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CHAPTER 18

AGRICULTURE, FOOD SYSTEMS, AND THE ENVIRONMENT

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C18S1

Introduction

C18P1 Agriculture has dramatically shaped the planet's environment for several millennia. Not only does farming impact the environment and ecological systems, but a 'farm' is itself a specialized ecosystem.[1] Yet, the role of agriculture has largely been framed in terms of providing food security, and this is arguably so for allied spheres such as land, water, soil, seeds, etc. Agriculture causes some environmental harm through its mere practice such as land degradation, habitat and biodiversity loss, depletion of water resources, soil erosion, and the release of toxins and pollution.[2] With the advent of industrialized agriculture in India in the 1960s, and its evolution towards catering to a global commodities market, the style of practising agriculture and its very purpose has undergone several major shifts. Watershed moments such as the 1960 Green Revolution and the 1991 economic liberalization have substantially shaped the trajectory of agriculture in India, which tolerated and/or neglected many types of environmental harm in the name of agricultural productivity.

C18P2 In India, agriculture is a deep-rooted socio-cultural institution, and consequently, it is highly diverse across the country. Diversities based on region, ecosystems, local environment, and conditions exist. Economic diversities also exist with respect to links between producer-farmers, 'middlemen', and other market actors, consumer demands, economic volatility due to fluctuating farm profits, and differentiated capacities to deal

[1] Ian Wilkinson, 'The Farm as an Ecosystem' (2017) 18(2–3) *Biodiversity* 92.

[2] A Suresh and others, 'Agricultural Sustainability and Its Trends in India: A Macro-Level Index-Based Empirical Evaluation' (2022) 14 *Sustainability* 2540.

with distresses.[3] Social diversities in the nature of the caste, gender, and religion of the farmers exist. Political diversities also play an important role. Agriculture remains one of the most politically significant sectors in India, despite its overall low-profitability and ever-decreasing contributions to India's economic growth.[4] A majority of the members of Parliament and State Assemblies have farming or agrobusiness backgrounds.[5] Elected leaders and political party workers at the local level have a substantial farmer-voter base.[6] Collective political power that different farmer groups exercise determines the manner of distribution of sector allocations, concessions, and subsidies, and are crucial in determining the concentrations of agrochemical and food processing industries, and access to higher selling prices due to greater corporate presence.[7] Yet, one should not let these diversities and complexities conceal some generalized 'hard truths' about agriculture such as its adverse impact on the environment.

C18P3 An environmental law critique of agriculture is, hence, long overdue, even if it is done at the risk of generalization. Environmental law has developed over the past decades, covering several key areas such as pollution, forests, and biodiversity conservation. Yet, 'agriculture' and 'environment' have evolved as somewhat separate and compartmentalized law-policy fields. A combination of active protections under agricultural law and passive silences under environmental law has left environmental harm to continue unabated, as well as perpetuated the chasm between these fields of study.

C18P4 The first section of this chapter describes Indian agriculture's productivist orientation, which has created severe environmental impacts. These are caused not only by farms but also by allied sectors such as large-scale irrigation infrastructure, chemical inputs to enhance yields and the hybrid seed industry. The second section explores the active (agricultural) and passive (environmental) laws and regulations that allow and exacerbate environmental harm. These include agricultural input subsidies, lack of adequate regulation of harmful chemicals and hybrid seeds, and an increasingly privatized market architecture that is driven by profitability and not ecological sustainability. The third and final section explores certain recent attempts at 'crossing the chasm'. These are environment-oriented agricultural laws, regulations, and programmes, expanding the focus area of environmental law into the fields of agriculture, and other approaches such as food sovereignty and peasants' rights that have the potential to address the environmental impacts of agriculture through other routes of law and policy.

[3] JB Ruhl, 'Farms, Their Environmental Harms, and Environmental Laws' (2000) 27 *Ecology Law Quarterly* 263.

[4] The World Bank, 'Data—Agriculture, Forestry, and Fishing Value Added (% of GDP)', World Bank National Accounts Data (1 March 2021) <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS>.

[5] Simin Fadaee, 'Politics of Alliance in the Farmers' March to Parliament in India' (2021) 37(1) *International Sociology* 31.

[6] Diego Maiorano and Vani Swarupa Murali. 'The Indian Elections and the Rural Sector' Institute of South Asian Studies Insights, No 533, National University of Singapore (19 January 2019).

[7] Shoumitro Chatterjee and others, 'A Study of the Agricultural Markets of Bihar, Odisha and Punjab. Final Report' (Center for the Advanced Study of India (University of Pennsylvania 2020) 51–53, 110–120.

C18S2

18.1 Dominant Agricultural Models and Food Systems Shaped by the Green Revolution 'Success' Story

C18P5 The 1960 Green Revolution is a watershed moment in Indian agricultural history, which pulled India out of an era of dire food shortages and an imminent threat of famine. 'Miracle wheat' was tested and introduced in 1962, followed by high-yielding rice in 1964. Within a few years, India became food secure and an exporter of wheat and rice internationally.[8] Despite the uptake of new seeds and agricultural technology being limited to north-western and western parts of India, the Green Revolution managed to create an enduring skeleton for policymaking in the decades to come.

C18P6 Post 1960, India's agricultural institutional apparatus aggressively promoted and endorsed rapid agricultural transformation, at first with the aim of achieving national food security and later, following the 1991 economic liberalization, with the aim of increasing economic growth, agricultural infrastructure development and farmers' incomes through increases in yields.[9] The productivist shift in agricultural law and policy was coupled with other developments, such as the rise of globalized trade and the consequent commodification of food, a neoliberal wave of development ideals, and the valuation of agricultural success or failure in terms of its contribution to national gross domestic product (GDP). The central government, aided by its newly fashioned agricultural bureaucracy, initiated several demonstrations and awareness-building campaigns via press, radio, and cinema to convince farmers to adopt high-yielding varieties (HYV) seeds and agricultural technology. Within the first ten years, the land area covered by HYVs increased by 10.4 per cent.[10] An increased emphasis on productivism ignored several other parameters of crop diversity, environmental impact in terms of water and soil erosion, and retention of control over traditional knowledge in seeds, plants, and plant genetic resources, etc. A centralized supply of agricultural productivist knowledge via India's agricultural institutional apparatus has had profound effects on the rural, social, and organizational structures, labour relations and the socio-economic situation of small- and medium-scale farmers.[11] In terms of food production, per acre per season food production almost tripled between 1960–90.[12] Farmers could sow two crops within

[8] Govindan Parayil, 'The Green Revolution in India: A Case Study of Technological Change' (1992) 33(4) *Technology and Culture* 737.

[9] Mark Rosegrant and Peter Hazell, Transforming the Rural Asian Economy: The Unfinished Revolution (Asian Development Bank 2000) 10.

[10] Government of India, Directorate of Economics and Statistics, 'Area under High Yielding Varieties Programme (HVP) All India 1966-67 and 1968-69' (Ministry of Food and Agriculture 1969) Statements I and II.

[11] Raj Patel, 'The Long Green Revolution' (2013) 40(1) *Journal of Peasant Studies* 1.

[12] Michael Lipton and Richard Longhurst, *New Seeds and Poor People* (Unwin Hyman 1989) 1.

one year instead of one, and the profitability of cereals resulted in more land being deployed for cereals vis-à-vis other crops. This also increased the holdings of buffer stocks, thereby removing the need for food imports and food aid. Self-sufficiency with respect to food staples was achieved, a goal pursued aggressively in the 1960–75 period.[13]

C18P7 National food security, which remained a core objective prior to 1980, gave way to new core objectives such as increasing agricultural growth and development. For instance, the 2020 Niti Aayog's (Policy Commission of India) Agricultural Vision continues to echo the productivist tone, where it points to low efficiency, sub-optimal fertilizer and chemical use, and problems in technology-diffusion and small landholding as the chief problems that affect agriculture and farmers.[14] It further elaborates the reasons for agriculture's overall under-development as low levels of technology, low quality of inputs, low investments, low availability of credit, and missing links within supply chains. Farmers' and rural poverty alleviation programmes have worked hand in hand with the idea that low productivity *is* unsuccessful agriculture.

C18P8 Since the turn of the twenty-first century, agricultural profitability has been on a decline, creating an acute 'agrarian distress'. This silent crisis has been attributed to the practices of the Green Revolution, which idealizes high and intensive production 'at all costs'.[15] Agrarian distress has led to a wave of impoverishment and depeasantization. Eighty per cent of all poor in India comprise smallholder farmers, women, pastoralists, landless agricultural labourers, and shepherds; that is, a substantial majority of the poor are involved in agriculture.[16] Further, thousands of young people are opting out of agriculture as a profession. The average age of a farmer in India is fifty-one years.[17] Surveys analysing rural youth's aspirations for what they wanted to become in the future show that merely 1.2 per cent wished to join agriculture.[18] Agricultural labourers who are usually landless themselves filled this youth vacuum and they are employed under precarious conditions. Long-term decisions regarding environmental protection and sustainable use of resources cannot be taken by this kind of labour or absentee landlords who only care about farm profits in production terms. A study showed that between 2000 and 2010 the number of cultivators declined by 10 per cent (14 per cent for women farmers), while the number of agricultural labourers rose by 31 per cent in

[13] Dana G Dalrymple, 'The Adoption of High-Yielding Grain Varieties in Developing Nations' (1979) 53(4) *Agricultural History* 704.

[14] Niti Aayog, Raising Agricultural Productivity and Making Farming Remunerative for Farmers (2015) <https://www.niti.gov.in/sites/default/files/2019-08/Raising%20Agricultural%20Productivity%20and%20Making%20Farming%20Remunerative%20for%20Farmers.pdf>.

[15] Dan Banik, 'Human Rights for Human Development: The Rhetoric and the Reality' (2012) 30(1) *Nordic Journal of Human Rights* 4, 17.

[16] MS Swaminathan, '50 Years of Green Revolution: An Anthology of Research Papers' (World Scientific 2017) 33–36.

[17] Centre for the Study of Developing Societies, 'State of Indian Farmers: A Report' (CSDS 2014).

[18] Richard Mahapatra, 'Farmers Ageing, New Generation Disinterested: Who Will Grow our Food?' *Down to Earth* (24 July 2019) <www.downtoearth.org.in/blog/agriculture/farmers-ageing-new-generation-disinterested-who-will-grow-our-food—65800>.

the same period.[19] Further, 76 per cent of farmers surveyed did not wish to remain in agriculture.[20] Since the advent of the Green Revolution in 1960, the number of farmers has reduced by a staggering 52 per cent, while landless female agricultural labourers increased by 47 per cent.[21] It is thus unfortunate that high production and profitability continue to remain the unit of measurement of success, which has not only caused severe environmental impacts but also disenfranchised several rural workers.[22]

C18S3

18.2 Active Protections and Passive Silences that Allow Environmental Impacts

C18P9 The body of agricultural law, regulations, and policies covering different sub-sectors in different states makes up a complex subject area. As stated above, most of these are focused on perpetuating a productivist drive, either ignoring environmental concerns or, in some cases, directly promoting negative environmental effects. Agriculture is a state subject under the Constitution of India, 1950,[23] yet agriculture is of national significance. The central government through its Ministry of Agriculture and Farmers' Welfare develops and provides finance for agricultural policies, schemes, and programmes. While the states implement these programmes and adopt state-specific legislations, the centre controls significant spheres, such as pricing, procurement and storage of grain, farmer cooperatives, and producer companies, foreign direct investment in chemical industries, transport trucks, agricultural technologies, etc., and seed-related research and diffusion of 'improved' seeds. It is impossible to analyse all these law-policy fields at the central and state levels, and therefore, only some prominent fields, such as water, chemical inputs, soil, land, and seeds, are analysed here.

C18P10 The most dominant varieties of crops, in terms of cultivation area, government procurement and profitability, are water-intensive. Many were introduced by the Green Revolution, such as HYV rice and wheat, and agricultural research since then has incentivized farmers to grow these crops rather than traditional cereals such as millet and sorghum. Rice and wheat require an extensive irrigation infrastructure, and this has

[19] Nitin Gupta, 'Decline of Cultivators and Growth of Agricultural Labourers in India from 2001 to 2011' (2016) 12(2) *International Journal of Rural Management* 179.

[20] ibid.

[21] Sudha Pai, 'Class, Gender and Agrarian Change: An Analysis of the Status of Female Agricultural Labour in India' (1987) 15(6) *Social Scientist* 16.

[22] Arthur Goldsmith, 'Policy Dialogue, Conditionality and Agricultural Development: Implications of India's Green Revolution' (1988) 22(2) *The Journal of Developing Areas* 189.

[23] The Constitution of India, 1950, Entry 14, List II.

resulted in severe water stress in many parts of India.[24] Approximately 91 per cent of all freshwater in the country is used in the agricultural sector.[25] India has the largest land area under irrigation (48 per cent) in the world, and the highest quantum of subsidies related to water. This includes subsidised pricing of water, of equipment used to extract groundwater and divert rivers or canal water, and of electricity used for irrigation.[26]

C18P11 Water subsidies (including electricity) usually benefit landed farmers that are connected to the irrigation network or can afford the extraction technology.[27] India's Socio-Economic Caste Census data indicates that 56 per cent of rural homes have no land;[28] and the median Indian farmer is a labourer and not a landowner.[29] Further, most small and marginal landowning farmers are dependent on rainfall, while the landless are not the usual beneficiaries of these subsidies.[30] Furthermore, large-scale irrigation infrastructures such as dams, water distribution canals, and technologies that shift the flow of rivers have massive environmental impacts.[31] For example, the gargantuan Sardar Sarovar Dam in the State of Gujarat was justified on the basis of food security and providing drinking water; yet, its chief beneficiaries are large-scale commercial farmers in North Gujarat that grow water-intensive cash crops.[32]

C18P12 Pesticides, insecticides, weedicides, and chemical fertilizers are used in large quantities to maximize production. Since the 1960s, the use of fertilizers in Indian agriculture has increased at an average 8.1 per cent compound growth rate every year.[33] With the lessening of available manual labour and the consequent rising costs of labour, chemicals have been increasingly deployed to remove weeds and herbs, an activity previously carried out manually. Further, the high use of chemicals directly corresponds to the high production of cash crops; that is, such inputs are most used in the states of Punjab, Haryana, and Maharashtra.

C18P13 The Insecticides Act, 1968 and the Insecticides Rules, 1971 regulate the use of insecticides and pesticides. They set up the Central Insecticides Board, which is empowered to regulate the use, manufacture, distribution, sale, and transport of

[24] S Subramanian and AV Manjunatha, 'Demystifying the Energy-Water-Soil-Food Nexus in Indian Agriculture' (2014) 20 *Ecology, Environment and Conservation* S303.

[25] Yoshihide Wada, LPH van Beek, and Marc Bierkens, 'Nonsustainable Groundwater Sustaining Irrigation: A Global Assessment' (2012) 48(6) *Water Resources Research* doi:10.1029/2011WR010562.

[26] Reena Badiani and Katrina Jessoe, 'The Impact of Electricity Subsidies on Groundwater Extraction and Agricultural Production' (2013) University of California at Davis Working Paper.

[27] Ramesh Chand, 'Doubling the Farmers' Income by 2022' (2017) Niti Ayog Working Paper No 1/2017.

[28] Ministry of Rural Affairs, 'SECC 2011– Highlights' <https://secc.govin/>.

[29] Rahul Tongia, 'India's Biggest Challenge: The Future of Farming' *The India Forum* (30 September 2019) <https://www.theindiaforum.in/article/india-s-biggest-challenge-future-farming>.

[30] G Ravindra Chary and others, 'Climate Resilient Rainfed Agriculture: Experiences from India' in Xavier Poshiwa and Ravindra Chary (eds), *Climate Change Adaptations in Dryland Agriculture in Semi-Arid Areas* (Springer 2022) 3.

[31] Philippe Cullet, The Sardar Sarovar Dam Project: Selected Documents (Routledge 2007)2–3.

[32] ibid 14–19.

[33] Research and Markets, 'Indian Pesticides Market: Industry Trends, Share, Size, Growth, Opportunity and Forecast, 2021–2026' IMARC Report (April 2021) i–v.

insecticides. The rampant use of Endosulfan is an exemplary case study of the failures of this Act in preventing harmful health and environmental impacts.[34] The astonishing levels of toxic residues in the soil, water and within humans have been reported in many parts of India.[35] The marketing of Endosulfan, as is the case with many other chemicals, is allowed by the Central Insecticides Board after sufficient testing is done and its data is submitted by the manufacturing entity (usually domestic companies such as AMICO or Indian subsidiaries of larger multinational corporations such as Syngenta AG or Bayer Corp). These companies have the option of testing and collecting data in either government laboratories or in government-approved private commercial laboratories.[36] Most applicant companies prefer private labs, as the desired results can be generated more easily.[37] Safe use levels as advertised by the companies themselves are too high to begin with, coupled with the problem of high levels of use by farmers themselves owing to subsidised prices and little training and awareness.[38] In 2011, following the tragedy of Endosulfan poisoning in Kasargod, Kerala, the Supreme Court of India issued an order banning its use.[39] Since then the government has been phasing out its use in the country.[40]

C18P14 With respect to pesticides, the Pesticide Management Bill, 2017, released by the Ministry of Agriculture and Farmers' Welfare was heavily contested and later withdrawn. A later version was released in 2020, which sought to replace the Insecticides Act if passed. The Bill sets up a stricter and wider regulatory framework with the Central Pesticides Board under the Insecticides Act exercising the power to formulate standards and best practices for manufacturers, laboratories, and pest control. Typical of any delegated legislation, the success or failure of this Bill will depend on how vigorously its institutional authority carries out its functions, and because it does not change much of its preceding legislation, it is unlikely to change the status quo drastically.[41] The Bill resembles the current Act in most respects, and as such does not combat the 'network of toxicity' within the political economy of agrochemicals—where private actors are

[34] Centre for Science and Environment, 'Pesticide Regulations' (21 July 2012) <https://www.cseindia.org/pesticide-regulations-1031>.

[35] Government of Kerala, 'Health Hazards of Aerial Spraying of Endosulphan in Kasaragod District, Kerala' –Report of the Expert Committee on Endosulphan Health Hazards (August 2003) <http://www.indiaenvironmentportal.org.in/files/KeralaGovt_FinalReport.pdf>.

[36] Indira Devi, 'Pesticides in Agriculture—A Boon or a Curse? A Case Study of Kerala' (2010) 45(26–27) *Economic and Political Weekly* 199, 203.

[37] Special Correspondent, 'Endosulfan Conspiracy' *Down to Earth* (15 July 2003) < www.downtoearth.org.in/coverage/endosulfan-conspiracy-38732>.

[38] Chandra Bhushan, Avimuktesh Bhardwaj, and Savvy Soumya Misra, *State of Pesticide Regulations in India* (Centre for Science and Environment 2013) 3.

[39] *Democratic Youth Federation of India v Union of India and Others* (2011) 15 SCC 530.

[40] Dileep Kumar and C Jayakumar, 'From Precautionary Principle to Nationwide Ban on Endosulfan in India' (2019) 4(2) *Business and Human Rights Journal* 343, 349.

[41] Kavitha Kuruganti, 'Does the Government Really Need a New "Pesticides Management Bill"?' *The Wire* (7 March 2018) <https://thewire.in/agriculture/does-the-government-really-need-a-new-pesticides-management-bill>. Kuruganti's critique is applicable for the 2020 Bill as well.

allowed a free hand in propagating their technologies.[42] Along with this Bill, a proposed ban on twenty-seven toxic pesticides is under review by a parliamentary expert committee. This is a positive development; however, it has been aggressively resisted by agrochemical companies across India. If implemented, this proposal will be the second ban imposed in a long-term phase-out programme of sixty-six identified chemicals, of which the first eighteen were banned in 2018.[43]

C18P15 Fertilizers are the other major chemical inputs that farmers use, and similar problems with respect to overuse, active promotion by chemical companies and passive acquiescence by a weak regulatory framework can be seen here, too. Laws regulating fertilizers comprise mainly two sets of rules notified under the Environment (Protection) Act, 1986—Environmental Protection Standards for Nitrogen Fertiliser Plants, 1989 and the Environmental Protection Standards for Phosphate Fertiliser Plants, 1989. These are technical standards meant for quality control and do not address the core issues of overuse to increase yield or misuse by mixing different fertilizers in the wrong proportions. Furthermore, the lack of adequate regulatory legislation promotes spurious manufacture, processing, and marketing of fertilizers.[44] The regulatory framework around chemical inputs can be described as one promoting their use and conducive to private companies operating in these sectors. This is because the framework, on the one hand, comprises price subsidies[45] and, on the other, some form of quality control and marketing permits. India's agrarian distress and its underlying ecological distress have continued unabated while chemical inputs have been on the rise. Agricultural regulations, thus have failed to account for losses due to environmental factors, which are, in turn, caused partly by the overuse of chemicals.

C18P16 Chemical inputs are one component of a larger technological package available to farmers. The most salient element is seeds, which are improved varieties that are highly responsive to chemical inputs, ensuring a quick maturation period, and less sensitivity to local climatic factors, which ergo produce higher yields. One of the most profound impacts of the increasing uptake of improved seeds is the loss of traditional farm-saved seeds. Agricultural law and policymakers have routinely dubbed traditional self-replicating seed varieties as inferior vis-à-vis the improved or hybrid varieties owing to their low productive value.[46] Some studies with respect to particular plants or in

[42] Aniket Aga, 'Draft Pesticide Management Bill is Out of Sync with the Agrarian Political Economy' (2018) 53 (18) *Economic and Political Weekly-Engage*.

[43] Prabhudatta Mishra, 'Decision on Banning 27 Pesticides by Agriculture Ministry Likely this Week' *The Hindu Businessline* (4 April 2022) <www.thehindubusinessline.com/economy/agri-business/decision-on-banning-27-pesticides-by-agriculture-ministry-likely-this-week/article65289983.ece>.

[44] Federation of Indian Chambers of Commerce and Industry, 'Study on Sub-Standard, Spurious/Counterfeit Pesticides in India' Report (2015) 6–7.

[45] The government previously lowered the market price of inputs, but since 2018, these subsidies have been linked with the direct benefit transfer (DBT) system, wherein subsidy payment to the companies take effect after actual sales to farmers by retailers at a recorded point-of-sale (PoS) machine. Companies have to register themselves on the e-Urvarak platform to claim this subsidy.

[46] C Subramaniam, 'A New Strategy in Agriculture: A Collection of the Speeches by C Subramaniam' (ICAR 1972) 31; Swaminathan (n 16) 33–36.

particular regions have shown that in areas that grow 70–90 per cent hybrid varieties, an estimated 95 per cent of traditional varieties have been lost.[47] In northeast India, several varieties of sugarcane have given way to a single hybrid variety.[48] Thousands of varieties of rice, cotton, minor millets, pulses, and other crops are no longer in use.[49] The overall share of private hybrid seeds vis-à-vis open-pollinated traditional seeds is 70–88 per cent in India.[50] Across major crops, hybrids comprise shares between 7–8 per cent in paddy, 60–70 per cent in maize, 90 per cent in jowar, bajra, and some oilseeds, 95 per cent in cotton, and over 80 per cent in vegetables.[51]

C18P17 The rise of private commercial interests in seeds has gone hand in hand with the rise of intellectual property rights (IPR) protection over seeds. India joined the World Trade Organization in 1995 and acceded to the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which required India to provide IPR protection for plant varieties.[52] In 2001, India enacted its *sui generis* legislation, the Protection of Plant Varieties and Farmers' Rights Act (PPVFRA) that recognizes plant breeders' rights and farmers' rights. This Act makes no distinction between commercial plant breeders and farmers and accords them equal status to register seed innovations and gain benefit therefrom. It also recognizes farmers' rights to save, use, exchange and sell farm-saved seeds.[53] This is important for a country like India where over 75 per cent of all food is grown using varieties saved by farmers.[54]

C18P18 The real question, however, is whether the PPVFRA has been effective in promoting the use and conservation of farmers' traditional varieties. First, plant breeder rights can only be granted if the plant variety satisfies the criteria of distinctness, uniformity, and stability.[55] In most cases, farmers' traditional seeds, especially landraces, do not meet

[47] Sivaraj Natarajan and others, 'Agrobiodiversity in India: Status and Concerns' in Souliha Cambay and Charan Singh (eds), *Sustainable Agriculture for Food Security: Concepts and Approaches* (Springer 2018) 121, 123.

[48] Ashish Kothari, 'Reviving Diversity in India's Agriculture' *Grain* (25 October 1994) <https://grain.org/es/article/entries/514-reviving-diversity-in-india-s-agriculture?print=true>.

[49] Somnath Roy and others, 'Chakhao (Delicious) Rice Landraces of North-east India: Collection, Conservation and Characterization of Genetic Diversity' (2014) 12 *Plant Genetic Resources* 264.

[50] Pramod K Agrawal, 'Seed Industry Regulations in Relation to Seed Industry Development in India' in David Gisselquist and Jitendra Srivastava (eds), *Easing Barriers to Movement of Plant Varieties for Agricultural Development*, World Bank Discussion Paper 367 (World Bank Publications 1997) 105.

[51] IMARC Group, Report: Seed Industry in India: Market Trends, Structure, Growth, Key Players and Forecast, 2022–2027 (2021) <https://www.imarcgroup.com/seed-industry-in-india>.

[52] Agreement on Trade-Related Aspects of Intellectual Property Rights, 15 Apr 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 UNTS 299 (1994), art 27(3b) states: 'Members shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof.'

[53] International Treaty on Plant Genetic Resources for Food and Agriculture, Rome, 3 November 2001, 2400 UNTS 303, art 9.1.

[54] FAO, 'India at A Glance' (n.d.) <https://www.fao.org/india/fao-in-india/india-at-a-glance/en/>.

[55] Stephen A Marglin, 'Farmers, Seedsmen, and Scientists: Systems of Agriculture and Systems of Knowledge' in Frederique Apffel-Marglin and Stephen A Marglin (eds), *Decolonizing Knowledge: From Development to Dialogue* (OUP 1996) 205–206.

these criteria. Landraces are genetically diverse and locally adapted varieties which are unfit for uniform crop production on a large scale.[56] IPR protection over seeds promotes homogeneity and uniformity, as these characteristics are conducive to mass agricultural production.[57] Second, the implementation data of the PPVFRA shows that even though farmers comprise the largest group of applicants (between 45–50 percent across the years and different categories), the proportion of acceptance of their applications (only 7–8 per cent of all applications) is much lower than the proportionate acceptance of other parties such as public/private research organizations or biotech companies.[58] Until 2020, farmers have submitted the highest number of applications but have been issued the lowest number of certificates.[59]

C18P19 The Seeds Bill, 2004, was drafted as an attempt to regulate private seed developers, which currently fall outside the regulatory parameters of the Seeds Act, 1966. This Bill was not passed, *inter alia*, due to conflicting provisions with farmers' rights under the PPVFRA by mandating all seeds sold, including farmers' varieties, to be registered. The Biotechnology Regulation Bill, 2013 was drafted but not passed due to strong opposition in the same vein, that is, the Bill would jeopardize farmers' interests by ushering in biotechnological advances in agriculture. Most recently, the Seeds Bill, 2019 has received similar opposition as its predecessors on the issue of restricting farmers' rights.[60]

C18P20 Today the development and diffusion of seeds in India, is chiefly controlled by public bodies such as the Indian Council of Agricultural Research (ICAR), thirty-eight agricultural research universities across different states, 415 Farm Science Centres (KVKs) to demonstrate and distribute free 'improved' seeds, and central and state seed corporations (*Beej Nigams*) that develop, check, mark, certify, and distribute seeds, and a highly competitive and profitable private seed industry comprising over 850 companies in the formal sector as of 2017.[61] In the informal space, a plethora of farmers' associations, local companies, and seed systems of farm-saved, selected, and exchanged seeds are involved in seed production and supply, and some of these entities and systems function with governmental financial support. The growth of the private sector has

[56] Suman Sahai, 'Farmers' Rights in India: The Way it Always Was' *Development and Cooperation* (29 March 2010) <https://www.dandc.eu/en/article/indias-law-plant-variety-protection-and-farmers-rights>.

[57] Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (Yale University Press 2003); Pushpa Singh, 'Politics of Knowledge in Development: Explorations in Seed Sovereignty' (2021) 9(1) *Studies in Indian Politics* 105.

[58] PPVFR Authority, 'List of Registered Certificates Issued' in *Annual Report (2020–21)*, updated 28 February 2020 <http://www.plantauthority.gov.in>. See also sections titled 'Annual Reports' and 'Application Details'.

[59] ibid. For analysis of data until 2014, see Rajshree Chandra, 'Farmers' Rights in India: Globally Sui Generis' (2016) 6 *South Asia Chronicle* 119, 129–131.

[60] Vandana Shiva, 'The Seed Bill 2019 is a Threat to India's Seed Sovereignty and Farmer's Rights' *Jivad* (4 November 2019) <https://seedfreedom.info/the-seed-bill-2019-is-a-threat-to-indias-seed-sovereignty-and-farmers-rights/>.

[61] Pepijn Schreinemachers and others, 'The Contribution of International Vegetable Breeding to Private Seed Companies in India' (2017) 64 *Genetic Resources and Crop Evolution* 1037, 1038–1039.

changed the landscape in which seeds are opted for and the direction of research and development in seeds.

C18P21 Environmental law has remained disengaged with the abovementioned environmental impacts of agriculture. The silofication of agricultural and environmental law is manifest, for instance, in the environmental impact assessment (EIA) law, namely the EIA Notification, 2006, which is highly limited in terms of activities and impacts it covers. Strategic impact assessments of agriculture at a sectoral level[62] that could include EIA for particular crops, particular regions (perhaps starting with water-scarce or severely degraded lands), or particularly large agrobusinesses remains absent. This assessment could provide a clearer picture of the impacts and allow the EIA departmental bureaucracy to scrutinize agriculture. This may be wishful thinking, considering that the Draft EIA Notification 2020[63] has a much-limited mandate compared to the 2006 Notification, and it consequently reduces the powers of the EIA Authority. The Pollution Control Boards (PCB) at the state and central levels routinely deal with air and water pollution issues caused by agriculture. Yet, aside from the censure of stubble burning in agricultural lands,[64] little has been done to curb environmental impacts caused by farming itself. The National Green Tribunal (NGT) is an important judicial institution that applies and interprets environmental law. Case analysis shows that albeit a wide range of matters has been argued before the Tribunal, they primarily focus on the activities of some industries, scrutiny of clearances by the Ministry of Environment, Forest and Climate Change, illegal land conversions, and construction of illegal structures on protected areas.[65] The NGT's jurisdiction does not prevent agricultural matters to be raised, yet a conceptual separation between agriculture and environment has apparently prevented agro-environmental impacts from being considered by the NGT.

C18P22 Environmental law's most significant engagement with agriculture has been in the domains of wildlife and habitat protection and forest conservation. Enclosures created under the Indian Forests Act, 1927, the Forest (Conservation) Act, 1980, and the Wildlife (Protection) Act, 1972, have been used to disallow and displace tribal, forest-dwelling and other rural communities that engage in small-to-marginal farming in protected or peripheral areas. A well-rehearsed narrative against shifting or *jhum* cultivation, clearing of forest patches for agriculture, and using 'polluting' methods of farming such as burning of timber and wastes and overusing forest streams has been heard from

[62] Urmila Jha-Thakur and Asha Rajvanshi, 'Strategic Environmental Assessment in India: Trends and Prospects' in Thomas Fischer and Ainhoa González (eds), *Handbook on Strategic Environmental Assessment* (Edward Elgar 2021) 388.

[63] Stellina Jolly and Siddharth Singh, 'Environmental Impact Assessment Draft Notification 2020, India: A Critique' (2021) 5 *Chinese Journal of Environmental Law* 11.

[64] S Bhuvaneshwari, Hiroshan Hettiarachchi, and Jay Meegoda, 'Crop Residue Burning in India: Policy Challenges and Potential Solutions' (2019) 16(5) *International Journal of Environmental Research and Public Health* 832, 836.

[65] Geetanjali Nain Gill, 'Environmental Justice in India: The National Green Tribunal and Expert Members' (2015) 5(1) *Transnational Environmental Law* 1.

India's forest administrators.[66] Yet, this needs to be put in perspective given environmental law's silence on impacts of industrialized large-scale agriculture, which are incomparable to tribal and other small-scale farming practices.

C18P23 This section has illustrated some examples of 'active protections' such as water and electricity subsidies that not only condone but, to a certain extent, encourage overuse of natural resources, or IPR protection of seeds that are improved or hybrid varieties, rather than traditional landraces; and 'passive silences' such as the complete absence of environmental impacts in agriculture within the environmental legal framework. On the one hand, the development and evolution of agricultural law and policy have been non-linear and ambivalent. It has rolled out laws and programmes for farmers' welfare and enhanced farming, yet these are entrenched within its own productivist outlook and in a political economy of several private players that stand to benefit from a perpetuation of productivism. A complex web of regulatory laws, commodity and income support programmes, government purchases, subsidies, and research and development focus have heavily influenced agriculture's environmental record. On the other hand, environmental law has remained disconnected from the agricultural sector and, arguably, its sub-sectors, too. The section below discusses the attempts made to reduce the environmental impacts of agriculture.

C18S4

18.3 Efforts in Promoting Ecologically Sustainable Agriculture—Towards Non-Productivist Focused Food Systems

C18P24 Attempts towards reducing the environmental impacts of agriculture reflect a rising environmental consciousness; however, the author reads them as the few exceptions in an overarching legal framework that has licensed environmental harms to continue unabated. Furthermore, these measures have largely been spearheaded by the agricultural administrative machinery in India rather than the environmental legal framework and machinery. As a result, environmental law's prescriptive, administrative, and adjudicatory outreach into the environmental impacts of agriculture remains stunted. Environmental law must, therefore, make meaningful inroads into the agricultural field to address environmental impacts. Years of productivity-focused agricultural policymaking have characterized what successful agriculture should look like.[67]

[66] Lara Domínguez and Colin Luoma, 'Decolonising Conservation Policy: How Colonial Land and Conservation Ideologies Persist and Perpetuate Indigenous Injustices at the Expense of the Environment' (2020) 9(3) *Land* 65.

[67] Raju J Das, 'Geographical Unevenness of India's Green Revolution' (1999) 29(2) *Journal of Contemporary Asia* 167.

Some government programmes and initiatives have tried to infuse environmental considerations within the existing model, which may lead to more ambitious measures in the future.

C18P25 The central government's National Mission for Sustainable Agriculture (NMSA) is one such instance. It is one of the eight missions under India's National Action Plan for Climate Change (NAPCC) launched in 2008 to combat the adverse impacts of climate change.[68] The NMSA aims for the conservation of natural resources, development of rainfed agriculture while coping with the growing demands of food for the future. The NMSA promotes many objectives, including 'improved crop seeds', 'water use efficiency', 'pest management', 'credit support', 'markets', and 'livelihood diversification'. The NMSA has four main sub-missions: Soil Health Management, Rainfed Area Development, Sub-Mission on Agro-Forestry, and Climate Change and Sustainable Agriculture: Monitoring, Modelling and Networking.

C18P26 Climate change has provided a much-needed link between environmental considerations and agriculture. Over the last five years, the NMSA architecture consolidated other schemes and programmes, including farmer welfare schemes to better streamline funding and implementation. Programmes under the NMSA have received a stagnant budgetary allocation during this time, however, only a little over half has been spent while the rest is diverted back towards the government in its 'revised budget'.[69] One reason for under-utilization is that only a quarter of these allocations were released to states during the 2021–22 fiscal year, while many states did not receive any funds.[70] Some programmes lack clarity and therefore are difficult to implement, such as the Rainfed Area Development Programme which lacks focus in terms of geographical areas and provides a generalized template for increasing productivity in rainfed areas as a one-size-fits-all solution for exploiting these areas.

C18P27 Alongside the NMSA institutional framework, programmes such as 'Zero Budget Natural Farming' (ZBNF) have been propagated as a solution for rising costs of chemical inputs, increasing farmer indebtedness and agrarian distress. Zero budget or natural farming was first proposed by agriculturalist and activist, Subhash Palekar, who in the 1990s developed, tested, and propagated this concept to oppose the techno-chemical methods of farming introduced by the Green Revolution.[71] Palekar was closely associated with several peasant mobilizations in South India, and was a member of the Karnataka Rajya Raitha Sangha (KRRS), which, in turn, functions as the Indian chapter of the global farmers' movement—La Via Campesina (LVC).

[68] Along with other Missions such as National Solar Mission, National Water Mission, Mission on Sustainable Habitat etc.

[69] Niti Aayog, Evaluation of Centrally Sponsored Schemes in Agriculture, Animal Husbandry and Fisheries Sector—Volume 2: Agriculture, Report 2020/UCSS01/2 (2020) 6–10.

[70] States such as Jharkhand, Telangana, Andhra Pradesh, Karnataka, Gujarat received no funds.

[71] Saikat Biswas, 'Zero Budget Natural Farming in India: Aiming Back to the Basics' (2020) 10(9) *International Journal of Environment and Climate Change* 38.

C18P28 ICAR has been testing the concept and techniques of ZBNF in basmati rice and wheat in some parts of India since 2017.[72] These studies and others have shown some positive impacts on soil health, including organic carbon and fertility; however, many productivity and economic impacts remain unproven. The National Academy of Agricultural Sciences, a research institute of leading agriculture scientists in India, have labelled this an 'unproven technology' that requires more data.[73] Scientific scepticism over ZBNF has largely centred around its (in)effectiveness in producing high yields.[74] Amidst such productivist entrenchment, even the government's own commitment towards ZBNF is questionable.[75] Aside from public campaigns, awareness programmes, training workshops, and lectures, hard funding and resource-allocation for switching to ZBNF has been minimal. The Central Government allocated a lump sum of only INR 325 crores to another umbrella scheme—*Paramparagat Krishi Vikas Yojana* (PKVY), of which ZBNF is one component among other programmes on soil health management under the NMSA. Out of this, INR 120 crores have been allocated to the Department of Agricultural Research and Education to carry out research on ZBNF.

C18P29 Organic farming is another term that has caught the imagination of policymakers, farmers, and urban consumers connected to natural farming but is much broader. Organic farming focuses more on using organic inputs rather than chemical inputs, but these may or may not reduce a farmer's input costs, as ZBNF intends to primarily do. The National Centre for Organic and Natural Farming has operated since 2004 as a nodal agency for the promotion of organic farming. Many regional centres have also been set up to conduct field research on organic farming. The central government has rolled out certain programmes, such as PKVY, that promote cluster-based organic farming, with governmental assistance in training, procurement of inputs, certification, and marketing. The Mission Organic Value Chain Development for the North-Eastern Region promotes organic farming of high-value 'niche' crops with a focus on exporting them and increasing farmer incomes. The Capital Investment Subsidy Scheme under the Soil Health Management Scheme aims to reinvigorate soil health by setting up fruit and vegetable market waste and agro-waste compost production units. Several similar programmes that provide financial assistance, organizational support, or procurement of organic produce for the Targeted Public Distribution System (TPDS) have been initiated on the demand and supply sides of organic farming. State-level initiatives, such

[72] Tests were conducted in Modipuram (Uttar Pradesh), Ludhiana (Punjab), Pantnagar (Uttarakhand), and Kurukshetra (Haryana), while other state-level agencies and NGOs have conducted their own field tests on ZBNF in the past five years.

[73] Harish Damodaran and Parthasarathi Biswas, 'Top Agricultural Scientists Body Rejects Zero Budget Natural Farming' *The Indian Express* (10 September 2019) <https://indianexpress.com/article/india/zero-budget-natural-farming-government-scientists-question-5981236/>.

[74] Sarah Duddigan and others, 'Impact of Zero Budget Natural Farming on Crop Yields in Andhra Pradesh, SE India' (2022) 14(3) *Sustainability* 1689.

[75] Jo Smith and others, 'Potential Yield Challenges to Scale-Up of Zero Budget Natural Farming' (2020) 3 *Nature Sustainability* 247.

as Sikkim becoming a fully organic state in 2016 and Andhra Pradesh pledging to be fully organic by 2024 are also significant.[76]

C18P30 The measures described above represent the first step in ushering in agroecological approaches to farming. 'Agroecology' is the use of ecological concepts and methods for long-term enhancement and management of soil fertility and agriculture productivity.[77] Aside from adopting 'natural' inputs and methods, this concept stresses the increasing diversity of plants and animals that, in turn, help in nutrient recycling, biomass creation and using natural resource systems in the production process. Agrobiodiversity is essential for securing adequate nutritious food, maintaining an ecological balance, and safeguarding socio-cultural norms surrounding food and agriculture.[78] In this context, any meaningful transition towards agroecology will necessarily require stronger conservation measures of farmers' saved seeds and landraces. The National Bureau of Plant Genetic Resources stores thousands of farmers' varieties and landraces to conserve them for future research and cultivation; the Traditional Knowledge Digital Library in New Delhi contains, *inter alia*, food and agricultural-related knowledge originating from many communities across India; and the ongoing work of Sristi, an organization that identifies and assists farmers to register their seeds under the PPVFRA is one way of making the PPVFRA more accessible to farmers, the same way it is for commercial breeders.[79] Organizations such as the MS Swaminanthan Foundation and many others that have worked both with the government and independently have set up many seed-gene-grain banks in several villages.[80] Yet these are islands of success in an ocean of ongoing seed loss.

C18P31 For a more holistic engagement between the environment and agriculture, agricultural 'success' itself needs to be reframed outside the productivist paradigm. Some Western countries have started moving towards this framing.[81] There is no evidence of the same in India. A framing in terms of agriculture's primal role in satisfying local/regional food systems through ecologically sustainable practices rather than its orientation towards satisfying global commodity markets through long supply chains needs to be acknowledged. If agriculture is viewed through the parameters of crop diversity, environmental impact in terms of water and soil erosion, retention of control over traditional knowledge in seeds, plants and plant genetic resources and incomes of farmers,

[76] Government of Andhra Pradesh and Rythu Sadhikara Samstha, 'Andhra Pradesh 'Zero-Budget' Natural Farming Vision 2024: A Systemwide Transformation' (2013) <http://www.mcrhrdi.gov.in/94fc/week4/shilpa/ZBNF%20-%20COP14%20-%2013Sept2019-1.pdf>.

[77] Nimisha Tripathi and others, 'Agroecology and Sustainability of Agriculture in India: An Overview' (2015) 2 EC *Agriculture* 241.

[78] Lori A Thrupp, 'Linking Agricultural Biodiversity and Food Security: The Valuable Role of Agrobiodiversity for Sustainable Agriculture' (2002) 76(2) *International Affairs* 283.

[79] SRISTI, 'Advocacy and Policy Analysis' <https://www.sristi.org/advocacy-and-policy-analysis/>.

[80] MS Swaminathan Research Foundation, 'Promoting Community Seed Grain Banks' <https://mssrf.org/content/promoting-community-seed-grain-gene-banks>.

[81] Geoff Wilson, 'From Productivism to Post-Productivism ... and Back Again? Exploring the (Un)Changed Natural and Mental Landscapes of European Agriculture' (2001) 26(1) *Transactions of the Institute of British Geographers* 77.

then the idea of a successful farmer would have to qualify more than the mere production bar.[82]

C18P32 In this context, the food sovereignty approach may provide some guidance in moving towards such food systems. Food sovereignty is a concept developed by La Via Campesina (LVC) as an alternative to neoliberal agricultural policies. It is the right of peoples to define their own agricultural and food policy and includes prioritizing local agricultural production to feed the people, access of peasants and the landless people to land, water, seeds, and credit, the right of farmers and peasants to produce their own food, the right of people to take part in agricultural policy choices, and the right of countries to reject certain policies and guard against low-priced agricultural imports. In India, several movements and organizations like the KRRS, Alliance for Sustainable and Holistic Agriculture (ASHA) and Navdanya have advocated for food sovereignty at a local subsistence level. Food sovereignty rights have more recently been articulated within the United Nations Declaration on Rights of Peasants, 2018 (UNDROP).[83] UNDROP provides a good entry point to re-conceptualize the role of agriculture and food systems in India, as India has voted in favour of UNDROP, and has its own rich history of peasant and small farmer resistance movements, and a post-colonial legal tradition of using rights as an emancipatory tool for 'new' claims.

C18S5

Conclusion

C18P33 This chapter has shown how agricultural and environmental law have evolved into separate conceptual categories. The complexities and diversities of agriculture in India make it a difficult subject for environmental impact scrutiny. As a result, several impacts go unnoticed and remain unaddressed. A combination of sanctions within agricultural law and silences within environmental law has abandoned the agricultural sector to market forces. In recent years, there has been a push towards promoting sustainable agriculture, yet several specific programmes remain underfunded, unclear in terms of mandate and limited in coverage. Adaptation to climate change has triggered many such measures. Yet, the role of environmental law has remained minimal. Environmental legislations, rules such as those on environmental impact assessment, and administrative and judicial institutions have not engaged with the question of environmental impacts of agriculture at the sectoral level. These gaps can be addressed by a more vigorous attempt to create linkages between agriculture and ecology, and by adopting new

[82] Ramesh Chand and Shinoj Parappurathu, 'Temporal and Spatial Variations in Agricultural Growth and its Determinants' (2012) 47(26–27) *Review of Rural Affairs, Economic and Political Weekly Supplement* 55.

[83] UN Declaration on the Rights of Peasants and Other People Working in Rural Areas, 17 December 2018, UN Doc A/RES/73/165.

approaches such as food sovereignty and rights of peasants that redefine the role and purpose of agriculture and food systems.

C18S6

Suggestions for Further Reading

C18P34 Sejuti Das Gupta, *Class, Politics, and Agrarian Policies in Post-liberalisation India* (CUP 2019).

C18P35 Alf Gunvald Nilsen and Kenneth Bo Nielsen, 'Social Movements, State Formation and Democracy in India: An Introduction' in Alf Gunvald Nilsen and Kenneth Bo Nielsen (eds), *Social Movements and the State in India: Deepening Democracy?* (Palgrave Macmillan 2016) 1–23.

C18P36 Raj Patel, 'The Long Green Revolution' (2013) 40(1) *Journal of Peasant Studies* 1.

C18P37 JB Ruhl, 'Farms, Their Environmental Harms, and Environmental Laws' (2000) 27 *Ecology Law Quarterly* 263.

C18P38 S Subramanian and AV Manjunatha, 'Demystifying the Energy-Water-Soil-Food Nexus in Indian Agriculture' (2014) 20 *Ecology, Environment and Conservation* S303.