codified the CBDR principle through Article 4(a) and (e), clauses which specifically talk about the transfer of technology, preventing GHG emissions from the agriculture sector, and to protect agriculture from drought and desertification, particularly in Africa (UNFCCC 1992). The CBDR principle was specific to Annex I countries (Kyoto 1997), i.e. the developed countries as the developing countries needed space and time to develop without the burden of emission restrictions. However, the interpretation of the CBDR principle and the historical responsibility discourse among the developed and developing countries was contested, with each one broadening or narrowing the essence of the principle according to their interests (Friman 2016: 296-300). Agriculture, which should have received prominence because of the impact of climate change on it, got affected indirectly.

It was not until the Copenhagen COP summit 2009 that agriculture specifically found a space in the climate negotiations. Agriculture was planned to be introduced as a draft decision by the AWG-LCA) under the heading “Cooperative sectoral approaches and sector-specific actions in agriculture” (AWG-LCA 2009: 6). AWG-LCA is part of the pre-consensus making process among states for the draft proposals or decisions to be placed before the COP meetings. [It is under this scheme of things that the draft decisions included the agriculture sector by stating the need for taking into “account the relationship between agriculture, [land degradation] and food security, the link between adaptation and mitigation and the need to safeguard that these approaches and actions do not adversely affect food security” (AWG-LCA 2009: 43). However, these draft provisions specifically catered to the “the interests of small and marginal farmers, the rights of indigenous peoples and traditional knowledge and practices” (AWG-LCA 2009: 43). This categorisation and specificity related to agriculture and the targeted demography were important as they indirectly would have benefited the developing and the underdeveloped countries.

The initiation of this dialogue on agriculture as a draft decision was promoted by the “Umbrella Group” of countries that are predominantly focused on agriculture export –New Zealand, Canada and Australia, supported by Switzerland and the United States. At a later stage, developing countries like Argentina, Brazil, Uruguay, Philippines, Thailand, and Bolivia too participated in the debate and expanded the horizon of discussion (PARIVI 2012: 4). However, the focus on “cross-sectoral”

linkages meant that the debate focused more on the aspect of mitigation than adaptation. Saudi Arabia, for instance, joined the discussion although its interests lay in the arena of oil and energy, which were critical “cross-sectoral” elements for mitigation actions (PAIRVI 2012: 4). It was not until the Bonn summit 2017 that both India and African countries began their engagement with this issue because of the fear of “unilateral trade measures being imposed by certain countries in agricultural trade” (PAIRVI 2012: 4).

After the formation of a special session of SBSTA on agriculture on the recommendation of AWG-LCA (AWG-LCA 2009: 43) to COP 15, the climate summit in Copenhagen was a failure from the perspective of agriculture as it got entangled in power politics. The outcome text of Copenhagen made no mention of agriculture. Even in the LCA draft decision, the entire focus was on mitigation rather than adaptation, which was relegated to a footnote reference “linking the sector to projects and programmes” (PAIRVI 2012: 5). The underlying reason for the text on agriculture remaining unchanged at Durban or Cancun was the insistence by the African countries to include paragraphs on adaptation. At Cancun, Argentina and Brazil’s proposal of inserting “text on trade measures and agriculture” faced opposition from New Zealand and the United States. Coupled with this was the politics of the developing countries who saw an opportunity to use the debate on agriculture within the “General Framework”. (PAIRVI 2012: 10-11).

After the efforts at Copenhagen, there was not much to be celebrated at Cancun in 2010 as countries decided to push efforts on mitigation and sideline adaptation to a footnote. The Cancun agreement simultaneously pushed for a declaration of national contributions which are not mandatory for developing countries (UNFCCC Cancun 2011). It is from here that international organisations like the World Bank, and Food and Agriculture Organisation (FAO) started presenting climate change in agriculture “as part of the problem and part of the solution to climate change” (Cabello 2011: 2). By introducing agriculture as a ‘solution’, these organisations tried to link carbon markets with the agriculture sector, especially agricultural lands. The overshadowing of adaptation – which is necessary for small farmers – by mitigation meant tackling climate change through carbon accounting. Small farmers will be the most affected as they need to be aggregated into bigger groups in order to access technology in

competition with large agribusinesses. The Institute for Agriculture and Trade Policy (IATP) noting these developments, predicts an increase in social conflicts, land grabbing, violation of human rights and related losses of small-scale production (Cabello 2011: 3).

Nationally Appropriate Mitigation Actions (NAMAs) for the developing countries were first brought into the negotiations at the Bali COP but did not find traction among the developing countries (UNFCCC Bali 2008: 2). However, the AWG-LCA document of 2009, which reached the Copenhagen summit, was not converted to anything tangible as the Copenhagen conference did not achieve anything other than a three-page political statement, which was void of any commitment related to agriculture (AWG-LCA 2009: 33).

Post the Copenhagen Accord, Brazil, South Africa, India and China (BASIC) countries started specifying voluntary commitments publicly by the end of 2009, officially recognizing ‘nationally appropriate mitigation actions’ (Hochstetler and Viola 2012: 758). NAMAs were endorsed officially in the Paris Agreement of 2015, when the common but differentiated principle based emission reduction program was converted into Intended Nationally Determined Contributions (INDCs) of a voluntary nature (INDCs) (UNFCCC Paris 2015). Agriculture emerged as an important issue of concern at the Paris summit. However, it was not an explicit subject of negotiations (Jayaraman 2015). Even the Paris Agreement of 2015 fails to explicitly recognise the impact on agriculture of climate change other than seeing the sector through the lens of its GHG contributions. The INDCs of COP 21 gave a token representation to agriculture and neglected the adaption policy priority of the developing countries (Jayaraman 2015).

The change in policy to voluntary emission reduction commitments resulted from the differing interpretation of the CBDR principle by the developed and the developing world (Friman 2016). The developed countries wanted the developing countries to be an equal participant in the emissions reduction programme. The developing countries, on the other hand, have argued that the developed countries have used up their share of the space for emissions and are responsible for the present crisis, and therefore are in no position to ask developing countries to be partners, as the latter still have to grow and utilise their share of the environment (Friman 2016).

This debate is also reflected in the context of agriculture and climate change. The developed countries, who are net exporters of food grains, see mitigation as their objective at the expense of adaptation, which developing countries, who will be affected the most from geographical, demographical and economic challenges, wish to prioritise (PARIVI 2012; Cabello 2011; CAN).

This post-Copenhagen change resulted in 35 developing countries including agriculture in their NAMAs and reporting them to the UNFCCC Secretariat as part of their economy wise emission targets. SBSTA was asked to study the impacts of climate change in agriculture to bring out a holistic proposal for mitigation. This was done after G77, Argentina and Bolivia got their proposals on mitigation in agriculture included in texts in the LCA after the meetings in Tianjin 2010 and Bonn 2009 (PAIRVI 2012: 5).

The developed countries push for quantification of sources and mitigation as the solution to deal with GHGs. To understand climate change in agriculture, it is important to understand the nature of agriculture fields. Lack of data, measurement mechanisms, changing nature of variables involved in agriculture like strong winds, pests, fires, droughts and human activities affect the management practices of land and agriculture (CAN 2011: 1-2). Under such uncertainty, soil carbon sequestration or the use of agriculture to reduce industrial emissions is difficult to pursue, gauge and ascertain due to the complexities of quantifying soil (CAN 2011: 1-2). Moreover to have a payments system or credit transfer system based on carbon sequestration defeats the whole idea of dealing with agriculture in climate change as it becomes antithetical to small farmers who are major stakeholders and also vulnerable (CAN 2011: 1-2).

Table 2: Agriculture in Climate Change Negotiations

Conference of Parties	Agriculture in Negotiations
Rio Summit, 1992	Talks of Sustainable Agriculture
COP 1, Berlin 1995	No Mention of Agriculture.
COP 2, Geneva 1996	Role of Agriculture limited to reduction of GHG emissions for gases like Methane, Carbon dioxide and

	Nitrous oxide for Annex I countries. However the final text doesn't have any mention of agriculture.
COP 3, Berlin 1997 Kyoto Protocol	To promote sustainable forms of agriculture with GHG emission targets for Annex I countries.
COP 4, Buenos Aires 1998	No Mention of Agriculture.
COP 5, Bonn 1999	No Mention of Agriculture.
COP 7, Marrakech 2001	Green Environment Facility (GEF) is setup. Agriculture mentioned with other sectors for preparing policy for adaptation. A climate change fund complementary to GEF is established for agriculture.
COP 13, Bali 2007	Nationally Appropriate Mitigation Actions (NAMAs) for developing countries were first officially proposed.
COP 13, Poznan 2008	No mention of Agriculture
COP 15, Copenhagen 2009	Failed negotiations, no conclusive text. Political resolution reached after intervention of US President. The beginning of the voluntary contribution mechanisms and the beginning of end of historical contributions principle and common but differential responsibility principle.
COP 16, Cancun 2010	No mention of Agriculture. But pushed for a declaration of national contributions which are not mandatory for developing countries
COP 17, Durban 2011	The Durban Agreement under Article 4 of the UNFCCC identified agriculture as a "priority" sector for delivering mitigation goals
COP 18, Doha 2012	No mention of Agriculture
COP 19, Warsaw 2013	No mention of Agriculture
COP 20, Lima 2014	Principles established for mobilising climate finance for agriculture among the various other sectors
COP 21, Paris 2015	Nationally Appropriate Mitigation Actions (NAMAs)

	officially endorsed. Agriculture emerged as an important issue of concern at the Paris summit. However, it was not an explicit subject of negotiations.
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Source UNFCCC COP documents

3.2. Negotiations for Agriculture at SBSTA

After the COP 15th session held in year 2009 inducted SBSTA, the negotiating positions of countries has been interesting regarding agriculture, especially in relation to the core debate on adaptation versus mitigation. In its draft decision to the COP, SBSTA accepted that the current scenario of climate change had effects on agriculture, as per present scientific knowledge (SBSTA 2014B: 18). This was in contrast to any of the COP meetings or pre-conference discussions, as a clear position emerged, stating the need 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, 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” (SBSTA 2014B: 18). But not withholding the progress in discussions and the position arrived at, the failure at the Paris COP to translate these draft positions into substantiating decisions shows the failure of the international negotiations in recognizing the importance of agriculture (Verschuuren 2016; Jayaraman 2015; CGIAR 2015).

Agriculture is missing from the negotiating texts of the Paris Agreement as well as the final agreement, which nowhere takes a categorical position (Verschuuren 2016: 1-4). Even after sufficient scientific evidence and the dominance of adaptation over mitigation in SBSTA discussions post 2014, nowhere did the Paris Agreement “directly or explicitly deal with agriculture” even after “its critical significance to agriculture”, showing the neglect of agriculture both at the national and international levels (Jayaraman 2015: 73-77).

Although the Paris agreement does not deal with agriculture explicitly, its full-text proposals on adaptation goals do mention maintenance of food security as a vital component. However, even this reference disappeared, only returning as part of “draft

COP Decision's preamble" and being part of the final text of the preamble of Paris Agreement (Verschuuren 2016: 1-4). The preamble reads "Recognizing the fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change" (Paris 2015). Similarly, the proposal on food security was incorporated in Article 2 of the Paris Agreement, which says, "Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production" (Paris 2015).

This failure to address agriculture in the Paris Agreement came after adaption becoming the focus of discussion on agriculture in climate change in the SBSTA workshop sessions. Countries who participated in the discussions not only accepted adaption as a viable mechanism to tackle climate change in agriculture but also suggested and declared their national actions plans that have been implemented or are being implemented (SBSTA 2014A: 1-12). The European Union (EU), which was represented by Ireland, stated "that effective adaptation of agriculture is of critical importance for the EU", with Switzerland pointing out the need to increase the forecasting and predicting technologies in order to help farmers to better adapt to climate change effects (SBSTA 2014A: 1-12). Switzerland also noted that the growing "need for adaptation and maintaining or even increasing agricultural productivity" has been reflected in its national practices to adapt to climate change in agriculture.

Similarly, the developing countries representing the global south have categorically asserted the need for adaptation to be the policy outcome and methods like arranging technology, finances, research, capacity building and support from developed countries to ensure proper implementation of the policy. India, in its submission, stated how the country that is predominantly dependent on the Monsoons for food production and agriculture is already facing negative impacts on production of food crops and fisheries, hence affecting food security (SBSTA 2014A: 1-12). Columbia too expressed similar concerns and categorically asserted how adaption would be its priority as its agriculture sector is highly vulnerable to climate change

impact and also due to the dependence of high percentage of the population on this sector for livelihoods (SBSTA 2014A: 1-12).

FAO took a more pragmatic position than individual countries by assessing adaption of agriculture to climate change as an important and necessary measure to “preserve the productivity of agricultural systems” (SBSTA 2014A: 6). By asserting how adaption has to be “location specific”, FAO brought back the question of diversity into the picture, advocating different policies for regions located at different spaces and time (SBSTA 2014A: 6). The submission from FAO looked at adaption as a “social learning process” where farmers are taken into confidence through farmer-level engagement for effective and progressive results (SBSTA 2014A: 6).

3.3. The Role Non-State Actors – NGOs and Political Parties

NGO access and influence on climate change negotiations are difficult to ascertain as there is no specific definition of influence. To take access to mean effective participation of NGOs is problematic. Moreover, climate change negotiations have slowly moved behind closed doors, where access to NGOs is limited, forcing them to develop more indirect linkages with media, civil society and other forces to get their positions onto negotiating tables (Betstill and Corell 2001). UNFCCC has witnessed the participation of non-state actors. NGOs are given access to most of the climate change negotiations and treaty making (Nasiritousi and Linne´r 2014). However, the role of NGOs in negotiating the effect of climate changes on agriculture has to be seen from the “influence” (Betstill and Corell 2001) perspective.

Liberal environmentalism remains the dominant frame among NGOs and to quantify their influence it is necessary to see their alignment with various government positions (Rietig 2016: 278-279). Climate Action Network (CAN) has argued for making adaption a priority over mitigation for developing countries and that all parties should ensure that resources are made available for promoting “biodiversity, resilient agriculture and appropriate technology development and transfer” (CAN 2011). Mostly both the Northern and Southern international NGOs such as CAN, which is an umbrella organization of NGOs related to climate change, have taken positions similar to the developing countries, whom they see as the most vulnerable to climate change (Rietig 2016: 278-279). While making its submissions to UNFCCC in

2012, CAN took a broad stand on both adaptation and mitigation without clearly emphasizing how developing countries will be affected by prioritising the latter over the former. It talked about reasserting the UNFCCC principles, ensuring justice and livelihoods for small farmer holders, maintaining food security etc. However, its position regarding how to go about dealing with agriculture was not clear (CAN 2012).

To protect agriculture from climate change, local communities around the world have taken leadership in advancing voluntary carbon emission reductions. Similarly, Multinational Corporations (MNCs), realising the impact of climate change, have been advocating low-carbon business models through their corporate social responsibility activities. These bottom-up mechanisms are translating into coordinated pledges on climate mitigation hence bringing transnationalisation as a trend into climate initiatives and domestic politics. It is important to note that these subnational, transnational actors have been focussing and promoting domestic action strengthening countries' domestic commitments to reduce emissions (Falkner 2016: 1110-1114). It is difficult to ascertain the influence NGOs have because almost all countries come with predetermined positions on negotiations dictated by their governments, and to assume any influence over these negotiators is difficult (Rietig 2016: 281). A possible conclusion one can draw is the influence NGOs have on domestic politics and in shaping the agenda of countries even before they come to the negotiations.

3.3.1 Political Parties

Domestic politics and pressure groups do have an influence on the nature of the agreement national governments achieve internationally. With regard to climate change in agriculture and its impacts, it is important to study the role important political parties of respective states have. The focus here is limited to the BASIC (Brazil, South Africa, India and China) countries and a few developed countries like the United Kingdom, the United States and Germany. The reason for selecting these developing countries is due to their larger populations, dependence on agriculture, the 'emerging' nature of their economies and their status as 'rising powers' given the influence they enjoy in their regions. The BASIC countries, who had 11% as their share of GDP in 1990, doubled to 22% by 2009. This relative shift in their share of

global GDP and their rising status economically, especially post 2000, put pressure on these countries to commit to a legally binding climate change pact.

During the early decade of climate negotiations i.e. in the 1990s, these countries were relatively less developed but this changed in the 2000s with their relative rise. The end of the Kyoto Protocol period became an optimum occasion for the developed countries to push for a commitment deal (Hochstetler and Viola 2012: 755-778). These changing positions necessitate a studying of the domestic and international politics, positions and negotiations of the BASIC countries regarding climate change in agriculture.

The Communist Party of India – the oldest among the Communist parties in India – in its political resolution adopted at the 20th and 21st Congress, limited its position to critiquing the United States’ (US) position on the Kyoto Protocol and their imperial agenda. However, no discussion or any positions related to agriculture or its linkages to climate change were discussed (CPI 2007: 2012).

Communist Party of India (Marxist), the larger and dominant left party in India, in its 20th party congress in 2012, spoke at large about the negotiating positions of India and the developing countries and how they are being forced to move away from the equity principle due to the dominance and influence of the US in international climate change negotiations. The 2015 party congress specifically points out how “the principle of equity between developed and developing countries has been rudely discarded with “common but differentiated responsibility” (CBDR) having been diluted significantly. An emissions control architecture based on voluntary pledges as pushed by the US is now most likely to form the basis of the Paris Agreement from 2020 onwards.” This is in contrast to the the political resolutions of CPI(M) on agriculture, which speak of issue areas like growth, spiralling food prices, lack of financial credit and other related issues but fail to see the looming threat of climate change in agriculture and its linkages with India’s negotiating position nor the politics around it. While India’s failure to bargain for its national interests is specifically pointed out, there is no recognition of the impacts on small and medium scale farmers who form the major chunk of the farming community getting affected due to climate change (CPI(M) 2008; 2012; 2015).

The role of the Communist Party of India Marxist-Leninist (CPI-ML) has been an exception in relation to other parties on the question of linking agriculture and climate change . In its 10th National Congress 2018, CPI-ML in clearest terms has linked climate change with agriculture by specifically talking about how climate change will affect the flow of rivers which have been the lifeline of the agrarian economy due to the melting of glaciers, floods and hurricanes. More importantly, the direct correlation between climate change, agriculture and food security is expressed as “according to credible sources, climate change is going to pose a severe threat to food security and livelihoods, with agriculture and fisheries sectors slated to bear the maximum brunt” (CPI ML 2018).

It is important to note that the position political parties take in a democracy make way for politicisation domestically with issues of concern becoming the prominent questions for the government of the day to address. By failing to take the questions of the marginalised and the vulnerable into question, any international agreement on agriculture and climate change will present an incomplete picture. . It is in this light that the role of other, bigger parties like Congress and Bharatiya Janta Party (BJP), who have alternated to power between them in the last two decades, needs to be studied for failing to raise issues of climate change in agriculture. The BJP manifesto of 2009 and 2014 talks of the impact of climate change and policy measures it will take up like setting up renewable plants, following a low carbon path with a focus on promoting research.

Similarly, Congress, which was in power from 2004 to 2014 and has been part of the majority of international negotiations on climate change, hardly makes any mention of climate change in its manifesto. By talking about the National Action Plan but not specifically addressing the impact on agriculture due to climate change, manifestos of both BJP and Congress fail to raise a critical issue (BJP 2009; 2014; Congress 2009; 2014). Considering that farmers are a ‘vote banks’ for both these political parties, and also being in power and being aware of the impact of climate change on agriculture and having access to the research of international scientific communities especially IPCC, this omission is surprising.

Interestingly, the African National Congress (ANC), the largest and dominant party in South Africa which has been mostly in power in the post-apartheid regime has recognised and responded to climate change in agriculture more positively relative to the Indian scenario. ANC, in its 2007 52nd Party Congress, did recognise the poor communities as being the most vulnerable and noted how climate change will affect Africa's effort to reduce inequality, poverty and unemployment in a situation of "...low levels of infrastructural development and high reliance on primary commodities and agriculture" (ANC 2007). Its 2012 Congress talked about focusing "on indigenous skills and technology that promote energy efficiency" as there will be a requirement for technology to adapt, although that does not mean dependence on the West, which should be avoided (ANC 2012: 19, 46-47). However, the prominence agriculture got in its previous Congresses is not seen in the latest 54th ANC Congress, where climate change is discussed more from an institutional point of view, with the linkages with agriculture completely removed from the text (ANC 2017: 62). It is important to note that it is the same ANC which recognised the rising sea temperatures already affecting its fishing industry with diminishing "...availability of traditional fish stock, such as certain types of pelagic fish and crayfish" (ANC 2007).

Domestic opinion in Brazil had a strong resonance on the elites who took part in the climate change negotiations. Brazil in 2005 had 61% GHG emissions coming from land use and land use change meaning deforestation with additional 19% coming from agriculture alone. This, coupled with strong opinions from Baptists regarding taking a more active position to set national climate action right with environmental non-governmental organisations, paved the way for a changed narrative about the transition from no commitments to voluntary contributions to emission cuts. This was contrary to the national representatives thinking of viewing negotiations as too much of "zero-sum thinking and national economic interests" (Hochstetler and Viola 2012: 758-769). The domestic pressure for taking action against climate change has been omnipresent and strong among the public post-Rio conference (Earth Summit) in 1992. The culmination of these pressures was in the politicisation of climate change, as Brazil became the first country among BASIC and other countries to pass a climate law under President Luiz Ignacio Lula in 2009 (Aamodt 2015: 25-26). Though this law did draw reservations from the Ministry of Agriculture, which felt mitigation will effect the food security of the country, GHG emissions from other sectors on the fall

compared to energy (30.2%) and agriculture (26.6%) which were contributing high emissions and with pressure from environmentalists who were drafted into government departments, such resistance did not last long (Aamodt 2015: 25-28).

The three coalitions that formed in Brazil – ‘Open letter to Brazil about climate change’, ‘Alliance of Corporations in Favor of the Climate’, and ‘The Coalition of Corporations for Climate’ – had considerable influence on the opinions of the general public domestically though their positions were never endorsed by the negotiators. The first one included 22 large corporations, the second was formed by agribusiness corporations and the last one was more of a heterogeneous coalition comprising of meatpacking firms to climate friendly ethanol producers. Though their success in influencing national negotiators was not great as Brazilian negotiators continued to stress the historical responsibility of developed countries for acting first, but their role in shaping public opinion cannot be sidelined (Hochstetler and Viola 2012: 758-769).

A combination of these factors provided the space and support for Brazil to take voluntary commitments at Copenhagen in 2009, which it also included in its climate law passed in 2009 i.e. “to reduce GHG emissions by 36.1–38.9 per cent below BAU trajectories by 2020 (Aamodt 2015: 27). President Lula, under a decree for implementing climate law, declared five sectoral plans, out of which having a “Low Carbon Agriculture” plan (ABC) shows the commitment Brazil had to deal with the emission reduction programme, which included adaptation measures. However, the concerns surrounding its implementation and regarding its effects on food security continue (Aamodt 2015: 30-32). After becoming the only BASIC country to have declared more voluntary emission reduction programmes and having the natural resources to strengthen its mitigation programme, Brazil is yet to be recognized by the developed countries for its contributions and its push for division of mitigation responsibility based on historical responsibility norms is rejected internationally (Aamodt 2015: 32).

According to the Chinese constitution, the National People’s Congress (NPC) is the highest organ of power; however China is effectively ruled by the Chinese Communist Party (CCP). With CCP being the sole power centre, the rules, regulations and laws are decided by it with no space for non-state actors (Stensdal 2015: 55-56) . Moreover environmental degradation and pollution have had issues of public order,

forcing China to consider impacts of climate change especially in agriculture. Being a unitary state, the Central government directs and allocates resources to local governments and communities to execute policies and measures with regard to climate change (Stensdal 2015: 49-50). Being a populous country, dependence on agriculture for food security is high. Agriculture contributes nearly 15% of GHG emissions, with most of it being methane due to cultivation of rice and wheat (Wang .et al. 2010: 1). Due to the political set up of China and its one party dominance, any action to be taken has to come from the Central government. Moreover being a signatory to the UNFCCC, there is an obligation on China to formulate a national response to climate change and in regards to that, in 2007, the Chinese government launched “China’s National Climate Change Programme”, which also deals with issues related to climate change in agriculture (CNCCP 2007).

China is heavily dependent on coal for its energy requirements and mitigation efforts primarily focus on reducing GHG emissions from the energy sector. With regard to agriculture, China looks to follow a range of adaptation mechanisms which are delineated in a CNCCP document. The document talks of increasing investments in research and development (R&D), selecting rice varieties with less GHG emissions and high yields, construction of ecological agriculture in high yielding areas and gradually establishing and strengthening a law and regulation based mechanism (CNCCP 2007: 44-45; Wang .et al. 2010). Following this, China in 2009 at Copenhagen, committed to voluntary emission reduction programme and later on has been pushing for greater participation of developing countries in commitments programmes (Stensdal 2015: 53). From the ‘adoption of Durban platform in 2010’, China started to differentiate North-South politics and South-South politics, with the latter being divided between better developing and less developing countries. This can be corroborated by China’s bilateral climate deal with the US in 2014 before the Paris Agreement and outside the framework of a multilateral framework of UNFCCC, indicating the changing dynamics of international negotiations (Stensdal 2015: 53).

What emerges from studying the influence political parties have on their respective governments is the public pressure, opinion making and more importantly the positions the ruling political parties take with regard to climate negotiations.

Without politicised public and political parties, it is difficult to expect national governments to include agriculture in climate change negotiations.

3.3.2 Farmers' Organisations

In India, farmers' organisations have played an important role in raising issues related to farmers due to their numerical strength and importance of agriculture to the domestic economy. Farmers' issues tend to play a prominent role in the positions taken by governments at international negotiations. The demand for equitable and just policies with an inclination towards protecting farmers' livelihoods and food security have been slowly being raised and politicised in the farmers' circles by farmers' organisations (AIKS 2017). There have been considerable discussions and debate about the possible impacts of climate change with the acceptance that agriculture will be worst affected but the transformation into collective action to attain support from governments and to play a critical role in negotiations is not translating into reality.

The *All India Kisan Sabha* (AIKS), one of the bigger farmer organisations in India, in its 33rd All India Congress, did raise and discuss the threat of climate change to the vulnerability quotient for poor and medium scale farmers. By bringing out everyday instances faced by farmers like apple-growing “migrating towards higher altitudes” in Himachal Pradesh and with egg-laying period for fresh-water crap moving up earlier to mid-April or earlier from May and their breeding period also extended to 160-170 days in 2000-05 period from 110-120 days of pre 1980-85 period, AIKS tried to bring climate change in agriculture into the discourse (AIKS 2013: 72). As its 34th All India Conference stance shows, though they have recognised climate change as a threat, they stopped short of claiming that the present agrarian crisis is due to climate change; however they categorically demanded the government's intervention to deal with the crisis. This possibly resulted from a lack of collective action from other like minded organisations, farmers collectives and political parties.

The demand for “effective investment in disaster management” (AIKS 2017) and increased public expenditure in agriculture in order to reduce the risks of disasters for agriculture clearly show the sense of vulnerability present in the farmers community; however the translation into political action is missing due to state

inaction. This can be witnessed in the warning given to the government to bring about a major change in its agriculture policies or else the “impact of climate change and climate variability will only worsen the plight of peasantry and rural labour even endangering the food security of the country as the whole” putting millions of people at risk (AIKS 2017). Though the AIKS statement mentions the Paris Agreement, the narrative is limited to the hegemonic dominance of the US and its imperialistic character. The point about agriculture and the failure of the Paris Agreement to address these concerns were not properly linked and not discussed (AIKS 2017).

Opinion about the role of agriculture in the climate change negotiations among farmers is divided, with the majority of the opinion that the interests of developed countries and agribusinesses to maximise profits are served through the inclusion of agriculture in the climate negotiations. They therefore have strong opposition to any negotiations related to agriculture within the frame work of climate change (PAIRVI 2012).

3.4. The Role of the Global North in Pushing Mitigation at the cost of Adaptation

The positioning of the countries of the global North and South in relation to mitigation and adaptation in the context of agriculture can be better understood by the “regime complex of climate change negotiations” (Keohane and Victor 2011), which “creates incentives for governments and non-state actors to invest in a wide array of institutions rather than a single hierarchy” (Keohane and Victor 2011: 8). The imposition of mitigation rather than adaptation on the developing countries through various possible means shows how these regimes are constructed by the elite to satisfy their interests (Keohane and Victor 2011: 8). The marginalisation of agriculture and adaptation in the climate change negotiations, which are important for the poor, marginalised, small and medium scale farmers, clearly reflects the true nature of the negotiations. The G8 forum in 2005 co-opted India, Brazil, Mexico, China and South Africa as emerging emitters onto their negotiation table, considering the growing emissions from these “emerging economies” (Payne 2008: 530).

Considerable efforts were made before the Copenhagen summit 2009 to ensure agricultural practices – especially the livestock rearing industries and farms in developing countries – to involve themselves in carbon sequestration and GHG

emissions reduction programme, i.e. mitigation efforts. However, such a solution to tackle the climate change-agriculture linkage is problematic as it sees carbon trading between developing and the developed countries as the best possible solution to offset emissions (Paul .et al. 2009: 8-10). It is important to note that developed countries' efforts to ensure that developing countries reduce emissions will only benefit agribusinesses and plantation companies who at the cost of "small and indigenous people" having "wealth of knowledge and experience of sustainable will" to fight climate change are marginalised. It is highly unlikely that countries like US, UK or other Northern countries will commit to any funding for tackling climate change in agriculture other than through a carbon credit system – which the developing countries have objections to (Paul .et al. 2009: 10).

US negotiators had tried to reject climate science and question the logic of the dangers posed by global warming and climate change before the Bali conference in 2008. However, with the passing of time and being one of the leading emitters of GHGs, this position was untenable for long. The need for emerging industrial powers to be part of any climate change agreement with commitments to reduce future emissions became a bargaining chip for any agreement on a climate change framework (Cook 2008: 164-168).

Domestically, government funded or government agencies have been researching on the effects of climate change in the US and are of the opinion that there are adverse effects for the US, hence standing diametrically opposite to the international position of the US in the climate change negotiations. Interestingly, agricultural emissions in the US for 6% of its total GHG emissions and its push for adaptation for domestic purposes included development of research facilities to improve genetic varieties, climate change resistant crops, improve technology and funding for agriculture, financially supporting farmers with direct payments to tackle climate change, forecasting and others (USDA 2010: 4-11). The US motivation to climate change as a leader is difficult to gauge as altruistic or self interested as it moved between engagement and disengagement with a change of Presidency in the White house. However what is clearly evident is its position post Kyoto that it wishes to move to a bottom-up approach of national pledges to reduce emissions, i.e. non-binding commitments rather than the top-down approach of Kyoto which included

binding commitments to emissions reductions (Parker and Christer 2018: 522-523). US reticence towards agriculture in the climate change negotiations is interesting as it presents a dichotomy in understanding its position on agriculture. In Kyoto negotiations as it argued for allowing unlimited “percentage of the total emission reductions” coming from “tree plantations and agricultural practices instead of Annex I countries having to reduce emissions from other sources like energy, industry and transport” which was rejected by the UK and other parties (Paul .et al. 2009: 16).

The European Union (EU) has been proactive among the developed countries with regard to climate change. From Kyoto to Paris, the EU has adhered to the binding commitments for GHG emissions and later has been pushing with other global northern countries for the participation of developing countries in emissions reduction policy. In EU, agriculture shares about 10% of GHG emissions, falling behind energy, transport and other industries (EPCARD 2017; EEA 2015). In order to attain a sustainable low carbon trajectory in agriculture by 2050, the EU feels both developing and developed countries should commit themselves alike (EPCARD 2017: 27). EU finds its additional mitigation action not being able to translate within the agriculture sector as a major challenge in climate change negotiations. The Durban Agreement under Article 4 of the UNFCCC identified agriculture as a “priority” sector for delivering mitigation goals and this acceptance by EU shows the importance it places on mitigation over adaptation (Durban 2011; EPCARD 2017: 27).

However, the EU 2009 White paper on adaptation shows EU’s acceptance of adaptation and its importance in tackling climate change in agriculture. It considers adaptation to be successful in terms of economic impact and believes preventive action can bring “clear economic, environmental and social benefits by anticipating potential impacts and minimising threats to ecosystems, human health, economy and infrastructure” (EU 2009: 6). Although it believes more research needs to be done on the costs of adaptation, but it does feel that these costs will be less than the cost of inaction (EU 2009: 6). Similarly its Green Paper in 2007, EU had talked of helping developing countries adapt to climate change with the support of the developed countries for “being responsible for most of the historic accumulation of anthropogenic greenhouse gas emissions in the atmosphere” (EU 2007: 22). It also

talked of how adaptation should be the central policy instrument in dealing with external policies especially in countries of Sub-Saharan Africa for achieving the UN Millennium Development Goals post 2015 (EU 2007: 22).

With changing, times and international power relations, the EU position on adaptation and mitigation for developing countries especially in case of agriculture, has been different. The EU has asked developing countries to adopt mitigation measures where developing economies with agriculture dominating GHG emissions over other sectors without any commitment to finances for doing so (EPCARD 2017: 27). Compare this with EU's new policy for its producers called 'green payment', where a grant will be given for "implementing three compulsory practices, namely crop diversification, ecological focus areas and permanent grassland" through its Common Agricultural Policy (CAP) through which it devises to help farmers adapt and mitigate the dangers of climate change; however, it does not wish to commit any amount for the developing countries for whom it preaches to adopt mitigation measures (EU 2016: 4).

EU is at better footing to tackle climate change in agriculture and has actively participated in the negotiations to bring about fruitful results. However, like the US and other global north countries, it has been trying getting mitigation effectively implemented through various other mechanisms. Though it is ironical that domestically the push is for adaptation, internationally, the global north countries want the developing countries to share the burden on the pretext of equality, ignoring their share of historical responsibility in GHG emissions.

3.5. Climate Smart Agriculture

Considering the pressure to act on the growing effects of climate change on agriculture with a focus on adaptation for developing countries and refusal from these countries to see mitigation as the only solution, new policy measures have to be resorted to in order to deal with the issue. Climate Smart Agriculture was first introduced and debated by the FAO in the Hague Conference on Agriculture 2010, Food Security and Climate Change with the theme on "Climate-Smart" Agriculture Policies, Practices and Financing for Food Security, Adaptation and Mitigation (CGIAR; FAO 2010). Climate-Smart Agriculture (CSA) means "an approach that

helps to guide actions needed to transform and reorient agricultural systems to effectively support the development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and removing greenhouse gas emissions, where possible” (FAO 2010).

The objective is to increase productivity and ensure sustainable practices of agriculture, not affecting the environment and increasing resilience of farmers to climate change (World Bank 2011: 2). The true essence of CSA is to promote mitigation which can be authenticated through World Bank intentions of seeing CSA “reduce agriculture’s contribution to climate change by reducing greenhouse gas emissions and increasing carbon storage on farmland” (World Bank 2011: 2). Mitigation as such is not problematic and it is necessary to reduce GHG emissions from agriculture but the policy of CSA is driven towards small-scale farmers and developing countries (FAO 2010; World Bank 2011; PAIRVI 2012). It is important to note that agriculture was negotiated in relation to climate change for non-Annex I countries for adaptation; however, pressure from FAO and World Bank have opened up the climate smart agriculture, i.e. mitigation measures for developing countries through Clean Development Fund (CDM) in order to implement new carbon market policies (Schroeder et al. PAIRVI 2012: 33).

Despite the pushing and influencing by the developed countries for CDM in agriculture as the solution for food security and agriculture, small farmers and the developing countries have rejected this proposal (PAIRVI 2012). By terming CSA as resilient (adaptation) and helpful in removing or reducing GHGs (mitigation), it may seem like FAO is propagating sustainable agriculture for the greater good of developing countries. However, it is also felt that what is being dubbed as the best policy for small farmers is nothing but an ambivalent policy of disguising industrialised countries’ high input and genetically modified plants agriculture as the ideal solution for climate change (Schroeder .et al. PAIRVI 2012: 33). Hence by shifting the discourse on adaptation towards only mitigation will only damage the developing countries as developed countries will use the threat of damage to food security ecosystems to push policies related to mitigation (Tiwari PAIRVI 2012: 29).

Taking forward the idea of CSA, the UN Secretary-General, at the UN Secretary-General's Climate Change Leaders Summit, announced the formation of the Global Alliance for Climate-Smart Agriculture (GACSA). More than 100 civil society organizations, 59 international organisations and 305 national organisations, in their statement to COP 21 held in 2015, stated that the formation of GACSA as “politically motivated” and termed it as an eyewash that would allow agribusinesses that are responsible for large GHG emissions to call themselves “climate smart” (Press Statement 2015). They distinguished “agro-ecology” – which is inclusive, farmer-driven, locally executed with traditional and local knowledge – with CSA, i.e. nothing but a “new promotional space for the planet's worst social and environmental offenders in agriculture”. Food security and a threat to agriculture are real but to push for a programme by an international organisation which *La Via Campesina* – the world's largest peasant farmers' movement – rejected as promoting agribusiness, shows the interest and agenda of the developed countries (Anderson 2014).

The World Bank, in its 2011 report, extensively speaks of how Asia and Africa will be affected due to climate change in agriculture affecting food security if no proper and immediate action is taken to minimise it as there is the absence of an adaptation mechanism to such loss in production (World Bank 2015). World Bank proposes to insulate this damage by changing the nature of its operations from a policy advocacy group to an active lender for climate-smart agriculture programmes by 2019 (World Bank 2016).

CSA replicates techniques that have been followed earlier such as no-till agriculture, monocropping and intensive agriculture. FAO and World Bank wanting to replace small-scale agriculture by CSA and the formation of CSA groups chaired by Monsanto, Olam and the Kellogg Company and Pepsico at the World Business Council for Sustainable Development Summit 2015, shows how the private sector is more interested in CSA and the small-scale farmers reject it from day one (Taylor 2012: 92-93; Anderson 2014). CSA is not concerned with who has access to land, resources, finances etc.; the only thing it is worried about is to ensure “apolitical” technocratic fix of production with World Bank trying to infuse the modern principles of liberalisation, technological advancement and modern techniques to ensure global

food production. The question is whether the problem of climate change impacting agriculture can be addressed by a technical fix alone? (Taylor 2012: 103).

CSA tries to balance the priorities of adaptation and mitigation, but its policy speaks of small-scale farmers involving themselves in the latter without considering the time, context and location of farmers and homogenising the policy solution (Neufeldt et al. 2013: 2). This raises an important and troubling question, i.e. “Why should resource-poor farmers invest in agricultural practices that may reduce emissions if there are few if any immediate benefits related to food or water security?” (Neufeldt et al. 2013: 2).

The question is whether the efforts of World Bank and FAO are simply aimed at tying up food security with mitigation. CSA, for many, is a move aimed at limiting the efforts of the developing countries to push for adaptation and commitments from developed countries for financial contribution. By pushing CSA through FAO and World Bank, the developed countries are trying to achieve what they could not through climate change negotiations.

3.6. WTO and Climate Change in Agriculture

The WTO Agreement on Agriculture (AoA) negotiated at the Uruguay round has three main pillars – “market access, domestic support, and export competition” (Sachin Kumar 2016: 15). The domestic support aspect is dealt with under three different boxes for streamlining domestic support policies for agriculture, i.e. “green (permitted), amber (slow down — i.e. be reduced), red (forbidden)”. The AoA has only the Amber and Green Boxes with an additional Blue Box (WTO 1995). The Green Box contains the permitted domestic support system without any limitation, the Amber Box deals with all domestic support measures that can be trade distorting over and above the permitted limits and finally the Blue Box deals with policies that deal with “payments directly linked to acreage or animal numbers” as a general exception to production-limiting policies (WTO 1995; Sachin Kumar 2016: 15).

It was under the Uruguay Round that agriculture became a part of the WTO, paving the way for “progressive liberalisation” (Richardo et al. 2009: 14). The use of excessive fertilisers will reduce or block the ability of microorganisms in the ground

to break methane resulting in more damage to GHGs (Richardo et al. 2009: 8). Government's intervention through investments is essential to reduce emissions and damage on the environment by introducing organic fertilisers and pesticides; however, these interventions would entail a violation of the WTO Agreement on Agriculture due to these investments directly coming under production which is desisted by the AoA (Richardo et al. 2009: 8). Developing countries are not only constrained by finance related provisions but also by the other provisions regarding disaster relief, public stockholding for food security or regional assistance programmes hence affecting small and medium scale farmers.

It is interesting to note the level of accommodation WTO provides to agriculture during natural disasters; as is evident, agriculture will be affected the most and that too in the developing countries impacting small and medium scale farmers more. Section 5, Annex 2 reduction commitments clearly devise a decoupled direct assistance programme to producers where governments can only give support to farmers based on "clearly-defined criteria such as income, status as a producer or landowner, factor use or production level in a defined and fixed base period" (WTO 1995: 61).

Rising temperatures and changing rainfall patterns will bring the worst in the form of increased cyclones and frequencies of drought and floods. Under such a scenario, the pressure on governments especially in developing countries will be to invest and rescue the farmers from after-effects. . Losses for this category of farmers are proportionately higher and will lead to food insecurity and loss of livelihood (Oduro 2009). By only focusing on the income aspect, the WTO AoA leaves out of the consideration, sources of support like biodiversity, water sources and other related facilitators, which might look ancillary but are essential for food production and farming.

The Doha round of negotiations did indeed recognise the need for addressing issues related to environment and agriculture – especially the concern of food security; the Doha Ministerial Declaration asked to, "take account of their development needs, including food security and rural development" in order to embed developing countries special and differential treatment (Cardwell and Smith 2013: 687-896). Similarly, in line with the Preamble to the AoA, there is a commitment to

support and promote food security and environmental protection under the ‘non-trade concerns’ clause under Annexe 2 in order to intensify its larger programme of sustainable intensification without any restrictions on domestic support reduction commitments (Cardwell and Smith 2013: 687-896).

In a note written by the WTO Secretariat on its website explaining the role of the AoA in climate change and agriculture, a correlation is established between reduction of tariff and non-tariff barriers in developed countries for efficient usage and provisioning of global resources and production. For developing countries, the WTO secretariat see an opportunity in the trade as trade negotiations will help these countries to increase their income gains. By talking about biofuels and their increasing production and trade among countries especially high consumption countries, the note reflects the larger agenda of trade free of barriers and market-based principle as the solution to deal with the crisis emerging from climate change in agriculture (Secretariat WTO).

However, the important debate at the WTO between the developed and developing countries lies with the issue of public stockholding of food grains for food security purpose at administered prices by developing countries. Though there was a temporary solution at the Bali conference in 2013, where developing countries got a breather through a peace clause for food security purpose, the lack of an institutional structure to deal with this issue permanently is the danger for food security under the climate change scenario (Sachin Kumar 2016: 3-4).

Moreover AOA only envisages the linkages between agriculture and climate change from the mitigation perspective as it sees an opportunity for countries to reduce GHGs in the agriculture sector i.e. 10-12% by reducing subsidies that have been effecting health of soil and plants. It subtly promotes greener direct payements to farmers under the green box like the UK. UK has a policy of paying producers a fixed amount for ensuring a portion of their land left fallow hence reducing GHG emissions (Cardwell and Smith 2013).

It is important to renegotiate AOA in terms of sensitivity towards changing dynamics of climate change negotiations towards agriculture and the need for developing countries to spend more in terms of infrastructure and public spending on

their farmers especially small and medium scale ones. Holistically it is important to see all the facets of agriculture negotiations in relation to climate change within the larger backdrop of North-South politics, South-South Politics and the debate surrounding mitigation versus adaptation between developed and developing countries. In trying to understand the domestic and international scenario with influences from state and non-state actors on each other at each stage, it is important to understand how agriculture is side-lined when compared to other issues. Further, within agriculture there a preference for mitigation over adaptation due to reasons of funding, commitments and over and above, the freedom and impunity from historical responsibility for developed countries for past GHGs. It is from this perspective one has to see the international politics in climate change negotiations for agriculture.

Chapter 4

The Agriculture-Climate Change Linkage as an Emerging Security Threat

Climate change is a reality of the 21st century. The impact of climate change on various aspects of the economy, life, culture, society etc. has been discussed and written about. However, an emerging interface is in the field of security, where the role of climate change is emerging since the late 2000s. The United Nations Security Council (UNSC) debated the role of climate change as a threat to international peace and security for the first time in 2007 and this continued later on with various aspects of climate change being discussed, i.e. food security, agriculture, migration, resource scarcity and conflict. However, it is unfair to call this as the first instance of any discussion on the emergence of climate change as a threat to international security. The United States (US), European Union (EU), Australia and other developed countries and small island countries have been discussing the possible linkages between climate change and its effect on the security of countries and the international community.

Migration, sea level rise and resource conflict have been the major themes of discussions under this broad emerging theme of climate change as a security threat for international peace and security. Agriculture, which is getting affected at large and is going to be affected the most due to climate change, has not found a prominent place in the discussions. Even food security, which is a component of agriculture and key to the maintenance of peace and security, has not found prominent attention. It is important to understand that the discussion on the role of migration, sea level rise and resource conflict would be incomplete without seeing the role of agriculture especially food security in the larger frame of international peace and security.

This chapter focuses on the politics around viewing climate change as a security threat and argues for the need to recognize the climate linked impact on agriculture and food security as a security threat too.

The Chapter views agriculture from the climate change security debates within the international community through the following sections. Section 1, titled *The emergence of climate change as a security threat: Locating Agriculture and Food Security*, looks into climate change as a security threat and the debates within the UNSC, UNGA and other fora. The prime focus in this section would be to locate the role of agriculture and food security within the broad paradigm of climate change as a threat to international peace and security. The second section –*Global North, Climate Change and Security* –looks at the role of the United States and European Union in seeing climate change as a security threat. The second section is titled *Regional Organisations and their Role in Assessment of Climate Change as Security Threat* and it focuses on the South Asian region, which will be affected the most due to climate change. It is important to understand the positions taken by South Asian Association for Regional Cooperation (SAARC) about climate change and food security. The third section -*The Role of Developed and Developing Countries in Securitisation of Climate Change*. Pacific Small Island Developing States (SIDS) countries have been prominent in making climate change a security threat along with developed countries. The pros and cons of such framework when looked from the perspective of securitisation is important as this is the path the security debate has taken due to the survival threat for SIDS countries. This chapter looks at the nuances and tries to understand the underpinnings of such an approach and looks at other wider security debates within the framework constructed by the international security community in regards to climate change as a threat to international peace and security. The fourth and last section –*Emerging Linkages of Climate Change and Conflict: A Few Case Studies* –looks into the major instances of disruptions in the agriculture sector leading to violence and instability, trying to establish linkages between the possibilities of conflict to rising instability due to the impacts of climate change.

4.1 Climate Change as a Security Threat: Locating Agriculture and Food Security

The US, since the early 1990s, has been discussing and debating about threats emanating from climate change with the active involvement of the defence departments like the Military and the Navy. There has been active thinking and planning about how to counter security threats emerging from climate change with the

consensus view that it is wrong of military strategists to see climate change as just a sociological problem, not a military and security threat (Pittenger and Gagosian 2003: 2).

Richard H. Ullman, in his work “Redefining Security”, defines security not just in military terms but redefines them as threats to national security emanating from non-military where cannot only be defined as goals but are consequences which are understood only when “we are threatened with losing it” (Ullman 1983: 133). His definition of security has two parts in sequence of threats to national security where the first one “threatens drastically and over a relatively brief span of time to degrade the quality of life for the inhabitants of a state” and the secondly the threats narrow the policy options available for the state, private actors, or nongovernmental entities (persons, groups, corporations) (Ullman 1983: 133). The nature of climate change consequences such as changing precipitation, droughts, floods, storms etc. – especially in areas like South Asia, where monsoon is the lifeline for a majority of the population for all purposes including agriculture – would definitely pose a security threat (Ullman 1983: 133; Pittenger and Gagosian 2003: 4-9). The threat posed by the likes of nuclear when compared to threats from natural catastrophes like earthquakes have a fundamental difference. The latter can only be handled and managed, while the former can be prevented (Ullman 1983: 138). Extrapolating the same analogy to climate change, due to the uncertainty of destruction and effects, the threats emanating from climate change have a bearing on the national security of states and the response to the disruption caused cannot be planned and strategized like it can in case of a military threat.

The UNSC debate and discussion and later efforts to build consensus on climate change originated from the Human Development Report 1994 with the concept of ‘human security’. Human security has two major components, i.e. “freedom from fear and freedom from want” which is an “integrative” concept (HDR 1994: 24). Considering “nuclear holocaust” a likelihood and considering “the threat of global poverty” emerging from the international drug trade, HIV/AIDS, illegal migration and terrorism, the HDR report also considers climate change to be a threat to human security (HDR 1994: 24). Although our discussion in this chapter is not specific to human security, the emergence and recognition of climate change as a security threat

to communities and individuals by the UNSC is a significant departure from the international security community's position.

Taking a cue from the HDR report of 1994, the UNGA Resolution A/RES/63/281 of 2009 which was adopted in the context of the first ever UNSC discussion on climate change as a security threat in 2007, talks about how UNGA's "principal focus in the present report is on the security of individuals and communities" (UNGA 2009B: 4). It categorically mentions the impacts on food security, food production, water scarcity, desertification etc. with the increase of "frequency and intensity of extreme weather events, including flooding, drought and tropical storms" (UNGA 2009B: 9). Later, it will also lead to migration and can cause insecurity at international borders and receiving states regarding resource allocation, distribution and management. The impact would be severe on countries located in low latitudes such as Africa, South Asia and South-East Asia, where the majority of the poor would face food insecurity due to rising prices. However, developed countries are not immune from the dangers, for instance, in Australia, severe drought and crop failure cause immense damage to world agriculture markets as Australia is one of the world's largest exporters of food grains. Increased threat from climate change will only exacerbate these problems and may lead to social protests and unrest, as has occurred in numerous countries and cities around the world (UNGA 2009B: 11).

During the first debate on climate change in UNSC in 2007, the themes relating to agriculture were crop production, food security and migration due to rising sea levels and changing nature of resource availability, especially from the developing countries. The larger reason for the adoption of climate change under the realm of the UNSC was that HIV/AIDS had earlier been recognized as a security threat and integrated into the broader thematic of peacekeeping (UNSC 2007; UNGA 2009A). The conflict aspect of climate change was prominent among the positions and opinions of the developed countries, who focussed more on the impact on fossil fuels and energy rather than food security. Most of the developed countries like UK, EU, US and others including the Secretary General of the UN, were interested in including the role of climate change in disturbing the peace and security of countries within the ambit of the UNSC. It is important to note that migration both internal and external – was an important issue for the developed countries as a possible security threat as it

threatens the social, political, and ethnic and other balances of countries and regions, causing tensions and disharmony (UNSC 2007).

Russia, which is going to benefit from climate change due to the opening up of the Arctic region and Siberia, asked countries not to panic and to debate climate change in appropriate forums. Cuba, on behalf of the Non-Aligned Movement (NAM), rejected the idea of a 15-member UNSC encroaching on subject matters like climate change that are developmental and require bodies having representation to discuss and debate. China, whose opinion the NAM countries agreed to support, believed that UNSC was not an appropriate forum to discuss climate change as a security threat as the problems associated with climate change are of a socio-economic nature, which has to be dealt through the General Assembly and other forums (UNSC 2007). Similarly, Sudan speaking on behalf of the African group, India, Bangladesh and Brazil with huge populations dependent on agriculture and emerging economies did not support the idea of UNSC discussing climate change. Instead, they argued that Annexe I countries should fulfil their objectives and the link between climate change and development should not be changed to a singular cause, i.e. security (UNSC 2007). However, small island countries like Papua New Guinea strongly objected to this position and asserted that climate change as dangerous as threats posed from guns and bombs. The Solomon Islands emphasized that climate change is not only a development concern but a security issue due to rising sea levels and the threat posed to small island states.

“The relationship between climate change and conflict” has largely remained “anecdotal” however a study of recent civil wars between 1945-2005 put the number of violent incidents in 32 instances as tussle between the “regional ethnic (minority) group considering itself as “the indigenous “sons-of-the-soil” with the ‘recent migrants from other parts of the country” (UNGA 2009B: 17). There is no specific provision or legal definition under international humanitarian law for environmental migrants who migrate voluntarily or are forced to due to environmental reason and considering that migration can spillover international borders, there is a possibility of considerable tension in the near future in a climate change scenario (UNGA 2009B: 17).

The Pacific Small Island Developing States (SIDS) presented a draft proposal at the UNGA in 2009 titled “Climate change and its possible security implications”, which was sponsored by Afghanistan, Andorra, Angola, Antigua and Barbuda, Barbados, Belarus, Belize, Benin, Burkina Faso, Burundi, Cape Verde, Comoros, Dominica, Gabon, the Gambia, Grenada, Guyana, Haiti, Jamaica, Kiribati, Madagascar, Mauritius, Mongolia, Montenegro, Morocco, Saint Kitts and Nevis, Saint Lucia, San Marino, Serbia, Singapore, Togo, Trinidad and Tobago, the United States of America and Uruguay (UNGA 2009A: 1). The SIDS represented by the Federated States of Micronesia, Fiji, Kiribati, Nauru, Palau, Papua New Guinea, the Republic of the Marshall Islands, Samoa, Solomon Islands, Tuvalu, Tonga and Vanuatu, using the UNGA platform, put forward their concerns about climate change and inferring a security threat raised in the UNSC in 2007 through a Resolution to be adopted by other countries (UNGA 2009A: 1). The major contention of the SIDS countries is about survival, i.e. due to sea level rise and increasing floods, droughts and weather extremities, there is a possibility that these countries will be submerged and it is from here that they draw their argument of positing climate change as a security threat (UNSC 2007; UNGA 2009A).

At the UNGA, the G77, China, India, Brazil, Non-Aligned Movement countries and others have argued that climate change is a socio-economic development issue to be dealt with at the UNGA, and other bodies and UNSC should not try and appropriate the issue (UNSC 2007). However Indonesia, Bahrain on behalf of the Arab Group, Nicaragua with the chairmanship of the Group of 77, though accepting the UNGA Resolution of the SIDS, have categorically asserted the position of China, G77, Non-Aligned Movement, which raised objections in the 2007 UNSC debate on climate change and asserted the socio economic nature of climate change, with countries like Argentina and Brazil too endorsing a similar stance (UNGA 2009A).

In a report by Terry P. Kelly of the Naval War college of the United States submitted to the US government in 1990, the author talks of how climate change will be an emerging security threat to developing countries like India, Bangladesh, Egypt and others who are dependent on agriculture, as low lying areas will be inundated due to rising sea levels and will affect the production and food security of these populations (Kelly 1989: 5). The report also speaks of how, due to inundation, low

lying countries will see an outflow of environmental refugees to other countries hence “stressing neighbouring nation’s resources and goodwill by their forced migration to the safer ground” (Kelly 1989: 5). The document talks of how “water supply and quality, food production and health conditions” will be threatened in developing countries and how developed countries, though having large resources to cope with the effects of climate change, still face hardships to cope with issues like rising sea levels, changes in food production, quality of water and others (Kelly 1989: 5). The change in precipitation and the volumes of water flowing through rivers, when affected, will alter the relations with riparian countries causing international tension related to water usage “as 75% of total land area in 50% countries falls under international river basins and globally the number is 47% for all countries (Kelly 1989: 52). It is implicit here that agriculture would need water for food production and any limitation on water flow by the upper riparian state would lead to tensions.

Out of the seven parameters that Intergovernmental Panel on Climate Change (IPCC) has used to gauge vulnerability, i.e. “magnitude of impacts, timing of impacts, persistence and reversibility of impacts, likelihood (estimates of uncertainty) of impacts and vulnerabilities and confidence in those estimates, potential for adaptation, distributional aspects of impacts and vulnerabilities and importance of the system(s) at risk” (IPCC 2007: 781). Out of the seven key parameters listed above for vulnerability, magnitude of timing and distributional aspects form the important vulnerabilities for food supplies, migration and conflict’s prime (IPCC 2007: 787).

Regions of Africa, Asia and Latin America with larger populations and high dependence on agriculture and related activities have been categorised separately, with Magnitude, Distribution, and Timing, Low Adaptive Capacity with Irreversibility being the extra criteria for Latin America (IPCC 2007: 788). Africa, which has a considerable practice of subsistence agriculture will face most vulnerability as the continent would face reduction in food security and agricultural productivity. Nearly 1 billion people from South Asia, South-East Asia and East Asia will be vulnerable due to increasing water stress from reduced water supplies, decreased agricultural productivity and increased risk of floods and droughts (IPCC 2007: 790-791). These changes and vulnerabilities will threaten human security by

undermining livelihoods, compromising culture and individual identity by promoting forced migration as climate change undermines the state's "ability to provide the conditions necessary for human security" (IPCC 2014: 762). In societies already inflicted with resource dependence, social marginalisation, limited capital assets any influence on factors like famine, conflict, socio-political instability and acute insecurity by climate change will progressively undermine human security (IPCC 2014: 762).

Adaptation as such would increase the security of individuals and reduce the vulnerabilities and threats faced by individuals and communities. However, adaptation too must be pursued with care and proper understanding of complex livelihoods or else adaptation might itself create insecurity (IPCC 2014: 762). The causal relationship between food insecurity, increasing tensions due to price rises not related to environmental factors is well established with the 2008 food crises. Africa, which is volatile due to socio-economic and political reasons, saw food riots due to increased prices in 14 countries. However, a climate change scenario with decreasing productivity, increasing population and restricted resource access, might yield a fertile ground for hostility. The turn towards violence or instability would depend on the responses by both government and private parties (IPCC 2014: 762).

Mobility – during an extreme weather event or in case of climate change – is inversely proportional to vulnerability, meaning those who are most vulnerable to climate change impact will have the least capacity to migrate (IPCC 2014: 767). Extrapolating this to the agriculture scenario, especially for marginal and small-scale farmers in developing countries like Africa, South Asia, South East Asia, migration would only be the last and "emergency" option as migration after an extreme weather event makes coming back to the original place difficult (IPCC 2014: 767). Not only is migration costly, it also poses challenges to governments and states to respond to the pressures of livelihoods, shelter and more importantly food security when land under agriculture is inundated or lost to droughts, and available land has to be managed for multiple purposes like production of biofuels, food crops, commercial crops, land, industry and other uses.

It is evident from the existing literature that inequality, access to resources and resource distribution do play a role in armed conflict and instability as they compound the vulnerabilities of communities and individuals (IPCC 2014: 773). However, the processes of mitigation and ‘maladaptation’ might also have a significant role in conflict generation and increasing vulnerability if they contradict the local requirements and fail to comprehend the complexities of communities and individuals (IPCC 2014: 773). In relation with this, there is some consensus in the literature about the changing precipitation pattern enhancing conflict at a localised level, especially in pastoral societies in Africa that are resource-dependent economies (IPCC 2014: 773).

Ban Ki-Moon, then UN Secretary-General, in his speech convening the UNSC session in 2009 on climate change and its related security threats emphasised how 35\$ billion (half budget of peacekeeping), till date has been spent in ten Council-mandated peacekeeping missions where natural resources played a key role in the conflict (UNSC 2011: 2). Updating on the previous UNSC discussion and further developments, countries more or less presented their earlier stances. Taking forward the conflict argument, Executive Director of UNDP in the 2011 UNSC meeting stated that climate change acts as a “threat multiplier” and would exacerbate conflicts in economically deprived and conflict-prone areas as both quality and quantity of resources available will get affected due to climate change (UNSC 2011).

Linking climate change with agriculture, Ban Ki-Moon stated how regions in Pakistan, Horn of Africa, China and others pointed to the bleakness of the situation, as the UN had to declare two regions of southern Somalia as famine affected. He also expressed his apprehensions about the changing nature of countries due to environmental refugees (UNSC 2011). It is quite evident that the countries of the North (as also reflected in the emphasis of the UN Secretary General’s worry of environmental refugees “reshaping the geography of the planet”) wish to see the security narrative of climate change to evolve around the refugee and migration aspect (UNSC 2011). However, it is pertinent that movement of people within and outside the country would have a significant impact on agriculture production, the price of commodities and food security. It has been acknowledged by many that small and medium scale farmers would be affected the most in developing countries; yet the

reality of food security and the threats to agriculture necessary for sustenance of major populations of the developing countries are not adequately taken on board.

Germany, who held presidency for the particular session, pointed out how food insecurity and drop in production could affect countries like Afghanistan, Cote d'Ivoire, Haiti, Liberia, Sierra Leone, Somalia and the Sudan (which is now two countries) where half or more than half of the labour force is engaged in agriculture as possible droughts, floods and extreme weather events will disturb and disintegrate the ethnic-social fabric of these countries affecting the peacekeeping efforts (UNSC 2011: 4).

Pakistan, Venezuela, Sudan (now two different countries), Philippines, Bangladesh, Kuwait on behalf of Arab States, Lebanon, South Africa, Non-Aligned Movement, Brazil along with Argentina on behalf of Group 77 countries and China, stuck to their previous position of UNSC 2007 but recognised and felt the importance of climate change as a security threat from the perspective of the SIDS (UNSC 2011). They did not agree with the direct linkages with conflict implied by Germany and the UN Secretary-General but did accept an indirect causal effect on conflict and called for the United Nations Framework Convention on Climate Change (UNFCCC) and other mechanisms to deal with it (UNSC 2011: 7). Brazil, along with China and G77 were of the view that conflict not only has the dimension of ethnic and religious violence but also factors in "hunger, poverty and competition for scarce resources" (UNSC 2011).

India contested the role of UNSC in addressing the issue and said that it "had some difficulty in accepting assertions made that affects of climate change go beyond the mandate of UNFCCC" (UNSC 2011: 10). The important point it raised in its position was about the urgent need to check agricultural protectionism with rising speculation on agricultural prices and commodities, diversion of land for non-food crops which have led to the situation of food crisis (UNSC 2011: 10).

Like earlier, Italy, UK, EU, Canada, New Zealand aligned with the SIDS and reiterated the importance of UNSC in understanding and developing responses to security threats emerging from climate change (UNSC 2011). France, however, declared that it considered agriculture to be a priority sector and said that for it

“agriculture security” was a priority (UNSC 2011). Kyrgyzstan noted the dangers of food price rise and the risk it has for its country’s food security and expressed threat about the possibility of conflict in such a situation and appealed to the international community to immediately take action on the UNGA Resolution 64/205 in providing food security for developing and underdeveloped countries (UNSC 2011). This, contrary to the existing nonchalance towards recognising the impending threat for agriculture, represents a first if not an explicit recognition of the agriculture sector’s security as a priority for a countries policy.

Lebanon, the Non-aligned countries, South Africa, Argentina on behalf of G77, Ecuador, Kuwait on behalf of Arab states, Bangladesh, Barbados on behalf of The Caribbean Community (CARICOM), Philippines, Sudan and Venezuela supported the above position and strongly asserted how UNSC cannot be the apt forum for discussion of issues related to climate change (UNSC 2011). This strong divide of North and South was clearly visible with the Northern countries batting for UNSC be the forum for discussion along with SIDS who face the imminent threat of survival, and with the Southern countries, though recognising and acknowledging the survival threat and security of SIDS, standing their ground on UNFCCC, UNEP and other related democratic forums as the appropriate forum for discussion and debate as climate change is more a development issue.

After holding numerous discussions and publishing reports on the linkages of climate change and a threat to international peace and security, the UNSC in November 2016 held a session on the discussion “Maintenance of international peace and security: Water, peace and security”. IPCC Assessment Reports, FAO reports, country documents and other NGO publications have shown how climate change is going to affect agriculture at large and one factor among the dangers for that is the reducing availability of freshwater, i.e. around 75% of total freshwater (UNSC 2016b: 38) and variability of availability of water due to climate extremities, changing temperatures, precipitation, melting glaciers and rising sea level. This session was held at an important time after countries signed the Paris Agreement in 2015 and there was a necessity to discuss the implications of the threat of water scarcity about the growing threat to agriculture and food security. Senegal, the President for the session, drew the attention of the Secretary-General and others to the forecasted and evolving

water crisis in Africa and the conflicts that can arise due to transboundary disputes from riparian states for water sharing in a water stress situation (UNSC 2016b). Ban Ki-Moon, then UN Secretary-General, indicated his apprehension about possible growth of communal tension exacerbated by reducing access to water. Citing examples of Darfur and Afghanistan, he argued his position stating one of the factors for conflict in these regions was competition for scarce water resources (UNSC 2016b: 2-3).

The danger of a water crisis exacerbating food insecurity is recognised by most countries across the North-South division. While there is recognition of the possible threat to agriculture and food security, the security threat dimension is not explicitly recognised even though this has prime importance for countries that are dependent on a river basin. Senegal pointed out how the Lake Chad Basin was reeling under extreme stress due to “protracted urban warfare in the Middle East”, giving rise to large complexities as concentrations of internally displaced person are only increasing around the basin (UNSC 2016b: 6). The threats of youth radicalisation, terrorism are evident due to the increasing poverty and unemployment as Lake Chad which is the basis for agriculture, fishing and cattle-raising for nearly 20 million people of four countries is seeing depletion, and in a climate change scenario, such stresses will only increase as is evident from various reports of IPCC, FAO and others (UNSC 2016b: 18).

Spain, in a discourse setting statement, stated, there is no “food security without appropriate water management” (UNSC 2016b: 28). Supporting what other African countries have been saying about the threat to agriculture due to water scarcity, Pakistan in its response stated how African countries especially sub-Saharan African countries will be affected the worst as “it is intricately related to food security and to development. Asian and African States, in particular, sub-Saharan States, all are witnessing growth in population, extreme vulnerability to climate change and an ever-increasing hunger for development” (UNSC 2016b: 32). The Maldives, whose survival is threatened by climate change, sees the growing threat of climate change as the aggravation of naturally occurring El Nino phenomenon in the Pacific ocean, posing a threat to livelihoods, agriculture and food security (UNSC 2016b: 71).

The crisis in the Sahel region of Africa at Lake Chad has been raised and discussed in various forums. UNSC, in its “Peace and Security in Africa Challenges in the Sahel region” meeting in March 2016, discussed the issues at stake and the threat of rising extremism at lengths. Egypt which held the Presidency for UNSC explained in detailed how both the West African region and the Sahel region are inflicted with “unresolved conflicts ranging from the renewed insurgency in the Niger Delta and deadly clashes between farmers and herders over scarce and dwindling agricultural resources, to terrorist activities in northern Mali and north-eastern Nigeria, which have spilled over to the neighbouring countries of Cameroon, Chad and the Niger” (UNSC 2016a: 2-3).

What is important to note here is the persistent frequent drought considered dangerous and hazardous has been aggravated by climate change hence adding to other threats like “organised crime, trafficking and violent extremism” (UNSC 2016a: 2-3). Boko Haram, the terror organisation that is widespread in Sahel region, finds its genesis due to the prevailing problem of rescinding and drying Lake Chad which has aggravated due to climate change. Lake Chad is a biodiversity providing prospects for livelihoods through fishing and farming to nearly 2 million people (UNSC 2016a: 3). Similarly the Niger River Basin area is another important zone rich in resources which too is suffering from the extremities of climate change i.e. changing rainfall patterns in Niger Basin affecting nine countries – Benin, Burkina Faso, Cameroon, Chad, Côte D’Ivoire, Guinea, Mali, the Niger and Nigeria, among which seven are amongst the 20 poorest countries in the world with 70% of population in these countries living in rural areas with “food insecurity” (UNSC 2016a: 3).

Land has a special cultural significance for people in the Sahel region; with it they identify community, history and culture (UNSC 2016a: 8). However, with effects of climate change and changes in water availability and increasing, intra and interstate migration and presence of Boko Haram already exploiting these differences, the possibility of conflicts increasing is growing. Desertification is an everyday problem and threat to people and agriculture in the Sahel region however now with climate change its impacts have numerous problems for agriculture as increasing “natural disasters particularly drought” will have a catastrophic impact on agricultural resources (UNSC 2016a: 9). As the growth of desertification will happen with

dwindling agriculture resources like water and effects of climate extremities, men will migrate to cities leaving women and children in rural areas fending for themselves to find food and survive. All this poses a crisis for human security (UNSC 2016a: 9).

The role of climate change in creating a security threat is not unanimously agreed upon, though there is widespread recognition that SIDS countries survival is impacted by climate change. The division between the North, who see UNSC as an appropriate forum and the South, who want UNFCCC, UNGA and another representative fora to be the platform for discussions and decisions is wide open. Between these contrasting positions, lies the recognition to act swiftly to ensure SIDS countries are affected the least and are not wiped out from the world map. The imminent threat posed to Sahel region from increasing activities of extremist organisations like Boko Haram which are using divisions and problems aggravated due to climate change as reasons to spread their network and terror is also acknowledged. However, action regarding this imminent threat lies upon the consolidation of a unanimous opinion about the appropriate forum and the nature of the threat from climate change.

Climate change as a phenomenon has a socio-economic perspective which the developing countries have been emphasizing. The threat of migration due to loss of livelihoods due to climate changes, especially in countries that are heavily dependent on agriculture is also real for countries in the EU, which are heavily debating the consequences of it. With close to 40% global employment coming from agriculture, i.e. 1.3 billion jobs with most of them being working poor (ILO 2017: 2), it is ironical that developed countries are fearing migration caused by climate change.

Changes in precipitation patterns will affect water availability, with arable land reduced due to floods, droughts and use of biofuels for mitigation purposes for the energy sector, impacting food security and causing instability (EU 2008). Being historically proximate with Africa, EU countries feel such food insecurity and resource crunch would fuel conflict, especially between different ethnic and religious groups leading to political radicalisation, which is a threat not only for EU but international security (EU 2008: 2-5).

EU already worries about migration and the possibility of conflict after the recent waves of migrants it has seen from countries like Syria, Iraq, Afghanistan and Eritrea (Stevens 2017: 3). Between 2002 and 2012, the share of immigrants in select EU countries crossed 10% in absolute terms in the majority of countries (Davis and Deole 2017: 1-3). This rise of immigrants is giving rise to right-wing parties in EU who are running elections on a xenophobic agenda, though the migration into EU happened due to conflicts in home countries like Iraq, Syria and others noted above. In specific countries, the amount of migration into the country has a direct correlation to the increasing vote percentage for these right-wing parties resulting in conflicts in societies based on fears of grabbing of resources (Podobonik .et al. 2017: 2-5). It is from these trends that EU has seen the possibility of threats from climate change disturbing the security of EU.

EU recognises the possibility of conflict in fragile regions and countries over the stresses populations face due to deteriorating access to resources, food, freshwater by “natural catastrophes exacerbated by climate change” forcing people to migrate by “overstretching the economic, social and administrative capabilities” of these fragile countries with an overall negative impact for international security (EU 2012: 3). Considering this situation EU has prepared and has a plan of action for its armed forces and its allied forces, i.e. NATO to respond to situations and scenarios increasingly affected by natural calamities due to climate change (EU 2012).

Africa, with which Europe has historical ties, has already been experiencing conflicts due to resource distribution which have been aggravated by climate change especially in the Darfur region of North Africa and Sahel region (EU 2008: 6). It has been noted that Southern Africa is already experiencing droughts and water scarcity hence affecting food production and food security. EU fears instability in these regions especially North Africa and Sahel region will fuel migration towards Europe (EU 2008: 6). Similarly, the other region that would be affecting Europe’s security is West Asia, which too is reeling under intense water stress with conflicts of sharing of water resources between riparian states already building up. The reduction in Jordan and Yarmuk rivers flow will affect Palestine, Israel and Jordan, increasing and extending fears for EU as any tension in this region would have “detrimental implications for Europe’s energy security and other interests” (EU 2008: 7).

Countries like Turkey, Iraq, Syria and Saudi Arabia will also be affected in a climate change scenario, impacting Europe's strategic interests (EU 2008: 7). Climate change and the resulting instability in Central Asia, South Asia, Arctic region and Carrabian and Latin American countries will have significant direct and indirect effects to security interests of Europe (EU 2008: 7-11).

The US, after recognising and including climate change threats in its military preparedness from the 1990s echoes similar concerns but is a step ahead with its various security policies already dealing with emerging threats. In its National Defence Strategy of 2008, the US Department of Defence identified various sources of conflict and stresses to international security in the next twenty years. It considers "physical pressures – population, resource, energy, climatic and environmental – could combine with rapid social, cultural, technological and geopolitical change to create greater uncertainty" to global security environment (USDD 2008: 4). Although the document significantly focuses on the rise of non-state actors and the threat posed by them, it also recognises climate change and threats emerging from it as a possible disrupter for international security.

In a statement recorded before the [House Permanent Select Committee on Intelligence House Select Committee on Energy Independence and Global Warming by Dr. Thomas Fingar, Deputy Director Of National Intelligence For Analysis And Chairman Of The National Intelligence Council] recognizes the impending security threat emerging from climate change to international security system in future and especially to US in the next 30 years (US GCC NIA 2008: 4-5). Though conceding that the US will not face direct threats, and could benefit from climate change due to better resources to adapt and advantages of increased agriculture output, the threat comes from the damages climate change will cause to developing countries where existing problems like poverty, hunger, social tensions, environmental degradation and others will be aggravated (US GCC NIA 2008: 4-5). This tension will give rise to instability within these countries leading to migration both inwards and outwards, affecting the richer countries in the latter case (US GCC NIA 2008: 4-5).

Due to varying rainfall and increasing temperatures from the 1960s, Sub-Saharan Africa will be the zone of instability in Africa. Similarly, the Asian regions of South, Southeast, and East Asia due to increasing floods and droughts will face

reduced agricultural productivity (US GCC NIA 2008: 8-12). Similarly the spillovers from poor and struggling states of Sub-Saharan Africa, the Middle East, and Central and Southeast Asia through “increased migration and water-related disputes” will certainly have an impact on global security climate (US GCC NIA 2008: 13). Importantly the National Security Strategy 2010 of US categorically recognises the threats posed by a warming climate especially increasing the possibility of “new conflicts over refugees and resources; new suffering from drought and famine; catastrophic natural disasters; and the degradation of land across the globe” (US NSS 2010: 47). Interestingly, The Quadrennial Homeland Security Review 2014 notes how climate change would act as a “threat multiplier”, indirectly being the cause of aggravating challenges of poverty, social tensions, enabling stressors abroad which “enable terrorist activity and violence” and others with threat of populations movements from Mexico, Caribbean and Central America due to increasing severe droughts and tropical storms (US 2014: 22).

The North perceives threats emanating from climate change within the spectrum of migration, rising sea level and conflict in developing countries due to resource scarcity. Though there is recognition regarding the threat to food security and agriculture, this is seen only about the possibility of conflict in developing countries but not as a human security issue that was contemplated and debated in the UNSC and UNGA. The primacy of migration and conflicts in the security discourse among the global North would entail similar responses from the international community due to the nature of international politics and climate change negotiations. It is not as though conflict does not affect social stability and progress for the developing countries, but there is a risk in distancing climate change from developmental concerns, which the global South wants to give primacy to.

4.2 Regional Organisations and their Role in Assessment of Climate Change as a Security Threat

To understand how climate change and its related threats were taken seriously, one has to study the role and responses by the South Asian Association of Regional Cooperation (SAARC) which is the premier regional cooperation body in South Asia. The third SAARC summit at Kathmandu took special note of increasing environmental degradation and the need to take steps to reign in this destruction

before it takes an irreversible form (SAARC 1987). What is interesting was the clear mention of rising global sea level and the threat it poses to the people of South Asia. The summit also noted how the increasing frequency of natural disasters like floods, droughts, landslides, etc. will pose a threat to the lives of people of South Asia. In the South Asian region, steps were taken to counter climate change way before the 1992 Earth Summit at Rio De Janeiro, where the international community recognised climate change as threat (SAARC 1987).

SAARC countries decided to celebrate 1992 as the “SAARC Year of the Environment” at Male, Maldives recognising the growing evidence from IPCC on climate change and the need to demand that developed countries mobilise finances to ensure that developing countries are not affected (SAARC 1990). However, this momentum did not last long as the subsequent summits did not yield any significant ways or methods to deal with the impending threat but became platforms to hide inaction at the ground level with tokenism such as by the declaration celebrating 2007 as ‘Year of Green South Asia’ at the 14th SAARC summit.

It was not until the Thimphu silver jubilee declaration that the importance and seriousness of climate change were recognised with climate change being the theme (SAARC 2010). The statement noted how “South Asia is particularly prone to climate change and related disasters” hence “making the need for a regional response to meet the challenge of climate change more urgent and compelling” (SAARC 2010). Notwithstanding this position at Thimphu, SAARC countries at the 14th SAARC summit in 2007, called for the establishment of a food bank to deal with crises of famine and food shortages where this collective grain will help deal with hunger during times of difficulties (SAARC 2007). The objective of the food bank was “to act as a regional food security reserve for the SAARC Member Countries during normal time food shortages and emergencies; and to provide regional support to national food security efforts; foster inter-country partnerships and regional integration, and solve regional food shortages through collective action” (SAARC 2007). The establishment of food banks shows how important food security is for these countries and the realisation that collective effort is required to ensure food security. Climate change impacts in the region would fall in the same category of problems. By ensuring the region collectively participates and takes stock of food

security, SAARC countries have ensured that social conflict will be minimised in times of climate change.

The Council for Security Cooperation in the Asia Pacific (CSCAP) – a non-governmental track two diplomacy channel for dialogue in the Asia Pacific with a wide range of countries like US, Japan, Papua New Guinea, EU, India and others – has identified climate change as an emerging security threat for the Asia Pacific region. CSCAP feels that Asia Pacific region will witness decreasing crop productivity, food security, varying and decreasing precipitation patterns, increasing intensity of storms, coastal flooding, droughts and floods directly or indirectly affecting the basic security of populations due to climate change. The primary drivers of climate change leading to short-term food crises due to decreasing yields in the fisheries sector due to changing temperatures or agrometeorological conditions, resulting in rising food prices and leading to “widespread hunger and malnutrition and social unrest” (CSCAP 2010: 1-4).

4.3 Locating Climate Change as Security Threat: The Role of Developed and Developing Countries in Securitisation of Climate Change

There appears to be an agreement amongst the international security community about climate change emerging as a security threat, albeit with various countries and stakeholders differing on the variance, nature, effects and the reasons. It is from this causal analogy that links the effects of climate change to conflict that the need for discussion arises.

One of the primary questions that arises is why climate change is seen as a security threat? How do various stakeholders in the international community like state, non-state actors and individuals perceive climate change as a security threat? Is there a reason between developed countries and SIDS seeing climate change as a security threat and developing countries like China including G77, India, Non-Alignment Countries, Arab group, African group and others questioning the normative framework of seeing climate change as a security threat rather than a development issue? What does securitising climate change yield to the security community at the international level?

To start with it is important to understand that climate change is a security threat for the SIDS countries as their existence is under question (UNSC 2007). It is an existential threat for them as their survival depends on tackling the effects of climate change or else the increasing water level due to global warming will submerge these islands, hence wiping out a sovereign country of the world map for the first time due to environmental reasons (UNSC 2007; UNGA; 2009; UNSC 2009). Climate change for SIDS countries is not just a question of development but a question of survival. The position of SIDS –economically, geographically and geopolitically – makes them vulnerable to any inaction towards climate change. SIDS countries, by pursuing their survival in a climate change scenario, are not just politicising the threat but by their action of speech and references to the threat of elimination, brings in the need for an emergency response, hence paving the path for securitisation of climate change.

The debates and consensus among developed countries, and including SIDS countries, see climate change being elevated to security threat level through a process of securitisation where the developed countries have fulfilled the main criteria of acceptance by the audience. The developed countries, through their sway in international politics, have an overbearing impact and influence on deciding the nature and content of the international security debate. This has to do with the hegemony of developed countries in the UNSC and the limited membership in the UNSC of developing countries, coupled with disproportionate availability of resources with the former. It is in this context the use of UNSC and the debate around climate change being a security threat needs to be studied. Developed countries bypass other fora like UNEP, UNGA, and UNFCCC While the developing countries regard climate change as a development issue which needs to be discussed in fora where representation and voting structure are democratic (UNSC 2007; UNGA 2009; UNSC 2009).

Security, for the constructivist school of thought, is not a value position or condition to be fulfilled but a social practice that is shaped by the social actors through their actions like speech, verbal and non-verbal and other (Trombetta 2008: 587). It is in this context that the Copenhagen school of thought, which introduced the concept of securitisation especially with the larger parameters of non-traditional security, argues that security as defined by the Realists is a narrow concept only

dealing with high politics and relegating non-traditional security concerns like environment and climate change to low politics (Trombetta 2008: 587). Securitisation, for the Copenhagen school, means an issue being securitised by a series of acts performed by actors through speech acts both verbal and non-verbal with a specific referent object with acceptance by the societal audience (Buzan, Wæver, and de Wilde 1998). It contrasts “politicisation with securitisation as the former referring with the act of dealing with an issue within the traditional political system, and the latter implying the call for “emergency measures” beyond the “normal bounds of political procedure” (Dhanasree 2017: 36-37). For the Copenhagen school, for an issue to develop into a security issue, there are “no objective threats wanting to be discovered” (Trombetta 2008: 588), but threats are there in the society to be socially constructed to pursue through emergency measure (Buzan, Wæver, and de Wilde 1998). It is with this understanding that SIDS countries as actors use their survival as the object of reference about climate change-induced effects within the global security community dominated by the UNSC and gained the acceptance of developed countries as the audience who accepted this position.

The example of US is apt to understand how climate policy has turned into “climatisation” through the “infiltration of military responses” in a non-military sector, hence bringing emergency provisions and making responses exclusionary (Lucke .et al. 2014: 875). The risk of these emergency provisions would require a shift in global policy efforts to deal with the effects of climate change – from the causes to the immediate concerns, i.e. to instantaneously reduce GHG emissions. This emergency provisioning would put pressure on developing countries, including the agriculture sector, as affecting the food production, livelihoods and food security of millions of people. The question of adaptation is important for developing countries as their security lies in adaptation (IPCC 2007; EU 2009; UNGA 2009B).

The discontent within the developing countries about climate change being seen as a security threat, the forum of discussion being the UNSC and the urgency being shown by the developed countries, has ensured that the security angle of climate change remains contested and debated. The larger consensus about threats emanating from environment issue and the reasons for environmental securitisation not being successful lies in its failure to find an “identifiable emergency measure” (Lucke et al.

2014: 858-862) like the Realist views military action as the solution for traditional security concerns. It is in this context that securitisation of climate change, when dealing with “risk” as a factor rather than “threat” being the criterion, countries find themselves much freer to deal with the vulnerability and security aspect of climate change rather than the limited narrative of exclusiveness and emergency provisions (Lucke et al. 2014) . It is the “possibility of harm” that encompasses “risk” in comparison with “threat” as the element of investigation for security threat concerns for which the “direct causes” i.e. the first order direct causes. However for “risk” it is the “second-order security politics” i.e. conditions of “harm or danger” become the basis of security making the whole exercise complex. (Dhanasree 2017: 49). The “risk” versus “security” aspect of seeing climate change is necessary to investigate especially when developed countries are using SIDS countries’ existential threat as a reason to push for emergency provisions through the platform of UNSC even after the developing countries have expressed their dissent. The essential distinction that needs to be made is the role of politicisation of climate change as opposed to securitisation.

There is a whole lot of literature available that establishes how the possible effects of climate change will pose a danger to international security through questions of food security, water security and migration. However this literature does not conclusively prove the linkages between effects of climate change leading to social conflicts (Kueter 2012: 2). Frequent storms, floods, droughts, increasing prices, movement of migrants leading to scarcity of resources, do create a ground for deteriorating social conditions leading to conflict and civil strife for resources, food and others. But any such relation is causal and “empirical proof for the causal connections between climate change and conflict” is hard to find as the environmental literature has scant support to offer regarding the claims of conflict between states or within due to storms, droughts, floods or resource scarcities (Kueter 2012: 3). Due to the lack of assertive and conclusive proof on linking environmental security threats to conflict especially in case of resource scarcity, water scarcity – though water has been a one of the factors for conflicts in Sub-Saharan Africa, West Asia and other countries – it is effective to say from the study of literature available that politicisation of environment has been more favourable to scholars than securitisation. However, there is consensus on the aspect of high politics now realising and accepting environmental issues as part of its security politics (Dhanasree 2017: 49).

The analogy of climate change increasing the possibility of floods, droughts, cyclones etc., hence lowering and affecting food production, food security, water security and in turn becoming an aggravating factor for conflict in regions experiencing resource conflict is nothing but a “climate-conflict hypothesis argument linked together in a chain” (Kueter 2012: 18). The validation of the above linkage would be true only if every link in the chain through the entirety needs to be accepted as an argument of assertion. If any negation happens in between, the veracity and truthfulness of the linkage breaks hence making it a casual set of arguments made to produce an impact on security interests (Kueter 2012: 18). Experts, who are asked to place these records or facts in place using the same cyclic methods or data used by IPCC, conclusively bring out an opinion which later on becomes an accepted fact. In reality, the problem arises when the authenticity of this proof is verified, making these arguments a set of “opinions, albeit informed opinions” (Kueter 2012: 18).

The politics around seeing climate change as a security threat revolves around the discursive trends used to frame the nature of threat and response, the prominent ones being the environment security and environment conflict discourse. Environmental conflict discourse has a narrative of emergency embedded in it, which has a sense of urgency as it relates primarily to conflict due to the scarcity of resources. Here the policy responses depend heavily on the state institutions to take immediate adaptive measures to deal with possible conflict among communities, social groups and individuals hence giving primacy to the state to protect the security threat of the state (Detraz and Betsill 2009: 302-306). Environmental security deals with human security as envisioned in the UN Human Development Report of 1994, which categorised environmental security, food security, economic security, personal security and health security, community security, and political security among seven securities (Detraz and Betsill 2009: 306). The Security Council debate on climate change as a security threat in 2007 did see a great divide of North versus South with the 70% of the former countries wanting UNSC jurisdiction and 29% of the latter only authorising such move.

Adaptation which holistically deals with the issue of climate change for the developing countries has been time and again asserted as the important mode of policy not only for survival but to ensure justice to people. This was also recognised

by the UNGA when it recognised adaptation as a necessary corollary to ensure security to people and “safeguarding social and economic development in the face of climate change threats” (UNGA 2009B: 24). Similarly, the ability of adaptation to reduce climate change impacts cannot be ignored and its potential to “reduce the risk of many key vulnerabilities” (IPCC 2007: 780). The international community should ensure effects of climate change are reduced through mitigation, and developing countries should be assisted through adaptation mechanism for capacity building and respond to “water scarcity, food security and agricultural resilience” (UNGA 2009B: 27).

Adaptation is seen as the prescription to avert the risk of climate change and also as a solution to deal with issues of migration, conflict and displacement. “Adaptation to climate change, sound policies on displacement, migration and conflict prevention are the most effective ways of dealing with the international security implications of climate change” (EU 2009). The idea of risk-based securitisation is to ensure the causes of climate change are eradicated through mitigation (Lucke et al. 2014: 872).

The role of securitisation of climate change especially within the broader framework of environmental security was recognized by Buzan, Wæver, and de Wilde. The work of Detraz and Betsill showed how the climate change discourse remained largely within the ambit of environmental security though there have been increased discussions about the role of conflict, it is only one factor among a range of others. It is in this relation agriculture has to be seen. The human security aspect which is prominent in the environmental security discourse should give space to agriculture-related effects of climate change. It is amply clear from the debates within the international security community that food production, extremities of climate and water availability will affect food security. To ignore and isolate agriculture from the larger security debate on climate change will be counterproductive. .

4.4 Emerging Linkages of Climate Change and Conflict: Some Recent Case Studies

The concept of climate change-induced conflicts has sometimes been challenged as nothing but an abstraction devoid of proper documentation of facts.

Some recent examples of conflicts in developing countries related to agriculture, water, environment, and climate change link these with conflicts.

India has the second largest population in the world, with nearly 55% of its population engaged in agriculture according to the 2011 census. However agrarian distress has been a big problem in India with nearly 3,00,000 farmers – cultivators and agricultural labourers – committing suicide between 1995 and 2014 due to financial distress, reducing farm incomes, crop failures and other problems (Basu et al. 2016). In India, close to 52 percent of the area is un-irrigated and rainfed, i.e. close to 73.2 million hectares out of the total 141.4 million net sown area (Economic Policy India 2018: 102). The years 2017 and 2018 have seen huge protests from farmers all over India with thousands of them turning to the streets to protest falling remunerative prices for agricultural commodities and for agricultural distress. Five farmers were shot dead by Madhya Pradesh state police in Mandsaur during farmers' protests (Gupta 2017). Over one lakh farmers marched on 12th March to the Maharashtra Vidhan Sabha in Mumbai from Nashik in the All India Kisan Sabha (AIKS) organised "Long March" demanding loan waiver and implementation of Swaminathan committee recommendations (Mehta 2018).

In irrigated lands, the price of fuel plays an integral role in the share of income a farmer gets; with reduced use of fossil fuels for energy due to GHG emissions, how will a climate change scenario play out for farmers? The Economic Policies of India 2017-18 document shows a distressing trend for Indian agriculture due to climate change. Un-irrigated areas will be most affected with the overall production of agriculture getting affected, i.e. on an average of 4% to 12.8% for *rabi* and *kharif* crops due to changing temperatures, rainfall and increasing extreme weather incidents. This coupled with reducing farm incomes on a range of 4% to 15% due to increasing-decreasing rainfalls, temperatures and extreme weather incidents for both *rabi* and *kharif* crops (Economic Policy India 2018). When seen in totality, the agriculture sector is plagued with immense problems that will only worsen with the predictions of Economic Survey of India which predicts a fall in production and income with rising temperatures, changing precipitation patterns and increasing extreme weather events. Though the Indian government sees securitisation as a western concept with Euro-centric tendencies, the agrarian situation will entail

necessary actions to be taken up or else with the present trends of rising unrest, the agriculture sector's problems will turn into a security issue for India.

Africa, the most underdeveloped and poverty stricken continent of all, is facing the brunt of climate change even though the role of Africa in GHG contributions historically has been minimal. The sub-Saharan region with increasing temperatures and reducing agriculture productivity will be the most vulnerable to social tensions as the region is already conflict prone and hostilities between communities are omnipresent. It is in the context of the water crisis in Cape Town, that South Africa needs to be examined. Cape Town experienced drought for three consecutive years, exacerbated by increasing global warming (Welch 2018; Morabito 2018). Cape Town has seen reduced rainfall over the years with 2017 being the lowest since 1933.

The Department of Water and Sanitation (DWS) sounded an alarm bell in 2007 about an impending water crisis. However the South African government in 2015 allocated significant amount of water i.e. 40% of Western Cape's water supply to agriculture (Morabito 2018). According to experts, this water crisis might affect around 3, 00,000 jobs in agriculture, services and thousands of jobs in food sector, industry, service and others (Baker 2018). The water crisis is so huge that the city council has decided to ration water and deploy South African Defence Force and South African Police to guard check-posts and water distribution to avoid any social tension (Frisk 2018; Morabito 2018; Baker 2018). On the face of it, the water crisis is located in an urban setting but it has wide implications for agriculture, both regarding water availability and job loss. This, in turn, can affect the agriculture production and food security of the country and the region.

Indications of such losses have been categorically stated by IPCC in its forecast reports, and the threat of social tension regarding the access, usage and allocation of resources during a crisis is well documented. In a clear case of visible linkage between climate change induced droughts, resulting in this situation of water scarcity and the use of the military to secure water, looks like a potential security issue for the country.

The 2007-2008 food crises hit global food security, pushing millions of people into hunger and poverty and reminding countries of the intricacies related to rising

food prices, social stability and food security. The worst affected were countries that were underdeveloped and import dependent for their food needs. Increasing food prices in already destabilised countries, especially in Latin America, Asia, West Asia and the Caribbean, have witnessed massive protests and food riots erupting in response to these price rises. Countries ranging from “Burkina Faso, Cameroon, Egypt, Guinea, Haiti, Indonesia, Mauritania, Mexico, Morocco, Nepal, Peru, Senegal, Uzbekistan and Yemen” faced huge crises to feed their populations as the need for emergency food aid increased with a number of people unable to access food with increasing food prices (UN 2011: 62).

Multiple factors contributed to the complex interplay of the 2007-2008 food crises with the prominent ones being drought-induced crop failures, increasing biofuel production in Europe and US, and “excessive speculation in agricultural commodity markets” (UN 2011: 68). Cheap oil played a critical role in agricultural production for several decades and with this coming to an end in 2008, with one barrel exceeding 147\$, showed how vulnerable agriculture prices are to energy. When this is seen with a persistent drought affecting major food producing countries, it forecasts a bleak picture for the future as climate change impacts the energy sector and agriculture. The energy sector dependence on fossil fuels has to decrease as both developed and developing countries need to reduce GHG emissions and move away from fossil fuels hence the role of biofuels – which take up a share of cultivated agriculture land and food produced – will be interesting to study in relation to food security and food prices (IFPRI 2008; UN 2011: 68).

In Africa, especially for the sub-Saharan African region, food requirements are not sufficiently met by the domestic production forcing them to heavily rely on food imports especially commercial imports and food aid to supplement their domestic production. These countries are plagued with insufficient infrastructure and resources for proper trade facilitation, adding further barriers to food security at times of increased food prices (Berazneva and Lee: 2013: 32). It is not surprising to see fourteen of the 53 African countries which saw a huge and abrupt rise in food prices in 2007-2008 see massive demonstrations that came to be known as “food riots” (Berazneva and Lee 2013: 31).

The production of bioethanol and biodiesel are heavily subsidised by developed countries, which provide \$13 billion in assistance to sustain and produce biofuel production, diverting nearly 120 million tons of cereals to fuel conversion away from human consumption. 119 million food grains which were shifted to ethanol distilleries out of 416 million in the US were sufficient to feed 350 million people for a year. An unpublished World Bank report claimed that biofuels contributed to global food price hike by forcing prices up by at least 75% (UN 2011: 68). The International Food Policy Research Institute (IFPRI) in its report underscores the role of biofuels in fanning and propagating food price spike in 2007-2008 (IFPRI 2008).

Scholars argue that empirical evidence for linking conflict with adverse effects of climate change is difficult to establish. However, the recent incidents of food riots during the 2007-2008 food crises, the Indian farmers' protests and the Cape Town water crisis show an emerging trend of governments facing the threat of social instability. It would be unfair and unrealistic to draw a causal and general understanding from these three instances. However, it would be unwise not to comprehend the nature of crises likely to result from climate change – impacting the poor in the developing countries and in turn imperilling international peace and security.

Chapter 5

Conclusion

The science of climate change has been a part of international politics and the climate change negotiations. The climate change negotiations can be traced back to the numerous reports and scientific endeavours of various individuals, states and organizations, such as IPCC, FAO and others. Though environment was a concern among states internationally, it was only with the Rio Earth Summit in 1992 that the translation of science into inter-governmental negotiations for climate change took place. While the impact of climate change on agriculture has been documented extensively, the linkages between agriculture and climate change have not appeared in an emphatic manner in the negotiating positions of countries or in the international agreements resulting from such negotiations. International organisations – both intergovernmental and non-governmental – have been discussing and showcasing the threats arising from the impact of climate change on agriculture, affecting weather variability, water availability, food security and livelihoods – especially of marginal and small-scale farmers located in the relatively poorer countries of the South.

The effects of climate change are more pronounced in rainfed regions than in irrigated farmlands. This makes the arid and semi-arid regions – where the tropical countries which are mostly the developing countries with large populations of small and marginal farmers engaged in agriculture – vulnerable to the effects of climate change. The periodic Assessment Reports of the *Intergovernmental Panel on Climate Change* (IPCC), which have provided the definitive scientific inputs to the international climate change negotiations since 1990, have not adequately focused on the critical linkages of climate change with agriculture and the implications for food security and livelihoods.

The climate change–agriculture linkage has found mention more in the context of GHG emissions caused by agricultural activities, especially paddy cultivation and animal industry, which are activities more pronounced in the developing countries as compared to the mechanised and technologically advanced agriculture sector in the global North. This acted as the inception for the divisions between the developed global North and the developing global South on the negotiating table. Moreover, the

North, with a much larger emissions share – both current and historical – has tended to focus more on *mitigation* and the global negotiations have, therefore, not provided adequate scope for discussion on *adaptation*, which is crucial for the developing countries, especially in the realm of agriculture. This bias in the negotiations in favour of mitigation has meant that the issue of agriculture has also become entangled in the larger narrative of North-South politics in the climate negotiations.

As the climate negotiations have proceeded over the decades, scientific evidence on the impact of climate change on agriculture – based on available data – has become more specific. IPCC, FAO, World Bank and various government reports have not only predicted reduced water availability but also indicated the possible impacts on food security due to rising temperatures, changing rainfall patterns and increasing climate extremities, individually as well as cumulatively affecting food production at large. Most studies converge on the finding that the adverse impact will be felt more in the developing countries, especially those located in the tropics – parts of Africa, Asia, South America and South and Southeast Asia – and other areas in the arid and semi-arid zones. The impact on agriculture is not only direct but also indirect, as shown by the ILO, which predicts 40% of overall global employment comes from agriculture, and that livelihoods are in danger due to climate change.

FAO, in its reports has pointed at the rising threat to small and marginal farmers, especially in places where dependence is high on rainfed farming. However its reports have been unable to translate into policy action. The developing countries of Sub Saharan Africa, South Asia and Southeast Asia, who are the primary targets of climate change, have been ineffective in raising issues of agriculture in the climate negotiations. If the 1997 Kyoto Protocol, which limited emissions reduction targets to Annexe I countries – was a victory for the global South, the 2015 Paris Agreement pact reasserted the dominance of power politics. The developed countries, under the leadership of the US, effectively drove a wedge between the developing countries post the 2009 Copenhagen COP by moving away from the ‘Common but Differentiated Responsibilities’ (CBDR principle, which bound historical emitters to legally binding emissions reduction commitments.

Brazil agreed to this new scheme of voluntary emissions reduction programme initially due to domestic pressures based on the fear of rising GHG emissions and

imminent threat to people at large. Though the Brazilian economy is dependent on agriculture and any effort to reduce emissions from agriculture will affect food production and food security, the role played by Baptists, NGOs, agro-companies, trade unions and pressure groups in the creation of a vibrant political consciousness about the environment and climate change brought about a change in the Brazilian position. South Africa followed Brazil's path as it too had a similar level of awareness within the political class about the dangers of rising global temperatures and the implications for their country. The US bilateral agreement with China, outside of the multilateral forum, brought the shift in the position of China. India, after losing its significant heavyweight allies in the climate change negotiations, acceded to the new formula offered at the Paris COP, thereby shifting away from the CDBR-based Kyoto regime.

The domestic arenas in China and India have little awareness of the emerging threats from climate change, especially for agriculture. China's political setup, i.e. the single-party political system and the central role of the Communist Party, does not allow much space for the domestic lobbies to play any role in building awareness. The Indian case is completely different; yet there is no significant awareness creation about the threats emerging from climate change to the population at large, leave alone the significant and specific threat to agriculture and food security. Leaving aside the Communist parties and their farmers' organisations, the two large national parties that have been in power since the last two decades have showed no significant interest in the growing threat to agriculture from climate change. Although in recent years, the government has been seen to commission reports and research, this is a post-Paris Agreement scenario, where voluntary emissions reduction targets need to be met.

The absence of any concrete policy or agreement on climate change impacts on agriculture leaves the sector vulnerable to the power politics of the developed countries. Agriculture, land related activities and forestry form a significant portion of global GHGs as well as developing countries' emissions. The CBDR principle has given way to voluntary emissions reduction programmes due to pressure from the developed countries, who focus on mitigation as the policy action rather than adaptation for agriculture. This is already evident from the strong pressure to move towards Climate Smart Agriculture (CSA), with the backing and support of the FAO,

IMF and World Bank. The projection of CSA as the solution to the problems in the agriculture sector is debatable as numerous researchers and activists argue that the policy will favour big agriculture companies, ensuring increased profits for them, while poor farmers and smallholders will become more vulnerable to exploitation. CSA, at the policy level, promotes the use of seeds and technologies useful for farmers to adapt to climate change. Many NGOs suspect this to be a euphemism for the promotion of genetically modified crops and more extensive use of industry manufactured pesticides and herbicides.

The push for adaptation as the mechanism to deal with the exigencies of climate change, especially in agriculture, has been vocally advocated by NGOs both domestically and internationally. They have been playing a vital role in influencing IGOs such as FAO, UNEP and others to conduct more research on the linkages of agriculture in climate change. In the realm of science and research, their contribution in opinion building around the issue has been significant. However due to the power structures and the nature of their limited engagement with the formal negotiations process, policy responses on the issue of climate change impact on agriculture have not found a prominent place in the final texts.

States, when faced with a situation of public pressure domestically act differently at the international level. The Brazilian case is an illustration where NGOs and other domestic actors had a considerable impact on public opinion, which pushed Brazil to concede its earlier position on the CBDR principle and to commit to a voluntary emissions reduction programme. Though India too conceded to a voluntary emissions reduction programme at a later stage, this did not result from domestic pressure, which was negligible if not totally absent. Rather, the pressure for India came from the fact that other similarly-located countries (Brazil, China, South Africa etc.) conceded.

As seen in chapter 2, for the developing countries, the GHG emissions from agriculture are high and comparable with other sectors of the economy. Considering the pressures from the developed countries with regard to mitigation and funding constraints for adaptation, there is palpable fear that to comply with emissions reduction targets, the developing countries might concede adaptation for mitigation though the acceptance of CSA. The lack of information about the merits and demerits of this

policy might be a cause of worry for small and marginal farmers as the cost of using these technologies will increase their vulnerability. The biggest threat that has been indicated by many NGOs and activists is that any shift towards mitigation might lead to changes in cropping patterns and land usage, leading to long-term changes in the agriculture sector. With their large and growing populations, the developing countries are likely to be thrown at the mercy of international markets for imports if their agricultural productivity is impacted.

The WTO Agreement on Agriculture does have provisions to take care of the environmental concerns of states. However, the limitations placed on public spending, especially for ensuring food security, have to be looked into to ensure justice and fairness for millions of people. In the Indian case, where the Food Security Act required government procurement, which would breach the authorised government spending in the form of subsidies, was covered by the temporary benefit of the 'peace clause' in the AoA. Disruption in food production, availability, access and affordability will impact the food security of millions, especially in countries where agriculture will be worst affected due to climate change. In order to ensure food security, the limitations set out by WTO rules need to be looked into not just from the prism of the environment but also from that of the impact of climate change on agriculture. As the climate negotiations and the Paris Agreement favour mitigation over adaptation, it is even more necessary to reconsider the provision of WTO.

The 2008-09 food crises, which saw prices of food commodities skyrocketing followed by food riots, indicate that in a situation where the developing countries become import dependent for their food security, any increase in the price of food will easily convert into a security challenge for these countries. The 'security' challenge is not only limited to the possibility of large-scale violence that would erupt in the form of riots and looting, but also the danger to the human security of individuals and communities as the most vulnerable sections of populations are impacted on a daily basis.

The concept of 'human security' has been recognised by several international entities such as the UNDP, UNSC, UNGA etc., validating the necessity for countries to ensure it. Climate change and its impact on agriculture will have a significant impact on food security, resulting in human security being compromised. UNSC and

UNGA have deliberated about the possible implications of this, however much of the focus lay on securitisation of the issue as the SIDS countries, which are threatened from submergence, have framed the issue of climate change as an existential threat. However as discussed in the Chapter 4, although there is agreement among countries about the threat to the SIDS countries and the need for action, the appropriate process and forum to deal with it has been the matter of contention. Developing countries see climate change as a socio-economic development issue and want relevant bodies like IPCC, UNEP, and UNGA to deal with it, not the UNSC which is not a representative body and which frames climate change as an explicit security threat. The fear of the developing countries is that the the unequal power structures of the UNSC would mean that the the developed countries, through the permanent five, would push the agenda of mitigation over adaptation, unlike in the UNGA, where each country carries one vote. Developed countries' strategy of siding with the SIDS countries is aimed at using their dominance in the UNSC to assert their policy prescriptions. Just like the North's domination at the World Bank and IMF has helped push the agenda of CSA as the silver bullet for climate change, the use of UNSC and the SIDS countries to securitize the issue as an emergency issue, does not allow for more representative routes to arrive at solutions.

The threat of violence and conflict resulting from increasing vulnerability due to falling agriculture production cannot be ruled out. However, the viewing of 'conflict' as a necessary variable in determining a security threat is dangerous and antithetical to the accepted notion of 'human security' by UN and other bodies.

NGOs, which did play a role in pushing for research and negotiations on the linkages of agriculture and climate change, have a somewhat limited role in the setting up of the security discourse. Developing countries, despite having the science and quotient of vulnerability on their side, have not been able to effectively push for policy measures such as adaptation, which are essential for reducing the effects of climate change on agriculture and food security. The reason for this ineffectiveness lies in the North-South politics and the internal divisions within the South, which were later exploited by the powerful developed countries. While the developed countries see agriculture as a sector that can contribute to mitigation, the developing countries, in a bid to resist any commitment on GHG emissions, have not effectively

taken up the case of agriculture and food security in climate negotiations. Due to the nature of international politics and negotiations, NGOs have had to rely on building a domestic base to influence opinion makers at the international level.

True to Robert Putnam's 'Two-Level-Analysis', the role of domestic actors does play an imperative and indispensable role in negotiations at the international level. With regard to climate change negotiations in relation to agriculture, this stands true. Due to the near absence of any pressure within the developing countries relating to the linkages of agriculture and climate change and the consequent effects on small and marginal farmers and food security, the developing countries have not bargained nor pushed for adaptation or other necessary policy measures. On the other hand, the developed countries, as seen from within the security discourse and the larger climate change negotiations, did have a considerable domestic opinion on issues of importance to them, which translated into their bargaining power. These interlinkages between both levels and the role of states, NGOs and IGOs, brings out a complex picture of the climate change negotiations, especially for agriculture where the power politics of the North is clearly visible.

The failure of the developing countries in having the available science on the impact of climate change on translated into effective policy is evident in the delayed response of the UN. The AWG-LCA which was formed to discuss and bring a draft text to be adopted in Copenhagen in 2009 with regard to agriculture did prepare one. But the collapse of the Copenhagen talks and the resulting imbroglio on the future of climate change negotiations sidelined the whole effort that was specific to the role of climate change in agriculture. The AWG-LCA recommended SBSTA to have a separate session with a mandate to look into the effects of climate change on agriculture. The mitigation versus adaptation debate was cohesively discussed, with a range of countries giving their opinions. However, the Paris Agreement climate pact that was reached in 2015 did not reflect the broad and exhaustive process that SBSTA engaged in. This shows how despite having agreed negotiations and positions, climate change negotiations at the COPs effectively tend to only cater to the interests of the developed countries.

However, it will be unreasonable to blame only the developed countries for such an outcome. The developing countries have allowed the discourse to slip out of their hands and allowed the definitions of justice to be determined by the powerful, historical carbon emitters, even though the countries of the South have a much larger and more immediate stake with regard to the impact of climate change on agriculture.

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