

EVOLVING A LEGAL FRAMEWORK FOR CLIMATE-INCLUSIVE AGRICULTURE: EXPLORING REGULATORY INSIGHTS FROM FOREIGN JURISDICTIONS

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ABSTRACT

In recent times, there has been extensive media coverage and public attention on some major controversial issues in the Indian agricultural sector such as fragmented land holdings, distorted agricultural marketing and the newly introduced agricultural acts. However, there remains one conspicuously neglected issue – the interlinkages between climate change and agriculture. Unfortunately, this is the state of play despite the fact that India is the third largest emitter of greenhouse gases (“GHG”) globally, of which the agricultural sector accounts for nearly 16% of the GHG emissions. On the legal front, there is very limited analysis and literature on how the agricultural laws and policies support and ensure inclusivity of climate change considerations. So, this article focuses on this legal gap and investigates whether the existing Indian framework adequately includes measures to tackle future climate change challenges to the agricultural sector. Through this exploration, the article highlights the parochial approach taken by the Indian legislators and policy makers so far in designing agricultural laws and policies without paying adequate attention to the significance of including climate change elements.

Broadly, the article analyzes the existing Indian agricultural laws and policies and highlights the inadequacies or absence of climate change elements in those laws and policies. Specifically, the paper focuses on illustrations from some leading countries that have prepared themselves for climate change challenges by incorporating climate-inclusive solutions into their legal and policy instruments in the agricultural sector. Through these global illustrations, the article recommends possible reforms that could be brought in the

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current and future Indian agricultural laws and policies and make it more climate-inclusive. Overall, the article hopes to set the stage for sparking a progressive thought process among relevant stakeholders to develop climate-inclusive agricultural laws and policies that could contribute to the global efforts to avert a future climate crisis.

I. INTRODUCTION

Climate change and agriculture are inevitably interlinked, both in terms of being the cause of and consequences for each other. On one hand, there is robust evidence that climate change jeopardizes the agricultural sector in multifarious ways,¹ including exacerbating extreme weather events, accelerating land degradation processes, affecting food security and nutrition,² and creating an influx of new pests and diseases³. On the other hand, it is proven that the agricultural sector is one of the highest contributors and primary drivers of climate change.⁴

Despite this conspicuous linkage, not all the national legal frameworks give serious attention to include legal provisions, policies and measures intended to combat climate change in the agriculture sector.⁵ Predominantly, most of the national laws, regulations and policies in the agricultural sector across the globe focus on regulating conventional facets of farming and land sectors such as “*crop and livestock production, plant and*

¹ *Agriculture and climate change – Law and governance in support of climate smart agriculture and international climate change goals*, FAO Legislative Studies, 11, No. 115, Food and Agriculture Organization of the United Nations (2020), available at <https://doi.org/10.4060/cb1593en>, last seen on 03/03/2021; Plural authoritative scientific sources confirm that human influence on the climate system is clear and that recent anthropogenic emissions of greenhouse gases are the highest in history, with widespread impacts on human and natural systems.

² *Climate Change and Land: Summary for Policymakers*, 10, Intergovernmental Panel on Climate Change (2020), available at https://www.ipcc.ch/site/assets/uploads/sites/4/2020/02/SPM_Updated-Jan20.pdf, last seen on 12/02/2021.

³ K. Kritee, et al., *Climate smart farming in India: A pathway to poverty alleviation, food security, and climate adaptation and mitigation*, Environmental Defense Fund, 4 (2019), available at <https://www.edf.org/sites/default/files/documents/Climate-smart-agriculture-India-EDF-report.pdf>, last seen on 14/03/2021.

⁴ See Supra 1, at 8 (“About 23% of the total human induced emissions of greenhouse gases (GHGs) globally is from the agricultural sector, together with forestry and other land use”); FAOSTAT: *Emission shares*, Food and Agriculture Organization of the United Nations, available at <http://www.fao.org/faostat/en/#data/EM>, last seen on 03/03/2021 (The latest data from the FAO reports that the share of greenhouse gas (GHG) emissions from aggregate agriculture-related activities along the supply chain, and including agriculture-related land use, was 19.8 percent of total GHG emissions in 2017).

⁵ Supra 1, at 9.

animal health, agriculture processing and industry, farming rights, tenure rights, agricultural infrastructure, investment, finance, credit and economic incentives, research, intellectual property, and trade”,⁶ and rarely address climate change. Although these goals are paramount to be achieved by agricultural laws and policies, it is crucial to prioritize adaptation and mitigation measures for climate change. Such measures will ensure that the agricultural sector improves its resilience to deal with various current and future climate risks. Furthermore, it is paramount that climate concerns are integrated into agricultural planning, policies and programmes considering that climate change is worsened due to the negative impact of conventional agricultural practices.⁷

Specially, developing countries like India need to minimize their climate footprint by drastically cutting down GHG emissions from its agricultural sector to avoid climate change’s irreversible consequences in the future. At present, India is the third largest contributor of GHG emissions globally, of which the agricultural sector accounts for nearly 16% of the GHG emissions.⁸ This demands that urgent measures and actions be taken in the Indian agricultural sector to cut down GHG emissions. Particularly, designing laws and policies bolstered by institutional frameworks to address climate change is the fundamental step towards accelerating efforts to combat agricultural GHG emissions. In light of this, this article focuses on the Indian legal and policy framework related to agriculture and analyzes whether it reflects climate change considerations. The purpose of such an investigation is to look at the potential areas for legal intervention to include climate change elements in the Indian agricultural sector.

The article is divided into four sections. Section I provides a brief overview of the interlinkages between climate change and agriculture, and the international legal framework on climate change and agriculture. Section II enumerates the need for legal intervention to mainstream climate change considerations in the agricultural sector. Section III provides an analysis of

⁶ Supra 1, at 106

⁷ Supra 1, at 101.

⁸ J. Timperley, *The Carbon Brief Profile of India*, CarbonBrief (14/03/2019), available at <https://www.carbonbrief.org/the-carbon-brief-profile-india>, last seen on 02/03/2021.

national agricultural laws and policies in India and highlights their inadequacies or absence of climate change elements. It also provides examples of good practices from other countries and highlights the best elements that could be incorporated in the existing and future agricultural laws and policies in India. Section IV concludes by reiterating some of the critical points in the article.

II. INTERLINKAGES AND INTERNATIONAL LEGAL FRAMEWORK ON CLIMATE CHANGE AND AGRICULTURE

It is widely acknowledged and well known that “*climate change interferes with the enjoyment of fundamental human rights such as the right to life, health, food and to an adequate standard of living*”;⁹ and it “*affects economic and political stability, contributes to growing inequality and decline in food and water security and increases threats to health and livelihoods.*”¹⁰ Specifically with respect to food security, climate change affects crop yields, the type of crops that can grow in certain areas, use of agricultural inputs such as water for irrigation, the amount of solar radiation that affects plant growth, as well as the prevalence of pests.¹¹ Climate change will also have an economic impact on agriculture, including changes in farm profitability, prices, supply, demand, trade and regional comparative risks and advantages.¹² The magnitude and geographical distribution of such climate induced changes may affect our ability to expand the food production area as required to feed the burgeoning population projected for 2050.¹³

These potential threats from climate change call for a significant, systematic and meaningful response across all sectors, particularly from

⁹ *Climate Change and Human Rights*, UNEP (2015), available at [https://wedocs.unep.org/bitstream/handle/20.500.11822/9530/-Climate Change and Human Rightshuman-rights-climate-change.pdf.pdf?sequence=2&%3BisAllowed=](https://wedocs.unep.org/bitstream/handle/20.500.11822/9530/-Climate%20Change%20and%20Human%20Rights%20human-rights-climate-change.pdf.pdf?sequence=2&%3BisAllowed=), last seen on 03/03/2021.

¹⁰ *General Recommendation No. 37 on gender related dimensions of disaster risk reduction in the context of climate change*, Committee on the Elimination of Discrimination against Women CEDAW/C/GC/37 (13/03/2018), available at <https://digitallibrary.un.org/record/1626306?ln=en>, last seen on 10/03/2021.

¹¹ C. Rosenzweig & D. Liverman, *Predicted effects of climate change on agriculture: A comparison of temperate and tropical regions*, 342, 343 in *Global climate change: Implications, challenges, and mitigation measures* (S.K. Majumdar, 1st ed., 1992).

¹² *Ibid.*

¹³ *Ibid.*

one of the “*most vulnerable sectors to climate change - the agricultural sector.*”¹⁴ Unfortunately, “*the agriculture sector (crops, livestock, forestry and fisheries, including aquaculture) as a whole, and specifically its relationship to climate change, has received relatively little attention within the international legal and policy framework on climate change, despite its criticality for food security, preserving ecosystems or its contributions to climate change*”.¹⁵

At the international level, United Nations Framework Convention on Climate Change (“UNFCCC”)¹⁶ is the framework convention that aims to prevent dangerous anthropogenic interference with the climate system and enhance policy framework and response to climate change threats.¹⁷ The Kyoto Protocol (“KP”)¹⁸, the Paris Agreement (“PA”),¹⁹ many decisions of Conference of Parties²⁰ and subsidiary bodies to these treaties, were all formulated under the UNFCCC. Although there are no binding legal obligations such as GHG emission reduction targets under the UNFCCC, “*it established a system of negotiation through which amendments and new instruments resulting from such negotiations could be adopted. Since then, the*

¹⁴ A. Tripathi & A.K. Mishra, *Knowledge and Passive Adaptation to Climate Change: An Example from Indian Farmers*, 16 *Climate Risk Management*, 195, 196 (2017), available at <https://reader.elsevier.com/reader/sd/pii/S2212096316300250?token=506BD5FBE2B19DCF3ED0C99347ECCB78C65B88C05B07D9EE9D9682DA1F6F81794171DFCD8D84787729803C223090FE52>, last seen on 10/03/2021.

¹⁵ *Supra* 1, at 2.

¹⁶ U.N. General Assembly, *United Nations Framework Convention on Climate Change*, 1771 U.N.T.S. 107 (09/05/1992), available at https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf, last seen on 12/03/2021.

¹⁷ *Ibid*, at 10.

¹⁸ U.N. General Assembly, *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, 2303 U.N.T.S. 162, (10/12/1997), available at <https://unfccc.int/process-and-meetings/the-kyoto-protocol/history-of-the-kyoto-protocol/text-of-the-kyoto-protocol>, last seen on 13/03/2021.

¹⁹ Conference of Parties, *Paris Agreement to the United Nations Framework Convention on Climate Change*, UNFCCC, FCCC/CP/2015/10/Add.1, (10/12/2015), available at https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english.pdf, last seen on 13/03/2021.

²⁰ See *Conference of Parties (COP)*. UNFCCC, available at <https://unfccc.int/process/bodies/supreme-bodies/conference-of-the-parties-cop>, last seen on 01/03/2021; Conference of Parties is the supreme governing body of an international convention. All States that are Parties to the Convention are represented at the COP. COP reviews the implementation of the Convention and any other legal instruments that the COP adopts. It also takes decisions necessary to promote the effective implementation of the Convention, including institutional and administrative arrangements.

*international climate regime has been developing in an innovative way, within the overall context of international environmental law”*²¹

The KP operationalizes the UNFCCC by requiring industrialized countries and economies in transition to commit to limiting and reducing their GHG emissions in conformity with agreed individual targets.²² However, these legally binding targets that aim at reducing emissions, along with penalties that arise for non-compliance, apply only for developed nations (also known as Annex I countries of the UNFCCC). The developing countries (Non-Annex I countries) were required to comply only voluntarily. “*Article 3.4 (of the KP) specifically recognizes the role of agricultural soils as a source of the GHG emissions, and removal of GHG emissions by sinks.*”²³

The PA is a legally binding international treaty on climate change that aims to limit the global temperature rise to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C.²⁴ The PA requires all countries irrespective of whether they are developed and developing to do their part and cut down GHG emissions. Unlike the KP, greater flexibility and national ownership is built into the PA. However, the PA does not define national commitments and every nation has the leeway to decide their own emissions targets according to their national priorities and technological capacity.²⁵ The PA in its preamble recognizes the impacts of climate change on the food production system.²⁶ It requires countries to use their best efforts towards mitigation and adaptation goals and to communicate these through their Nationally

²¹ D. Bodansky, J. Brunnée & L. Rajamani, *International Climate Change Law*, 374 (1st ed., 2017).

²² *What is Kyoto Protocol?*, UNFCCC, available at https://unfccc.int/kyoto_protocol, last seen on 10/03/2021..

²³ R. Mendelsohn & D. Tiwari, *Two Essays on Climate Change and Agriculture: a Developing Country Perspective*, 145 FAO Economic and Social Development Paper 90 (2004).

²⁴ *Supra* 1, at 11; Recent reports reveal that the world is not on track to meet the goals of the Paris Agreement (PA) and that emissions will continue to rise even beyond 2030 (UNEP, 2019).

²⁵ See M. Denchak, *Paris Climate Agreement: Everything You Need to Know*, NRDC (15/01/2021), available at <https://www.nrdc.org/stories/paris-climate-agreement-everything-you-need-know#:~:text=Unlike%20the%20Kyoto%20Protocol%2C%20which,and%20slash%20greenhouse%20gas%20emissions>, last seen on 10/03/2021.

²⁶ *Supra* 18, at 2; the Preamble language of the Paris Agreement that states “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”.

Determined Contributions (“NDCs”).²⁷ Most parties to the PA have included mitigation and adaptation actions in the agriculture sector within their NDCs that were submitted to the UNFCCC secretariat.²⁸

Further, a recent analysis by Climate Action Tracker 2020 revealed some shocking details about the first set of NDCs submitted by Parties to the UNFCCC Secretariat. The analysis estimated that the aggregate effect of the measures proposed would lead to scenarios varying from a temperature increase of 3 to 4°C. “*This implies that significant additional efforts will have to be made by Parties over the coming years to fulfil the PA’s collective goal to limit temperature increase to well below 2°C, including through measures addressing the agriculture sector.*”²⁹

Although the KP and the PA recognize the significance of the agricultural sector to some extent, it is the Koronivia Joint Work on Agriculture (“KJWA”)³⁰ that fully acknowledged the nexus between climate change and agriculture and their impacts on each other. KJWA contains specific targets for improving sustainable agriculture and addressing food security dimensions of climate change in the agricultural sector.³¹ KJWA gives hope for advanced climate action in agricultural sectors in the future. Both the PA and the KJWA are connected to the 2030 Agenda for Sustainable Development, particularly SDG 13 that recognizes the relationship between climate change and sustainable development. One of the SDG 13 targets is to “*integrate climate change measures into national policies, strategies and planning.*”³² These international instruments give a glimpse of how the agricultural sector’s nexus with climate change is recognised at the international framework in a limited yet significant way.

²⁷ *The Paris Agreement: Process and Meetings*, UNFCCC, available at <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>, last seen on 05/03/2021.

²⁸ *Supra* 1, at 1.

²⁹ See *Supra* 1, at 27 (This fact was confirmed by the IPCC in two of its Special Reports issued in 2018 and 2019, namely *Global Warming of 1.5° C* and *Climate Change and Land – Summary for Policymakers*).

³⁰ See FAO, *Climate Change, What-we-do*, <http://www.fao.org/climate-change/our-work/what-we-do/koronivia/en/>.

³¹ *Ibid*, at 13.

³² *Ibid*, at 14; See *Global Goals for sustainable development*, Global Goals, available at <https://www.globalgoals.org/13-climate-action>, last seen on 03/03/2021.

III. MAINSTREAMING CLIMATE CHANGE IN THE AGRICULTURAL SECTOR: NEED FOR LEGAL INTERVENTION

By 2050, the world population will have grown to 9.9 billion,³³ and the demand for agricultural products will increase anywhere between 59%-98% from the present.³⁴ “An extra 593 million hectares of agricultural land, an area nearly twice the size of India, will be required by 2050 over 2010 levels.”³⁵ This escalating growth of population, swelling food demand and the consequent consumption patterns pose a serious risk of escalating climate change. Global agricultural activities are already identified as the largest contributors of non-carbon dioxide GHG emissions.³⁶ Nearly 19.8 percent of the total GHG emissions globally are from clusters of agriculture and its related activities across the supply chain which includes land use for agriculture.³⁷

This indicates a global conundrum that scientists and experts around the world are and will be grappling with, which is to curtail agricultural GHG emissions and at the same time ensure food security for the growing population. Tackling this global issue calls for major changes in the agricultural sector to reduce its GHG emissions at national levels. However, “introducing such changes might be more challenging compared to other sectors.”³⁸ This is because first of all, the agricultural sector employs more than one-quarter of the global population and mobilizing such a large

³³ T. Kaneda, C. Greenbaum & K. Kline, *2020 World Population Data Sheet Shows Older Populations Growing, Total Fertility Rates Declining*, PRB (10/07/2020), available at <https://www.prb.org/2020-world-population-data-sheet/#:~:text=The%202020%20Data%20Sheet%20identifies,2020%20population%20of%207.8%20billion>, last seen on 12/03/2021.

³⁴ M. Elferink & F. Schierhorn, *Global Demand for Food is Rising. Can We Meet It?*, Harvard Business Review (2016), available at https://www.researchgate.net/publication/302466629_Global_Demand_for_Food_Is_Rising_Can_We_Meet_It, last seen on 02/03/2021.

³⁵ *Food loss and waste and the linkage to land and global ecosystems*, United Nations Convention to Combat Desertification: Knowledge Hub (09/05/2020), available at <https://knowledge.unccd.int/publications/food-loss-and-waste-and-linkage-land-and-global-ecosystems>, last seen on 04/03/2021.

³⁶ Supra 1, at 27.

³⁷ FAOSTAT: *Emission shares*, Food and Agriculture Organization of the United Nations, available at <http://www.fao.org/faostat/en/#data/EM>, last seen on 03/03/2021.

³⁸ J. Ahmed et al., *Agriculture and Climate Change: Reducing emissions through improved farming practices*, McKinsey & Company, 7 (2020), available at <https://www.mckinsey.com/~media/mckinsey/industries/agriculture/our%20insights/reducing%20agriculture%20emissions%20through%20improved%20farming%20practices/agriculture-and-climate-change.pdf>, last seen on 05/03/2021.

population to reduce GHG emissions will be slow and time-consuming. *Secondly*, unlike other sectors, introducing emissions-reduction-technology options that replace the existing ones in the agricultural sector will be arduous. For example, in the electricity sector, wind and solar can replace coal and gas and such options do not necessarily exist in agriculture.³⁹ Lastly, the agricultural sector is significantly less consolidated than other sectors and has a complex set of competing priorities such as conservation, food security, nutritional needs, biodiversity and protecting the livelihoods of farmers alongside climate goals.⁴⁰

Despite these challenges, “*law can be the lynchpin for creating and promoting binding climate related commitments*”,⁴¹ and related policy goals in the agricultural sector. Political willingness and readiness to enact germane legislation is an indication of a nation’s ability to fulfill its climate-related goals laid out in its NDCs and its overall contribution to combat global temperature rise.⁴²

At the national level, developing new laws or refining existing agricultural laws and policies to include climate considerations will play a crucial role in not only promoting sustainability, food security and safeguarding the lives of millions of people from harmful effects of climate change, but also ensuring that countries meet their international obligations and commitments. However, globally, “*despite other legal developments at the international level, adoption of domestic legislation that addresses climate change in the food and agriculture sectors is lagging behind*”.⁴³ A study indicated that the energy laws receive more attention compared to the incorporation of climate change elements in general environmental regulations as well as into forestry, transport and agriculture legislation.⁴⁴

³⁹ Ibid.

⁴⁰ Ibid.

⁴¹ Supra 1, at 3.

⁴² See C. Schwarte, *Legislating the Paris Agreement in Developing Countries*, Climate Law and Governance Working Paper Series, 5, No. 1/2017, Centre for International Sustainable Development Law (2017).

⁴³ Supra 1, at 17.

⁴⁴ M. Nachmany, S. Frankhauser & J. Setzer, *Global Trends in Climate Change Legislation and Litigation: 2017 Snapshot*, London School of Economics and Political Science & Grantham Research Institute on Climate Change and the Environment (09/05/2017), available at <https://www.lse.ac.uk/granthaminstitute/publication/global-trends-in-climate-change-legislation-and-litigation-2017-update/>, last seen on 14/02/2021.

This legislative gap therefore needs to be addressed urgently by countries, particularly India, “*which is still struggling to achieve food security and protect its vast agrarian population from production and market risks.*”⁴⁵ A massive overhaul of the legal and institutional framework governing the existing agricultural sector to incorporate climate considerations is required. Pragmatically, the process is daunting, complex and time-consuming. As a first step, discussions could be triggered among policymakers to consider legislating for a new climate-inclusive agriculture legal framework or policy. Simultaneously, efforts should be made to incorporate climate-inclusive considerations in existing laws, policies and programmes in the agricultural sector.

IV. EXISTING POLICY AND INSTITUTIONAL FRAMEWORK FOR AGRICULTURE AND CLIMATE CHANGE IN INDIA

1. A Brief Overview of the Agricultural GHG Emissions in India

Agriculture, with its allied sectors, is the largest source of livelihoods in India covering about 58% of the population.⁴⁶ Nearly, 70 percent of India’s rural households predominantly depend on agriculture for their livelihood.⁴⁷ As per the Economic Survey 2020-2021, nearly 20% of India’s Gross Domestic Product (“GDP”) is derived from agriculture.⁴⁸ Further, Indian agricultural exports are estimated to reach US\$ 60 billion by 2022 and essential agricultural commodities exports in 2020 increased by 43% compared to 2019.⁴⁹ Unfortunately, the agricultural GHG emissions from India are “*estimated to be 350 million tons a year which is 18% of the country’s*

⁴⁵ P.K. Joshi et al., *Role of development policies in combating climate change issues in Indian Agriculture: A first order assessment of irrigation and fertilizer policies*, International Association of Agricultural Economists, available at <https://ideas.repec.org/p/ags/iaae15/211817.html>, last seen on 02/03/2021 (Conference, August 9-14, 2015).

⁴⁶ *Agriculture in India: Information About Indian Agriculture and its Importance*, Indian Brand Equity Foundation (2021), available at <https://www.ibef.org/industry/agriculture-india.aspx>, last seen on 10/03/2021.

⁴⁷ *FAO in India: India at a Glance*, Food and Agriculture Organization of the United Nations, available at [http://www.fao.org/india/fao-in-india/india-at-a-glance/en/#:~:text=Agriculture%2C%20with%20its%20allied%20sectors,275%20million%20tonnes%20\(MT\)](http://www.fao.org/india/fao-in-india/india-at-a-glance/en/#:~:text=Agriculture%2C%20with%20its%20allied%20sectors,275%20million%20tonnes%20(MT),), last seen on 01/03/2021.

⁴⁸ *Report Summary: Economic Survey 2020-2021*, PRS Legislative Research (30/01/2021), available at https://www.prsindia.org/sites/default/files/parliament_or_policy_pdfs/Report%20Summary%20-%20Economic%20Survey%202020-21.pdf, last seen on 06/03/2021.

⁴⁹ *Supra* 50.

*total.*⁵⁰ A study shows that cropland-based agricultural activities “accounts for 24.17% of India's total methane and 95.84% of the total N₂O emission from the agricultural sector.”⁵¹

India made its climate pledge under the PA and submitted its NDCs in 2015 for implementation of the PA in the post-2020 period.⁵² The NDCs have eight goals, including three quantitative goals viz. reduction in the emissions intensity of GDP by 33-35 per cent by 2030 from 2005 level.⁵³ To achieve it, “GHGs emission intensity has to be reduced by 33-35% of 2005 level by 2030. This demands the creation of an additional carbon sink of 2.5-3 billion tonnes of CO₂ equivalent by 2030”.⁵⁴ Hence, particular emphasis and drive should be given to finding ways to reduce GHG emissions in all sectors including the agricultural sector.

There has been growing interest in scientifically ascertaining the interlinkages and impacts of climate change and agriculture on each other.⁵⁵ However, in the legal arena, there is no national-level legislation or institutional framework that comprehensively addresses how and what measures are to be taken by different departments and bodies responsible for climate change and agriculture to achieve India's climate related goals and commitments and to ensure mainstreaming of climate considerations in the agricultural sector.

⁵⁰ Supra 3, at 4.

⁵¹ S. Some, J. Roy & A. Ghose, *Non-CO₂ emission from cropland based agricultural activities in India: A decomposition analysis and policy link*, 25 *Journal of Cleaner Production*, 637, 638 (2019), available at <https://doi.org/10.1016/j.jclepro.2019.04.017>, last seen on 15/03/2021.

⁵² Apex Committee for Implementation of Paris Agreement (AIPA), Ministry of Environment, Forest and Climate Change Notification F. No. CC-13008/55/2019-CC (27/11/2020), available at <https://static.pib.gov.in/WriteReadData/userfiles/AIPA%20Gazette%20Notification.pdf>, last seen on 20/02/2021.

⁵³ Ibid.

⁵⁴ Draft Copy of National Soil Policy, at 41.

⁵⁵ See P. Thornton, et al., *Agriculture in a changing climate: keeping our cool in the face of the boathouse*, 47 *Outlook on Agriculture* 283, 284 (2018), available at <https://journals.sagepub.com/doi/full/10.1177/0030727018815332>, last seen on 13/04/2021; See J.V. Braun, *Climate Change Risks for Agriculture, Health, and Nutrition*, 135, 136 in *Health of People, Health of Planet and Our Responsibility* (W. Al-Delaimy, V. Ramanathan & M. Sánchez Sorondo M., 1st ed., 2020).

2. An Overview of India's Existing Legal, Policy and Institutional Framework on Agriculture that include Climate Change Concerns

With regard to India's institutional framework for agriculture and allied sectors, the Ministry of Agriculture and Farmers' Welfare⁵⁶ and its three departments namely Department of Agriculture Research and Education,⁵⁷ Department of Agriculture, Cooperation and Farmers Welfare,⁵⁸ and Department of Animal Husbandry, Dairying and Fisheries⁵⁹ are the primary organizations. Although these departments have launched agricultural policies and programmes, they have not given special consideration to incorporate adaptation⁶⁰ or mitigation⁶¹ measures to combat climate change in their decisions or directives. However, there are some policies and programmes introduced by the Government of India ("GOI") that have addressed some climate concerns directly or indirectly, which are discussed below.⁶²

⁵⁶ Ministry of Agriculture & Farmers Welfare, Government of India, available at <https://www.mygov.in/group/ministry-agriculture-and-farmers-welfare/#:~:text=The%20mission%20of%20DAC%26FW%20is,successful%20implementation%20of%20Ministry's%20schemes>, last seen on 10/03/2021; the Ministry of Agriculture and Farmers Welfare was established under the Government of India. It is the national level apex body that formulates and administers laws, rules, regulations, policies and guidelines related to the agricultural sector in India.

⁵⁷ See Department of Agriculture Research and Education, Ministry of Agriculture and Farmers Welfare (Government of India), available at <http://dare.nic.in/>, last seen on 10/03/2021.

⁵⁸ See Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare (Government of India), available at <http://agricoop.nic.in/>, last seen on 10/03/2021.

⁵⁹ See Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare (Government of India), available at <http://dahd.nic.in/>, last seen on 10/03/2021.

⁶⁰ *Glossary of climate change acronyms and terms*, UNFCCC, available at <https://unfccc.int/process-and-meetings/the-convention/glossary-of-climate-change-acronyms-and-terms#:~:text=Mitigation,the%20sinks%20of%20greenhouse%20gases>, last seen on 15/03/2021; Adaptation to climate change refers to "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities".

⁶¹ *Ibid*; mitigation in the context of climate change means "a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other 'sinks' to remove greater amounts of carbon dioxide from the atmosphere".

⁶² A. Kishore et al., *Unfolding government policies towards the development of climate smart agriculture in India*, 31 *Agricultural Economics Research Review* (Conference) 123, 124 (2018); in the current article, only the policies launched and sponsored by the GoI are discussed "Agriculture is under the state list of the Constitution of India and therefore, all agriculture-related policies and programmes are implemented by the state governments.

The first ever National Agricultural Policy was formulated by the GOI in 2000 that aimed at actualizing the potential of Indian agriculture and achieving a growth rate in excess of four per cent per annum in the agricultural sector,⁶³ based on efficient use of resources and conservation of soil, water and biodiversity.⁶⁴ Its key objectives include increasing the exports of agricultural products, encouraging private sector investment, minimizing price fluctuations in commodity prices, and institutionalization of farm credits among others.⁶⁵ In short, most of the objectives focused on enhancing productivity and profits from agriculture rather than including environmental aspects such as effects of climate change. This could be because during the said period, there was no explicit acknowledgement of the linkages between climate change and agriculture. Notably, there is some recognition of climate change effects at a later point in time such as in the National Farmers Policy, 2007.⁶⁶ The policy states that strategies will be developed for major agro-climatic zones in India and farmers would be trained to be “*climate managers*” in the art of managing extreme weather events. However, this policy suffers from lack of implementation as pointed out by the former chairman of the National Commission on Farmers.⁶⁷

In 2020, three agro-farm bills were passed by GOI as agricultural laws namely - the Farmers’ Produce Trade and Commerce (Promotion and

The GoI can, however, influence policies and programmes it wants the states to adopt by extending financial support for their implementation. Thus, we have two types of agricultural programmes in India. *Firstly*, some programmes are implemented across all the states with partial or full financial support from the central government. *Secondly*, states may have their own programmes for agriculture funded by their own budgetary resources”.

⁶³ R. Mani, *Ministry of Agriculture Announces National Agricultural Policy* (2000), India Water Portal (5/12/2009), available at <https://www.indiawaterportal.org/articles/ministry-agriculture-announces-national-agricultural-policy-2000>, last seen on 15/04/2021.

⁶⁴ *OECD Food and Agricultural Reviews: Agricultural Policies in India*, 146, OECD Library, available at <https://www.oecd-ilibrary.org/docserver/9789264302334-en.pdf?expires=1615486864&id=id&accname=guest&checksum=CCA2DD524BB16546417F119D3AB8B1D5>, last seen on 12/02/2021.

⁶⁵ *Ibid.*

⁶⁶ See National Policy for Farmers 2007, Department of Agriculture & Cooperation (Ministry of Agriculture, Government of India), available at <http://agricoop.nic.in/sites/default/files/npff2007%20%281%29.pdf>, last seen on 20/02/2021.

⁶⁷ See M.S. Swaminathan, *National Policy for Farmers Ten Years Later*, 6 Review of Agrarian Studies 1 (2016), available at http://ras.org.in/national_policy_for_farmers_ten_years_later, last seen on 15/03/2021.

Facilitation) Act, 2020;⁶⁸ the Farmers' (Empowerment and Protection) Price Assurance and Farm Services Act, 2020;⁶⁹ and the Essential Commodities (Amendment) Act, 2020.⁷⁰ However, what was expected to be a watershed moment was mired in controversies. Farmers' unions have been demanding repeal of these laws. A detailed look at these new agricultural laws reveals that they make no explicit reference to climate change considerations as part of the reforms introduced in the agricultural sector.

The next important policy to consider is the National Mission on Sustainable Agriculture (“NMSA”).⁷¹ It is one of the milestones among the eight missions under the GOP's National Action Plan on Climate Change⁷² (“NAPCC”). One of the main objectives of the NMSA is to make agriculture more sustainable and climate resilient.⁷³ It contains adaptation and mitigation measures to tackle climate change in agriculture.⁷⁴ In aggregate, these policies and programmes form the fundamental infrastructure and institutions responsible for responding to future climate risks.⁷⁵ However, the NMSA does not explicitly specify a need for legal intervention as one of the adaptation and mitigation needs for Indian agriculture,⁷⁶ except for a reference to have ‘legal safeguards’ to prevent risks from climate variability and changes.⁷⁷ But these safeguards do not seem to have been elaborated or formulated so far.

⁶⁸ See Farmer's Produce Act, 2020.

⁶⁹ See Farmer's Empowerment and Protection Act, 2020.

⁷⁰ See Essential Commodities Act, 2020.

⁷¹ See *National Mission on Sustainable Agriculture*, Department of Agriculture, Cooperation and Farmers Welfare (Ministry of Agriculture & Farmers Welfare, Government of India), available at <https://nmsa.dac.gov.in/>, last seen on 20/03/2021.

⁷² See *National Action Plan on Climate Change*, Prime Minister's Council on Climate Change (Government of India), available at <http://extwprlegs1.fao.org/docs/pdf/IND170509.pdf>, last seen on 14/02/2021.

⁷³ See *Objectives, National Mission on Sustainable Agriculture*, Department of Agriculture, Cooperation and Farmers Welfare (Ministry of Agriculture & Farmers Welfare, Government of India), available at <https://nmsa.dac.gov.in/frmObjectives.aspx>, last seen on 20/03/2021.

⁷⁴ Supra 45, at 2.

⁷⁵ Ibid.

⁷⁶ See *Mission 2.5 of the National Mission on Sustainable Agriculture*, Department of Agriculture, Cooperation and Farmers Welfare (Ministry of Agriculture & Farmers Welfare, Government of India), available at <https://nmsa.dac.gov.in/>, last seen on 10/03/2021.

⁷⁷ See *National Mission for Sustainable Agriculture: Strategies for Meeting the challenges of Climate Change*, 41, Department of Agriculture and Cooperation (Ministry of Agriculture) (2010), available at

The National Green Mission⁷⁸ under the NAPCC focuses on the significance of sustainably managed forests and other ecosystems as carbon sinks in relation to climate change. It makes no mention of the role of agricultural lands in relation to climate change, although it acknowledges agriculture as being a climate-sensitive sector.⁷⁹

Programs launched by the Indian Council of Agricultural Research, an autonomous body under the Department of Agriculture, Research and Education, such as the National Initiative on Climate Resilient Agriculture (“NICRA”),⁸⁰ have gaps in terms of legal intervention and mainstreaming of climate elements in agriculture. NICRA’s main objectives are to carry out strategic research, technology demonstrations and capacity building.⁸¹ It does not recognize the need for a legally supportive system or an institutional mechanism for climate-resilient agriculture.

To further illustrate the lack of attention to climate change in agriculture, the “*Consultative Group on International Agriculture Research Program on Climate Change, Agriculture and Food security that aims to promote adaptable and resilient agriculture and food systems in India and the International Crops Research Institute for the Semi-Arid Tropics initiative to develop a pool of climate-smart technologies*”⁸² do not include climate change considerations in promoting resilient agriculture. These innovative programmes are commendable and have been emulated in other countries. Yet in the Indian context they do not create a climate sensitive system and a supportive institutional mechanism.

<http://agricoop.nic.in/sites/default/files/National%20Mission%20For%20Sustainable%20Agriculture-DRAFT-Sept-2010.pdf>, last seen on 10/02/2021.

⁷⁸ *National Mission for a Green India (Under the National Action Plan on Climate Change)*, Ministry of Environment & Forests (Government of India), available at <http://www2.ecolex.org/server2neu.php/libcat/docs/LI/MON-093444.pdf>, last seen on 12/03/2021.

⁷⁹ Ibid.

⁸⁰ *National Innovations in Climate Resilient Agriculture*, NICRA, available at <http://www.nicra-icar.in/nicrarevised/>, last seen on 10/02/2021.

⁸¹ Ibid.

⁸² A.K. Padhee, *Actionable Policies to Make Indian Agriculture Climate-Resilient*, Agri-Buzz (ICRISAT), available at <https://www.icrisat.org/actionable-policies-to-make-indian-agriculture-climate-resilient/>, last seen on 10/02/2021.

3. Need for a National level Institution for Information on Climate Risks and Effects on Agricultural Sector

Another major legal and institutional gap in the Indian system is the absence of a national level legal or policy instrument establishing an authoritative body that serves as a repository for reliable data and information on climate risks and effects on the agricultural sector. Many scientific institutions and experts produce requisite data on climate risks in agriculture both in the medium and long term. But for national plans, schemes, programmes and measures to operate, all the reliable and relevant data on climate change and agriculture should be organized and made easily accessible to different levels of governments and stakeholders by an institution established for this purpose.

An example of such an innovative mechanism exists in Brazil, where the Brazilian Decree No. 9.841 - National Programme for the Agricultural Zoning of Climate Risk, 2019 facilitates research and monitoring of climate risks in agriculture and disseminates the results.⁸³ This Programme, with an aim to enhance the quality and accessibility of information on climate risks for agriculture in Brazil, has played a significant role in agricultural policy and risk management. It introduced methods for research and monitoring of climate risks in agriculture and for providing information on the results of such monitoring to society.⁸⁴ This Programme is an example of how a national agricultural programme could be instrumental for providing information on climate risks and its effects on the agricultural sector.

Moreover, countries are now shifting their agricultural practices towards “*climate-smart*” agriculture (“**CSA**”) which has gained popularity in recent years and is promoted by several organizations such as the Food and Agriculture Organization, World Bank, and Consultative Group on International Agricultural Research.⁸⁵ CSA is an integrative approach to address the interlinked challenges of food security and climate change that

⁸³ Decreto N° 9.841 de 18 de junho de 2019 - Dispõe sobre o Programa Nacional de Zoneamento Agrícola de Risco Climático, 2019 (Brazil), available at <http://extwprlegs1.fao.org/docs/pdf/bra187586.pdf>, last seen on 10/03/2021.

⁸⁴ Supra 1, at 112

⁸⁵ Supra 13, at 197.

aims at three objectives: (i) sustainably increase agricultural productivity to support equitable increase in farm incomes, food security and development; (ii) adapting and building resilience of agricultural and food security systems to climate change; and (iii) reducing GHG emissions from agriculture.⁸⁶ It is quite unique compared to other sustainable agricultural practices because of its specific focus on climate risks and addressing the challenges. However, to incorporate CSA or any other equally effective sustainable agricultural practices or measures within the country's agricultural sector, there should be a supportive legal framework and a policy enabling environment for CSA along with institutional changes, strategic research, scientific methodologies, investment and advanced technologies and techniques. Once this coordination happens and transformations occur, CSA can be incorporated in India's legal and policy framework.

V. NEED FOR LEGISLATING ON A CLIMATE-INCLUSIVE AGRICULTURAL FRAMEWORK WITHIN SPECIFIC AREAS OF THE AGRICULTURAL SECTOR IN INDIA

It is important to look at the existing laws and policies in specific areas of the agriculture sector and analyze the extent of intervention to mainstream climate elements. *“Within the agricultural sector, the enteric fermentation in livestock, followed by methane emission from rice cultivation, nitrous oxide emission from agricultural soils, carbon dioxide emissions from crop residue burning, energy use in agriculture and fisheries are the major contributors of GHG emissions.”*⁸⁷ Here, we consider five major areas of the agriculture sector that have significant nexus to climate change in terms of GHG emissions.

1. Soil Health and Climate Change

Soil health is a very fundamental aspect of sustainable agriculture, and soil resources are considered one of the best allies in fighting climate change as

⁸⁶ *Climate Smart Agriculture Sourcebook: Introducing Climate-Smart Agriculture*, Food and Agriculture Organization of the United Nations, available at <http://www.fao.org/climate-smart-agriculture-sourcebook/concept/module-a1-introducing-csa/chapter-a1-2/en/#:~:text=As%20noted%20in%20the%20overview,greenhouse%20gas%20emissions%2C%20where%20possible>, last seen on 13/03/2021.

⁸⁷ Supra 62.

they aid in the exchange of GHG with the atmosphere and act as terrestrial carbon pools.⁸⁸ It is estimated that “in 25 years, soils can sequester more than 10 percent of the anthropogenic emissions.”⁸⁹ Despite its vital role, soils are one of the most vulnerable resources and face complex challenges due to increasing threats of climate change.⁹⁰ Quite surprisingly, the linkages between soil and climate change are often undermined. Most of the national soil legislations across the globe have focused primarily on soil pollution, soil erosion, land degradation and desertification,⁹¹ and recognition of the nexus between climate change and soils is a rare phenomenon in soil conservation laws, policies and programmes.

India, with nearly 140 million hectares of net sown area,⁹² has a pervasive soil degradation problem,⁹³ and soil deterioration due to stubble burning.⁹⁴ The annual soil loss rate in India is about 15.35 tonnes per hectare,⁹⁵ which can have direct impacts on climate change. However, the current operational schemes of soil conservation do not have adequate provision to address severe erosion problems under projected climate change scenarios.⁹⁶ Moreover, India does not have an exclusive legislation dealing

⁸⁸ Supra 1, at 169.

⁸⁹ *FAO Soils Portal: What is Soil Carbon Sequestration?*, Food and Agriculture Organization of the United Nations, available at <http://www.fao.org/soils-portal/soil-management/soil-carbon-sequestration/en/>, last seen on 14/03/2021.

⁹⁰ Supra 1, at 169.

⁹¹ *Ibid*, at 152.

⁹² S. Mukherjee, *ICAR to Prepare Plan Specifying the Maximum Sowing Area for Each Crop*, Business Standard (06/09/2019), available at https://www.business-standard.com/article/markets/icar-prepares-a-plan-specifying-the-maximum-sowing-area-for-each-crop-119090600025_1.html, last seen on 10/02/2021.

⁹³ R. Bhattacharyya, et al., *Soil degradation in India: Challenges and Potential Solutions*, 7 Sustainability 3528, 3529 (2015), available at <https://www.mdpi.com/2071-1050/7/4/3528>, last seen on 20/03/2021.

⁹⁴ S. Bhuvaneshwari, H. Hettiarachchi & J.N. Meegoda, *Crop Residue Burning in India: Policy Challenges and Potential Solutions*, 16(5) International Journal for Environmental Research and Public Health 832 (2019), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6427124/#B22-ijerph-16-00832>, last seen on 03/04/2021; the burning of crop residues generates numerous environmental problems. The main adverse effects of crop residue burning include the emission of GHGs that contributes to global warming, increased levels of particulate matter and smog that cause health hazards, loss of biodiversity of agricultural lands, and the deterioration of soil fertility.

⁹⁵ Jitendra, *India's Agrarian Distress: Can We Revive Our Fatigued Soils*, DownToEarth (24/09/2020), available at <https://www.downtoearth.org.in/news/agriculture/india-s-agrarian-distress-can-we-revive-our-fatigued-soils-73528#:~:text=According%20to%20New%20Delhi%2Dbased,major%20impact%20on%20crop%20productivity>, last seen on 03/04/2021.

⁹⁶ *Ibid*.

with soil. Soil conservation, pollution or degradation issues are dealt with in silos in different legislations and in a vague manner. Even policies and programmes on soils seem to be limited. For instance, the GOI introduced a unique programme named Soil Health Card Scheme in 2015,⁹⁷ aiming to rejuvenate India's exhausted soil health by assessing the nutrient status of every farm holding in the country.⁹⁸ It advocates judicious use of chemical fertilizers, together with organic manure and biofertilizers, in order to improve the health of the soil, productivity, safety, and for mitigating climate change.⁹⁹ While some have lauded the scheme for improving productivity, critics claim that there are barriers to successful implementation of the scheme.¹⁰⁰

India could take inspiration from Bulgaria which has a comprehensive soil legislation that also considers climate-related issues. The Bulgarian Soils Act 2007 identifies as its objectives the protection of soils and their functions, as well as the sustainable use of soil and its long-term restoration.¹⁰¹ Similar to this, India could enact an exclusive soil legislation that establishes soil protection, use and restoration on the basis of principles such as an ecosystems approach, sustainable use, preventive control, application of good practices and the polluter pays principle.¹⁰² This legislation should also establish a competent authority that is tasked with conducting preliminary surveys and research, developing restoration projects, and monitoring, assessing and maintaining areas with restored soil functions.¹⁰³ Under this Act, national and regional programmes for soil

⁹⁷ *Soil Health Card*, Department of Agriculture, Cooperation and Farmers Welfare, available at <https://www.india.gov.in/spotlight/soil-health-card#tab=tab-1>, last seen on 03/04/2021.

⁹⁸ *Soil Health Card Scheme Completes 5 years on 19-2-2020*, Press Information Bureau, Government of India, Ministry of Agriculture & Farmer's Welfare, available at <https://pib.gov.in/Pressreleaseshare.aspx?PRID=1603379>, last seen on 03/04/2021.

⁹⁹ A. Bhargava, *Integrated Nutrient Management: Soil health Cards for Sustainable Agriculture*, Indian Express (20/02/2020), available at <https://indianexpress.com/article/opinion/columns/integrated-nutrient-management-soil-health-cards-for-sustainable-agriculture-6276545/>, last seen on 03/04/2021.

¹⁰⁰ See Dr. J.P. Mishra, et al., *Improving the Soil Health Card Scheme*, Policy Brief, available at https://static1.squarespace.com/static/5b7cc54e4eb7d25f7af2be/t/5c745123f9619af62c469c2b/1551126823002/Policy+Brief+FINAL+High+Quality+25th+Feb.pdf?source=post_page, last seen on 03/04/2021.

¹⁰¹ Bulgarian Soils Act, No. 89 of 2007, as amended in 2011 (Bulgaria), available at <http://extwprlegs1.fao.org/docs/pdf/bul116552.pdf>, last seen on 03/04/2021.

¹⁰² *Supra* 1, at 153.

¹⁰³ *Ibid.*

protection, sustainable use and restoration that is subject to environmental assessment could be introduced.¹⁰⁴

India could also look into the example of Costa Rica which passed a comprehensive soil legislation in 1998 that tackles threats to soil health as well as soil rehabilitation.¹⁰⁵ This Act introduces coordination mechanisms between government bodies to ensure that soil conservation and rehabilitation is undertaken at both national and regional levels. The Costa Rican Act, along with its implementing decree,¹⁰⁶ establishes measures to be used to prevent damage to soils from agricultural burning.¹⁰⁷

Another example is Bulgaria's Law on the Preservation of Agricultural Lands 1996,¹⁰⁸ the main objective of which is the preservation of lands from damage, as well as the restoration and improvement of the fertility of agricultural lands. This law provides an example of how aspects of climate concerns can be institutionalized. The law mandates the Ministry of Agriculture and Forests to maintain an information system for agricultural soil resources that shall contain a special register of agricultural lands.¹⁰⁹

Recently, the Ministry of Agriculture and Farmers' Welfare released the Draft National Soil and Land Use Policy for Serving Farmers and Safeguarding Agriculture.¹¹⁰ This policy gives some hope for consideration of climate change. Its objective is to *"ensure optimal utilization of the limited land resources in India for achieving sustainable development, addressing social, economic and environmental considerations and to provide a framework for states to formulate their respective land utilization policies incorporating state-specific concerns and priorities to achieve both short-term and long-term objectives."*¹¹¹ The policy has considered climate change elements in a limited yet useful manner. It makes it

¹⁰⁴ Ibid.

¹⁰⁵ Ley N°7 779 sobre uso, manejo y conservación de suelos, 1998 (Costa Rica), available at <http://extwprlegs1.fao.org/docs/pdf/cos15493.pdf>, last seen on 03/04/2021.

¹⁰⁶ Decree 29 375/MAG/MINAE/S/MOPT – Reglamento a la Ley sobre uso, manejo y conservación de suelos, 2000 (Costa Rica); Decree N° 35 368/MAG/S/MINAET – Reglamento para quemas agrícolas controladas, 2009 (Costa Rica), available at <http://www.fao.org/faolex/results/details/en/c/LEX-FAOC089538/>, last seen on 03/04/2021.

¹⁰⁷ Supra 1, at 154.

¹⁰⁸ Law on the Preservation of Agricultural Lands, 1996, as amended in 2003 (Bulgaria), available at <http://faolex.fao.org/docs/texts/bul61178.doc>, last seen on 03/04/2021.

¹⁰⁹ Supra 1, at 114.

¹¹⁰ Draft National Soil Policy.

¹¹¹ Ibid, at 6.

mandatory for periodic submission of soil health status reports to the Parliament and in the process acknowledges the change in soil health status due to climate change that need to be monitored on a time scale in benchmark sites.¹¹² Although this policy is a good starting point, India requires to go a long way in acknowledging the interlinkages between soil health and climate change in its legislative and policy measures related to soil.

2. Fertilizers and Climate Change

In agriculture, N₂O is produced from fertilized soils and animal wastes, and it is a potent GHG which has been calculated to have 300 times the global warming potential of CO₂ over a 100-year period.¹¹³ Fertilizer is one of the largest sources of N₂O contributing around 77% of the total direct 'N₂O emissions'¹¹⁴ from agricultural soils.¹¹⁵ Apart from application, even the manufacture of nitrogen fertilizers is very fossil-fuel intensive, contributing to CO₂ emissions. Globally, about six percent of total human-induced GHG emission originates from manufacture of nitrogen fertilizer and its application to farm soils.¹¹⁶

Around the world, although fertilizer use is one of the relevant sources of agricultural GHG emissions, management of fertilizer use and regulation is largely inefficient.¹¹⁷ Generally, fertilizer legislation in most nations

¹¹² Ibid, at 41.

¹¹³ N. Millar, J.E. Doll & G.P. Robertson, *Management of Nitrogen fertilizer to reduce Nitrous Oxide Emissions from Field Crops*, Climate Change and Agriculture Fact Sheet Series, MSU Extension Bulletin (2014), available at [https://www.canr.msu.edu/uploads/resources/pdfs/management_of_nitrogen_fertilizer_\(e3152\).pdf](https://www.canr.msu.edu/uploads/resources/pdfs/management_of_nitrogen_fertilizer_(e3152).pdf), last seen on 03/04/2021.

¹¹⁴ N₂O emission from agricultural soil is due to the natural biochemical process in the nitrogen cycle. Application of nitrogen-based fertilizers stimulates microbes in the soil to convert nitrogen to N₂O at a faster rate than normal. So, controlling nitrogen fertilizer use can help in the reduction of N₂O emission; S. Ghosh, *Nitrous Oxide Emission from Agriculture has Risen Sharply over 30 Years, Finds Study*, Scroll.in (25/05/2019), available at <https://scroll.in/article/924221/nitrous-oxide-emission-from-agriculture-has-risen-sharply-over-30-years-finds-study>, last seen on 03/04/2021.

¹¹⁵ Standing Committee on Agriculture, 16th Lok Sabha, *Twenty Ninth Report*, at 15, 2016, available at http://164.100.47.193/lssccommittee/Agriculture/16_Agriculture_29.pdf, last seen on 03/04/2021.

¹¹⁶ R. Tirado, et al., *Greenhouse gas emissions and mitigation potential from fertilizer manufacture and application in India*, 8(3) International Journal of Agricultural Sustainability, 176 (2010), available at https://www.researchgate.net/publication/233232177_Greenhouse_gas_emissions_and_mitigation_potential_from_fertilizer_manufacture_and_application_in_India, last seen on 04/03/2021.

¹¹⁷ Ibid, at 176.

focuses on those aspects directly relevant to fertilisers such as “*manufacture, importation and sale, as well as environmental pollution aspects of fertilizer use*”.¹¹⁸ They do not pay attention to indirect yet crucial issues related to climate change such as nutrient management which could be a key policy goal for climate change mitigation.¹¹⁹

In India, a study revealed that in the agricultural sector, although methane emissions have been constantly dwindling, there has been a spike in N₂O emissions in the atmosphere in the last three decades, creating an imbalance¹²⁰ in the ‘actual recommended ratio of nitrogen, phosphate and potassium’¹²¹ used by farmers. Another study stated that from 1980 to 2015, the said increase in N₂O emissions were around 358 percent - nearly 5100 tonnes per year, which is mainly due to the usage of nitrogen-based fertilizers.¹²² In fact, nitrogen-based fertilizers were responsible for nearly 77% of the total agricultural emissions over the stated period. The latter study also indicated that the fertilizer pricing policies (which made nitrogen fertilizer cheaper than others)¹²³ and the resulting disproportionately higher use of nitrogen fertilizer, going beyond officially prescribed ratios, are the two main culprits for this increase.¹²⁴ To top it all, India remains the second-largest producer and consumer of nitrogen fertilizer in the world after China, with close to a 15 per cent share of the global total.¹²⁵

¹¹⁸ Supra 1, at 167.

¹¹⁹ Ibid.

¹²⁰ S. Some, J. Roy & A. Ghose, *Non-CO₂ Emission from Cropland Based Agricultural Activities in India: A Decomposition Analysis and Policy Link*, 225 *Journal of Cleaner Production*, 638 (2019), available at <https://www.sciencedirect.com/science/article/abs/pii/S0959652619310856>, last seen on 04/03/2021.

¹²¹ The recommended nitrogen, phosphate, and potash should be used in Indian soil conditions is 4:2:1, though this ratio varies across regions within India. Because of the pricing policies on fertilizer inputs, however, in some years the ratio has deteriorated to approximately 10:3:1; See S. Gupta, *Fertilizer Policy in India: An Overview*, Chapter 4: The Political Economy of Fertilizer Supply to Agriculture, at 36-37, <http://ebrary.ifpri.org/utis/getfile/collection/p15738coll2/id/129618/filename/129829.pdf>.

¹²² Supra 55, at 638.

¹²³ Supra 127, at 38; the GOI’s expenditure on subsidies and concessions to fertilizer producers has increased steadily over the past three decades (Table 4.7). The subsidy on fertilizers increased from Rs 3.81 billion in 1980/81 to Rs 110.15 billion in 2002/03 (MoF 2004a, 3).

¹²⁴ See supra 98; Also see supra 55, at 645.

¹²⁵ See supra 122, at 176.

Fertilizer as an industry is under the GOI's control under the Industries Development and Regulation Act, 1951.¹²⁶ Further, under the Essential Commodities Act, 1955,¹²⁷ fertilizer was declared as a commodity. Then, the GOI released the Fertilizer (Control) Order, 1985,¹²⁸ which has provisions related to control mechanisms, manufacture, import, sale and pricing of fertilizers, rather than provisions related to emissions and pollution from fertilizers. Even the subsequent amendment of this order, which was introduced in 2013¹²⁹ focuses on equitable distribution of fertilizers and does not make any mention about emissions from fertilizers. Mostly, *“fertilizers in India have been promoted through government subsidies and they are blamed for increasing fiscal burden and distorting soil nutrient ratio.”*¹³⁰

Such subsidies began in 1977 with the Retention Price Scheme which was replaced by a group-based concession scheme called the New Pricing Scheme from 2003.¹³¹ These subsidy schemes stimulated indigenous production as well as an increase in consumption of fertilizers. Then, the Nutrient Based Subsidy Policy, 2010 was implemented to *“control mounting subsidies and to ensure soil nutrient balance could not achieve its targets so far.”*¹³² Although these subsidies increased crop yields, they failed to maintain nutrient balance in the soil and led to degradation.

So, in order to set the right pricing and subsidies, encourage investments and ensure balanced use of fertilizers, advanced techniques and technologies to reduce nitrogen fertilizer dependency, India requires a comprehensive climate-inclusive fertilizer legislation. The German

¹²⁶ See the Industries (Development and Regulation) Act, 1951.

¹²⁷ See the Essential Commodities Act, 1955.

¹²⁸ See Fertilizer Control Order, 1985; there are also reports that only bring the positive aspects of fertilizers on agriculture. For instance, the Report of the Working Group on fertilizer industry in its 12th plan highlights the positive effects of fertilizers in food production and does not anywhere address the pollution caused by nitrogen or its negative effects on climate change; See *Report of Working Group on Fertilizer Industry*, Ministry of Chemicals & Fertilizers (2017), https://www.nqr.gov.in/sites/default/files/09_Report_of_the_working_group_XII_Plan_0.pdf, last seen on 03/04/2021.

¹²⁹ Fertilizer Control (Amendment) Order, 2013.

¹³⁰ K.V. Praveen et al., *Fertilizer Subsidies in India: An Insight to Distribution and Equity Issues*, 13(3) *Journal of Crop and Weed*, 24 (2017), available at https://www.researchgate.net/publication/322939582_Fertilizer_subsidies_in_India_an_insight_to_distribution_and_equity_issues, last seen on 04/03/2021.

¹³¹ See *Fertilizer Industry Coordination Committee (Attached Office)*, Government of India, Department of Fertilizers, available at <https://fert.nic.in/fertilizer-industry-coordination-committee-attached-office>, last seen on 04/03/2021.

¹³² *Supra* 136, at 24.

Fertilizer Ordinance of 2006,¹³³ later revised in 2017, is a solid example of how a core legislation on fertilizer engages in aspects of reduction of nitrate and phosphate emissions from agriculture. “*This piece of legislation consists of different sets of measures, including measures to limit the quantity of applied nutrients and detailed technical or management specifications.*”¹³⁴ The 2017 revision included considerable changes, such as compulsory fertilizer planning, the inclusion of biogas digestate from plant origin, stricter blocking periods for fertilizer application, a stepwise introduction of reduced ammonia emission application techniques and the possibility to introduce additional measures in pollution hot spots.¹³⁵ This type of legislation is an example of regulatory control of agriculture issues which also serve climate goals. Learning from the German example, India needs to acknowledge the nexus between fertilizer and climate change and enact a robust climate-inclusive fertilizer legislation and also consider incorporating climate elements in all the relevant fertilizer policies and government orders.

3. Seeds and climate change

The purity and quality of seeds ensure success of any agricultural produce. Farmers require timely and adequate supply of diverse varieties of quality and climate resilient seeds to survive the harsh effects of climate change. India has one of the largest seed market potential in the world with around \$3 billion out of the global market of \$55-59 billion.¹³⁶

As is the case with other sectors, national legislations in different countries on seeds focus on regulating quality and ensuring accessibility of good quality seeds, certification and registration, procedures to enhance seed quality, mechanisms to support producers and vendors, and provisions for registration among others.¹³⁷ They rarely refer to or integrate climate related

¹³³ Fertilizers Ordinance (Düngeverordnung – DüV), 2006 (Germany).

¹³⁴ Supra 1, at 168.

¹³⁵ See T. Kuhn, *The Revision of the German Fertilizer Ordinance in 2017*, Discussion Paper, Institute for Food and Resource Economics, University of Bonn, Germany (2017), available at <https://www.researchgate.net/publication/319211355> The revision of the German Fertilizer Ordinance in 2017, last seen on 04/03/2021.

¹³⁶ M. Dadlani, *Seed Law and legislation: An update from India, Japan & Korea*, APSA-ISTA Seed Quality Management Seminar (2020), available at https://www.apsaseed.org/wp-content/uploads/2020/02/13_MD_APSA_1802_Speaker.pdf, last seen on 03/04/2021.

¹³⁷ Supra 1, at 176.

goals. In India too, laws pertaining to seeds are limited, outdated and do not explicitly include climate concerns. The Seeds Act, 1966,¹³⁸ and the Seeds Rules, 1968¹³⁹ and its later amendment 1973, provides for regulation of quality of seeds for sales. The Seed Control Order, 1983 provides for compulsory licensing,¹⁴⁰ and the New Policy for Seed Development, 1988 aimed to liberalize export and import norms for seeds.¹⁴¹ Then the Environment (Protection) Act, 1986 contained provisions for regulation of GM varieties.¹⁴²

After more than a decade, the Protection of Plant Varieties and Farmers' Rights Act, 2001¹⁴³ and Rules, 2003¹⁴⁴ were enacted to fulfill India's international commitments. They provided for a *sui generis* system to balance plant breeder's along with farmer's rights and researcher's rights. This gave a boost to the seed industry along with Biological Diversity Act, 2002 that facilitated exchange and use of seeds as genetic resources.¹⁴⁵ Apart from these laws, the National Seed Policy, 2002 was formulated to raise India's share in global seed trade through introduction of scientific aspects such as biotechnology to farmers.¹⁴⁶ The latest development is the introduction of the Draft Seeds Bill, 2019 to amend the Seeds Act, 1960.¹⁴⁷

None of these laws and policies are climate-inclusive or provide scope for integration of climate elements in the seed sector. One possible solution is to include suitable provisions in the Draft Seeds Bill, 2019. There is enormous scope to make this bill climate friendly by looking into global examples such as the seed legislation of Mexico,¹⁴⁸ that provides for

¹³⁸ The Seeds Act, 1966.

¹³⁹ The Seeds Rules, 1968.

¹⁴⁰ The Seeds Control Order, 1983.

¹⁴¹ The New Policy for Seed Development, 1988, available at https://seednetgov.in/PDFFILES/NEW_POLICY_NPSD.pdf, last seen on 03/04/2021.

¹⁴² The Environment (Protection) Act, 1986.

¹⁴³ The Protection of Plant Varieties and Farmers' Rights Act, 2001.

¹⁴⁴ The Protection of Plant Varieties and Farmers' Rules, 2003.

¹⁴⁵ The Biological Diversity Act, 2002.

¹⁴⁶ The National Seeds Policy, 2002, available at <https://seednetgov.in/PDFFILES/National%20Seed%20Policy,%202002.pdf>, last seen on 03/04/2021.

¹⁴⁷ Draft Seeds Bill, 2019 (pending), available at [https://www.prsindia.org/sites/default/files/bill_files/Draft Seeds Bill, 2019.pdf](https://www.prsindia.org/sites/default/files/bill_files/Draft%20Seeds%20Bill,%202019.pdf), last seen on 03/04/2021.

¹⁴⁸ Ley para el desarrollo agrícola sustentable del Estado de Nayarit, 2012 (Mexico).

*“sustainability and the rational use of natural resources as the guiding principle for agricultural production. Specific initiatives under the Law include, for example, the promotion of improved and certified seeds and other inputs that augment productivity while protecting the environment.”*¹⁴⁹

Another important legislation to learn from is Ecuador’s Organic Law of Agrobiodiversity, Seeds and Promotion of Sustainable Agriculture, 2017.¹⁵⁰ This Act contains provisions that mandate the agricultural authority to coordinate with relevant authorities and institutions to train and assist farmers to learn to recover their seed production system from calamities that could be caused due to climate change. It also establishes a national germplasm bank holding varieties of landraces and germplasms.¹⁵¹ Similarly, India could emulate the Kenyan Crops Act, 2013 that has supportive mechanisms for establishing seed farms to develop climate-resilient crop varieties and seed markets.¹⁵²

Apart from this, the Seeds Bill, 2019 can integrate climate related goals by promoting crop diversity directly, or through farmers’ access to crops and varieties that have already been tested and approved in other countries.¹⁵³ The Bill can also include provisions to facilitate *“access to diversity for relatively neglected crops, for instance by recognizing different seed quality standards in order to foster a seed sector that is more diverse in terms of the types of enterprises involved, crops multiplied, and seed prices.”*¹⁵⁴ Further, the Bill should not only include provisions for providing incentives to breed climate-resilient seeds but also introduce mechanisms to make investments in climate-resilient seed production and distribution that includes seed bulking facilities, expanded extension services, and input subsidies.¹⁵⁵ Incorporation of these

¹⁴⁹ Supra 1, at 177.

¹⁵⁰ Organic Law of Agrobiodiversity, Seeds and Promotion of Sustainable Agriculture, No. 10 of 2017 (Ecuador).

¹⁵¹ Ibid.

¹⁵² Crops Act, 2013 (Kenya).

¹⁵³ Supra 1, at 176.

¹⁵⁴ Ibid.

¹⁵⁵ O.J. Cacho, et al., *The Value of Climate-Resilient Seeds for Smallholder Adaptation in Sub-Saharan Africa*, 162 *Climatic Change*, 1215 (2020), available at <https://link.springer.com/article/10.1007/s10584-020-02817-z>, last seen on 04/03/2021.

suggestions could ensure that the draft seed bill is climate-inclusive and opens up a possibility of integration of climate elements in the seed sector.

4. Agrobiotechnology and Climate Change

Agricultural biotechnologies are increasingly being applied in crops and agro-industries as a means to adapt to climate change and to maintain the natural resource base.¹⁵⁶ With respect to climate change, some experts are of the opinion that agrobiotechnology could be a way to mitigate climate risks by reducing agricultural GHG emissions through boosting carbon sequestration on cropland.¹⁵⁷ Further, agricultural biotechnology when appropriately integrated with other technologies for the production of food, agricultural products and services, can be of significant assistance.¹⁵⁸ For instance, it can facilitate new varieties and traits that are drought and heat tolerant and resilient to extreme weather events.¹⁵⁹

India ranks in the top five countries in the world in terms of planting agri-biotech crops.¹⁶⁰ However, the adoption of agrobiotechnology in India has remained contentious for several years. Some believe that it is owing to information asymmetry in this field,¹⁶¹ and others strongly opine¹⁶² that there are uncertain risks of genetically engineered crops escaping the farm and impacting natural plant species. The Department of Biotechnology (“DBT”) under the Ministry of Science and Technology is the primary agency for coordinating agri-biotech operations in India. In view of the potential risks of biotechnology to the environment, the areas of research,

¹⁵⁶ Supra 1, at 178.

¹⁵⁷ Ibid.

¹⁵⁸ Supra 1, at 178.

¹⁵⁹ Ibid.

¹⁶⁰ H. Dang, B. Gilmour & N. Kishor, *India's Agri-Biotech Policies, Regulations and Decision-Making*, 18(1) *AgBioForum*, 87 (2015), available at https://www.researchgate.net/publication/280533784_India's_Agri-Biotech_Policies_Regulations_and_Decision-making, last seen on 04/03/2021.

¹⁶¹ See S. Menon & S.K. Jha, *National Biosafety System for Regulating Agricultural Biotechnology in India*, 14(2) *International journal of Biotechnology*, 151 (2016), available at https://www.researchgate.net/publication/305621146_National_biosafety_system_for_regulating_agricultural_biotechnology_in_India, last seen on 04/03/2021.

¹⁶² See *Impacts of Genetically Engineered Crops on Farm Sustainability in the United States*, The National Academies of Sciences Engineering Medicine, Chapter 4, P.59, 2010, <https://www.nap.edu/read/12804/chapter/4>, last seen on 14/04/2021; See A. Bauer-Panskus et al., *Risk assessment of genetically engineered plants that can persist and propagate in the environment*, *Environ Sci Eur* 32, 32 (2020), available at <https://doi.org/10.1186/s12302-020-00301-0>, last seen on 14/04/2021.

product development and commercial release is assigned to the Ministry of Environment, Forest and Climate Change. Further, the Ministry of Health and Family Welfare also plays a key role.¹⁶³

Since the 1980s, India has enacted several regulations and policies related to agrobiotechnology. None of them have seriously acknowledged the nexus between climate change and agrobiotechnology. The legal and policy framework for agrobiotechnology is weak, and climate change concerns rarely feature in the existing policies and decisions of the relevant institutions. Examples of biotechnology regulations in India include the Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells 1989,¹⁶⁴ the Recombinant DNA Safety Guidelines, 1990,¹⁶⁵ and Research in Transgenic Plants & Guidelines for Toxicity and Allergenicity Evaluation of Transgenic Seeds, Plants and Plant Parts, 1998.¹⁶⁶ None of these rules include the climate nexus. In 2007, the DBT also released the National Biotechnology Development Strategy, 2007, which includes climate change as one of the areas for supporting research that is aimed at protection of yield loss due to climate change.¹⁶⁷ However, the strategy makes no mention of how agrobiotechnology could be a climate change mitigation measure.

At the state level in India, certain states have welcomed biotech policies.¹⁶⁸ This complex and controversial scenario presents a potential difficulty for

¹⁶³ Supra 174.

¹⁶⁴ Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells, 1989.

¹⁶⁵ Recombinant DNA Safety Guidelines, 1990, available at <https://biosafety.icar.gov.in/recombinant-dna-safety-guidelines-1990-2/>, last seen on 03/04/2021.

¹⁶⁶ Revised Guidelines for Research in Transgenic Plants & Guidelines for Toxicity and Allergenicity Evaluation of Transgenic Seeds, Plants and Plant Parts, 1998, available at https://biosafety.icar.gov.in/wp-content/uploads/2015/11/Rev_Guidelines_Research1998.pdf, last seen on 03/04/2021.

¹⁶⁷ National Biotechnology Development Strategy, 2015-2020, available at http://dbtindia.gov.in/sites/default/files/DBT_Book-29-december_2015.pdf, last seen on 03/04/2021.

¹⁶⁸ See Biotechnology Policy of Tamil Nadu (2014), available at <http://extwprlegs1.fao.org/docs/pdf/ind194101.pdf>, last seen on 03/04/2021; Karnataka Biotechnology Policy (2017), available at [http://www.bisep.karnataka.gov.in/images/downloads/karnataka-biotech-policy-III\(2017-2022\).pdf](http://www.bisep.karnataka.gov.in/images/downloads/karnataka-biotech-policy-III(2017-2022).pdf), last seen on 3/4/2021; Kerala Biotechnology Policy (2003), available at <https://www.bio360.in/wp-content/uploads/2018/08/policy2003%20kerala%20biotech%20policy.pdf>, last seen on 03/04/2021.

a legal intervention to mainstream climate concerns in this key sector. However, it is important that once agrobiotechnology laws and policies are enacted in India, climate concerns are acknowledged and integrated with special efforts made by the DBT and the concerned ministries.

One of the best examples of such a legal intervention for mainstreaming climate concerns in biotechnology law is the Kenyan Biosafety Act, 2009, which requires the National Biosafety Authority formed under the Act to mainstream climate change in implementing biosafety and design policies to respond to future climate change considerations.¹⁶⁹ Similar to this, India should include provisions that mandate mainstreaming of climate change in its existing biotechnology policies, regulations and guidelines. This will ensure that the existing biotechnology policy framework is adequately informed and equipped to respond to future climate effects which will in turn benefit the agricultural sector.

5. Livestock and Climate Change

The livestock sector contributes significantly to GHG emissions through methane emissions from livestock and land use changes that occur due to the conversion of forestland to pasture land. This is a serious concern which has been included as part of mitigation measures in NDCs of different countries.¹⁷⁰ So it is paramount to steer the attention of this sector towards climate friendly practices by introducing legal interventions.

India has one of the highest livestock populations of over 537 million in 2019,¹⁷¹ and the total GHGs emission is estimated at 247.2 metric tons in terms of CO₂ equivalent emissions.¹⁷² The livestock sector alone contributes 4.11% GDP and 25.6% of total agriculture GDP in India.¹⁷³

¹⁶⁹ Supra 1, at 179-180.

¹⁷⁰ Supra 1, at 180.

¹⁷¹ G. Bakshi, *Livestock Population in India up by 4.6% in Seven Years*, Jagran Josh (18/10/2019), available at <https://www.jagranjosh.com/current-affairs/livestock-population-in-india-up-by-46-in-seven-years-1571295223-1#:~:text=The%20livestock%20population%20in%20India,nearly%20536%20million%20in%202019>, last seen on 04/03/2021.

¹⁷² A. Chhabra et al., *Greenhouse Gas Emissions from Indian Livestock*, 117 *Climatic Change*, 329 (2013), available at <https://doi.org/10.1007/s10584-012-0556-8>, last seen on 04/03/2021.

¹⁷³ S. Dash, *Contribution of Livestock Sector to Indian Economy*, 6(1) *Indian Journal of Research*, 159 (2017), available at

The Department of Animal Husbandry and Dairying is one of the departments of the newly created Ministry of Fisheries, Animal Husbandry & Dairying responsible for matters relating to livestock production, preservation, protection from diseases and improvement of stocks among others. The Department advises State Governments/Union Territories in the formulation of policies and programs in the field of Animal Husbandry and Dairy Development.¹⁷⁴

The Department lays out several schemes, programmes and policies which include the National Livestock Mission, the National Programme for Dairy Development, and the National Animal Disease Control Programme among others. None of these schemes include climate concerns. The National Livestock Policy, 2013 provides the policy framework for improving productivity of the livestock sector in a sustainable manner and acknowledges the nexus between livestock and agriculture.¹⁷⁵ It takes into account the provisions of the National Farmers Policy, 2007 and the recommendations of the stakeholders, including the States. The policy includes provisions that mandate efforts to modify the management and feeding systems to reduce GHG emissions by livestock.¹⁷⁶

Despite this development, India needs a much larger legal intervention as its livestock population and their GHG emissions keep on increasing. There are examples from other countries that have crucial lessons for India. One example is Lao's legislation on livestock that aims to guarantee food security while ensuring sustainable environmental protection.¹⁷⁷ It mandates that activities in livestock should be carried out without harming the environment and lays down general principles to guidance implementation.¹⁷⁸ There are also other good examples of legislation that include climate concerns as one of the goals in livestock production such

https://www.worldwidejournals.com/paripex/recent_issues_pdf/2017/January/January_2017_1483613920_159.pdf, last seen on 04/03/2021.

¹⁷⁴ Department of Animal Husbandry and Dairying, available at <https://dahd.nic.in/>, last seen on 04/03/2021.

¹⁷⁵ National Livestock Policy, 2013, available at <http://dahd.nic.in/sites/default/files/NLP%202013%20Final11.pdf>, last seen on 04/03/2021.

¹⁷⁶ Ibid, at 26.

¹⁷⁷ Law No. 03/NA on Livestock Production and Veterinary Matters, 2008, as amended in 2016 (Lao).

¹⁷⁸ Supra 1, at 182.

as the law in Mexico that includes in its objectives, a duty to promote sustainable livestock practices to reduce climate change.¹⁷⁹ Two other examples are the Korean legislation that establishes a special agency to promote sustainable utilization of livestock excreta,¹⁸⁰ and New Zealand's legislation that includes specific target reduction of emissions from livestock production.¹⁸¹ Therefore, while India has incorporated schemes to manage its livestock, it is imperative that climate change be taken into account more lucidly, in light of India's international commitments.

VI. CONCLUSION

With climate change becoming an overwhelming global challenge, there is a dire and urgent need for countries to mainstream climate concerns into every possible sector affected by its impacts. This article expounds on how climate change consideration should be the cornerstone of agricultural laws and policies as arguably, agriculture is not only one of the most vulnerable sectors affected by climate change, but also has the potential to worsen climate impacts due to greater increase in agricultural GHG emissions in the future.

As evidenced in this article, several foreign jurisdictions have pioneered to incorporate climate concerns within its agricultural laws and policies. Unfortunately, India, despite being a largely agrarian economy and a leading contributor of agricultural GHG emissions, is yet to chart a low-carbon climate future and design a climate-inclusive agricultural legal and policy framework. Although some existing Indian agricultural policies do allude to climate concerns, there still remains significant gaps in the legislative and implementation front such as lack of agricultural policy or legislations to establish legally supportive institutional mechanisms to bolster climate-resilient agriculture; absence of agricultural policies that

¹⁷⁹ Ley de desarrollo pecuario del Estado de Tabasco, 2011 (Mexico). See more on the provisions included in this legislation at Supra 1, at 183.

¹⁸⁰ Republic of Korea's Act on the Management and Use of Livestock Excreta, No. 8 010 of 2006, as amended by Act No. 13 526 of 2015 (South Korea). See more on the provisions included in this legislation at supra 1.

¹⁸¹ Climate Change Response (Zero Carbon) Amendment Act 2019, No. 61 of 2019 (New Zealand); see more on the provisions included in this legislation at Supra 1, at 184.

target climate mitigation/adaptation measures; lack of climate related concerns in agricultural decisions/directives; paucity of quality and reliable information on climate related risks in agriculture among others. Without addressing these fundamental gaps, having a legal or policy framework that supports a climate-resilient agricultural sector in India will remain a wishful thinking.

The article however does not merely limit itself to identifying and criticizing the existing climate related gaps in the agricultural policies in India but propounds recommendations by highlighting good practices in agricultural laws, policies and measures in other foreign jurisdictions that have provided special attention to include climate angle in their frameworks. By doing this, the purpose was to bring to the attention of relevant stakeholders, including law-/policymakers, scientists, farming communities, agricultural experts and economists, that although there is not yet an international blueprint on how climate friendly agricultural legislation can be put in place, there are systems and approaches prevalent in many countries that give hope in the direction of adopting good practices that can be tailor-made to suit domestic needs and priorities. Thus, the article provides a fundamental guiding step in designing climate-inclusive agriculture legislation in India.

It is recommended that by learning from different country examples cited in this article, India could choose from one of the recommended approaches discussed in the article. One approach to go ahead with is to design an exclusive climate change legislation that comprehensively includes regulatory actions, long-term and short-term goals, institutional framework among other significant actions. The other approach is to make sector-specific climate amendments in agricultural legislation that integrate climate considerations across all sectors including agriculture. While areas such as seed legislations, biotechnology, etc., are crucial for adaptation, sectors such as fertilizers and livestock can be the basis for immediate mitigation-oriented measures. Each of these approaches provide avenues for introducing pro-climate amendments which can simultaneously contribute to reducing agricultural costs, improving productivity, and increasing incomes apart from combating climate change. The mandate of

making the agricultural sector climate-resilient must be sufficiently apparent in such laws whether it is a national legislation or sector-specific legislation, and must reflect the paradigm shift that is necessary for sustaining India's agriculture.

Meanwhile, India should also give every public entity in the state government and central government the mandate to integrate climate change action plans and considerations into their sectoral strategies and action plans, and in other implementation projections for the assigned legislative and policy functions. This will require that every legislation or policy made in the agricultural sector is informed by and responds to eventual climate change considerations and goals as included in the National Action Plan on Climate Change. Also, climate proofing agricultural legislation or policy would require a lot of *“stimulus, resources and expertise from external agencies and organizations such as the United Nations and international development institutions.”*¹⁸²

Although the tasks are ambitious and herculean in nature, it is not impossible to bring in robust reforms if the learnings from good practices of other foreign jurisdictions are done in a phased manner with an emphasis on making it an inclusive and consultative process that involves all relevant stakeholders. Further, the articulation of all such reforms must be done in a manner that instills confidence and trust in all such relevant stakeholders. Further, the reality still remains that no reforms in laws and policies is possible without political willingness to prioritize climate change elements on par with other significant goals of agriculture such as food security, conservation and enhancing economic aspects of agriculture. Even more herculean is the task of enacting robust agricultural legislation or amending existing legislations in agriculture to specifically promote such goals, build institutional mechanisms and fulfill India's climate goals and global commitments.

¹⁸² Climate Change and Agricultural Policies, *How to mainstream climate adaptation and mitigation into agricultural policies*, FAO Policy learning Programme, 30, available at http://www.fao.org/fileadmin/templates/ex_act/pdf/ppt/Climate_Change_and_Agricultural_Policies_ppt.pdf, last seen on 10/05/2021.

Apart from designing or amending legislation and policies, India must also bear in mind that enabling conditions for promoting climate friendly agricultural practices such as providing current and future financing mechanisms, incentives, institutional support, access to advanced agricultural technology interventions and techniques, innovative adaptation and mitigation options, improved energy usage, capacity building, identifying scientific, legal and policy experts, and disaster preparedness are all instrumental in the smooth transition of the existing legal and policy framework to adapt to a climate-inclusive agricultural framework. Additionally, the importance of educating and incentivizing farmers about the importance of climate concerns in agricultural practices cannot be overstated. Ultimately, these enabling conditions along with a solid legal and policy intervention in the agricultural sector could be the fundamental yet significant steps in creating a climate-inclusive agricultural legal framework in India and lead India to the pathway of achieving its climate commitments and goals.