Genetically Modified Crops and Intellectual Property Law

Interpreting Indian Patents on Bt Cotton in View of the Socio-Political Background

by **Lodewijk Van Dycke and Geertrui Van Overwalle***

Abstract: In India, patents on Bt cotton have given rise to an unproductive controversy. This controversy has compromised the deliberative debate on the potential contribution of genetically modified crops to rural development. Notwithstanding the ongoing controversy, the article argues that the central demand of the campaign against patents on Bt cotton (the abolishment of patents on plants and plant parts) is actually not in contradiction with the practices of the Bt cotton industry (which mainly uses patents on the Bt technology). Furthermore, the Indian courts do have the legal possibility to interpret the Indian Patent Act in such a way that it prohibits the patenting of plants and plant parts. Such an interpretation could potentially help to appease the ongoing controversy and to foster a deliberative debate on genetically modified crops and rural development.

Keywords: Bt cotton; genetically modified crops; patents; intellectual property; India; deliberative democracy

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A. Introduction

1 From the year 2001 onwards, genetically modified (GM) crops have profoundly influenced the agricultural practices in many Indian states.[1][2] More specifically, GM cotton has overtaken the Indian cotton areal and is now grown on approximately 95 per cent of the Indian cotton fields.[3] In this GM cotton, a gene from a common soil bacterium (*Bacillus Thuringiensis* or "Bt") has been introduced: the "Cry gene" or "Bt gene", hence "Bt cotton". This gene causes the plant to produce a protein that is toxic for insects of the Lepidoptera order, which comprises the fiercest insect pest for cotton: bollworms.[4] Bt

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1 Choudhary and Gaur, 'Biotech Cotton in India, 2002 to 2014' (*ISAAA Series of Biotech Crop Profiles*, ISAAA 2015) <https://asiarice.org/resources/publications/biotech_crop_profiles/bt_cotton_in_india-a_country_profile/download/Bt_Cotton_in_India-2002-2014-Hindi.pdf> accessed 27 July 2016.

2 For a historical overview of the events mentioned in this article, see Table 1 Historical overview.

3 James and others, 'Global Status of Commercialized Biotech/GM Crops' (*ISAAA Brief 51*, ISAAA 2015) <http://www.salmone.org/wp-content/uploads/2016/04/mergedpdf> accessed 17 May 2016.

4 Vaeck and others, 'Transgenic Plants Protected from Insect Attack' (1987) 328 Nature pp. 33-37; Peferoen, 'Progress and Prospects for Field Use of Bt Genes in Crops' (1997) 15 Trends in Biotechnology pp. 173-177; Herring, 'WHY DID "OPERATION CREMATE MONSANTO" FAIL?: Science and Class in India's Great Terminator-Technology Hoax' (2006) 38 Critical Asian Studies pp. 467-493.

cotton would allow farmers to reduce insecticide spraying and thus production costs.[5] As of today, Bt cotton is still the only GM crop with a significant acreage in India.[6] Hence, in an Indian context, GM crops and Bt cotton are practically coterminous.

2 The introduction of GM crops has often been associated with intellectual property (IP) protection. In view of the increasing privatisation of agricultural research, it has been argued that private companies need IP protection, including patents, to provide for a return on their research investments.[7] However, concerns have been expressed that excessive IP rights on GM crops might result in limited access for those who need it most of all: resource-poor farmers in developing countries.[8]

3 In India, GM crops and the related IP protection have become the object of a tense societal controversy.[9] A coalition of international NGOs and Indian civil society action groups, including several farmers' organisations, has continuously opposed GM crops, as well as IP protection for such crops because both GM crops and IP protection would be detrimental for farmers. However, Herring considers the civil society campaign against GM crops to be a failure, as Bt cotton has been adopted almost uniformly.[10] According to Herring, the divergence between the universal take-up of Bt cotton and the demands of the civil society campaign, illustrates that the campaign is unaware of farmers' actual concerns and practises, whereas the campaign claims to speak on behalf of farmers.

4 The problem this article aims to address is the unproductive societal controversy revolving around GM crops and IP in general, and Bt cotton and patents in particular. More specifically, the article aims to address the dominant, detrimental tendency within the Indian civil society campaign to prioritize opposition to patents on Bt cotton. The civil society campaign seems to view the abolishment of patent protection for Bt cotton as key to resolving all problems related to the deployment of GM crops in India. The article will demonstrate that this myopic focus is unjustified because patents have played no significant role in the development of the Bt cotton industry at all. The article will argue that this myopic focus is even counterproductive as it has contributed to the polarisation of the debate revolving around GM crops, IP and rural development. The article will argue why a non-polarised debate on GM crops, IP and especially rural development, based on Habermasian democratic deliberation, is pivotal. Finally, the article will try to contribute to the inception of such a deliberative debate.

5 Influenced by the myopic focus of the civil society campaign, the debate on GM crops, IP and rural development has not been conducted as a deliberative debate, but as a yes-or-no controversy regarding patents on Bt cotton. Democratic deliberation does not thrive in such an environment where the only question at stake is "yes-or-no patents on Bt cotton". The narrowing down of the debate restricts the room to manoeuvre, the arguments that are regarded as relevant, and the chances of finding a compromise. Therefore, the article argues that creating the space for a deliberative debate requires a reopening of the narrow controversy regarding patents on Bt cotton to a broad debate about how GM crops and other agro biotechnologies contribute to or hamper rural development, and about what roles IP might play in that respect.

6 Due to the unlikelihood that the influential civil society campaign will abandon its myopic view, reopening the debate is not likely to happen automatically. Therefore, the article explores two legal pathways to settle the yes-or-no controversy on patents on Bt cotton, by establishing the unpatentability of GM plants. The article does so in an attempt to create the intellectual and political space to pass on to a deliberative debate on GM crops, IP and especially rural development.

7 The article will proceed in eight sections. First, the characteristics of a deliberative debate will be sketched, and it will be argued why such a debate is needed regarding GM crops, IP and rural development (Section B.). Second, the yes-or-no controversy regarding patents on Bt cotton in India will be compared with a deliberative debate. It will be illustrated that the yes-or-no controversy substantially diverges from a deliberative debate, due to the abundant and persistent use of stereotypical arguments regarding patents on Bt cotton (Section C.). Third, the demands of the civil society campaign regarding patents on Bt cotton will be analysed. The central demand will turn out to be "no patents on plants" (Section D.). Fourth, the article will scrutinise to what extent plants are actually patentable in India. It will turn out that plants are not directly patentable, but that they might be within the scope

5 Peferoen (n 4); Herring (n 4).

6 James and others (n 3).

7 Borlaug, 'Ending World Hunger. The Promise of Biotechnology and the Threat of Antiscience Zealotry' (2000) 124 Plant Physiology pp. 487-490; Barton and Berger, 'Patenting Agriculture' (2001) 17 Issues in Science and Technology pp. 43-50.

8 Borlaug (n 7); Barton and Berger (n 7).

9 Herring, 'Miracle Seeds, Suicide Seeds, and the Poor' in Ray and Katzenstein (eds), *Social movements in India: Poverty, power, and politics* (Rowman & Littlefield Publishers 2005); Herring, 'WHY DID "OPERATION CREMATE MONSANTO" FAIL?' (n 4).

10 Herring, 'Miracle Seeds, Suicide Seeds, and the Poor' (n 9); Herring, 'WHY DID "OPERATION CREMATE MONSANTO" FAIL?' (n 4).

of product claims pertaining to genes (Section E.). Fifth, the role patents play in the Bt cotton industry will be scrutinised. It will be shown that patents, and especially plant patents, play only a very limited role in the Bt cotton industry (Section F.). Sixth, the article will explore two legal pathways to ascertain the unpatentability of plants, while assessing whether the suggested pathways are compliant with the Indian Patent Act (Section G.) and whether the Indian plant patent regime is compatible with international patent law (Section H.). The article will conclude by arguing that no modifications to the Indian Patent Act are required as all suggested adaptations can be achieved through interpretations of the Indian Patent Act by the Indian courts (Section I.).

B. Need for a deliberative debate on GM crops, IP and rural development

8 A "deliberative debate" is a genuine and sincere debate in which the stakeholders are willing to take into account each other's well-reasoned arguments and in which the stakeholders are willing to nuance their own opinion in order to reach a compromise (cf. the deliberative democracy model of Habermas)[11]. There are two sets of reasons explaining why the debate on GM crops, IP and rural development needs to be deliberative: legal reasons (i.e. formal mentioning in authoritative legal documents) and substantive reasons (i.e. content-related, factual, practical reasons).

9 The legal reasons are contained in two international treaties.[12] First, Article 9.2 (c) of the International Treaty on Plant Genetic Resources for Food and Agriculture determines that farmers' rights include "the right to participate in making decisions, at the national level, on matters related to the conservation and the sustainable use of plant genetic resources for food and agriculture". The Governing Body to the Treaty has urged the Contracting Parties at several occasions to nationally implement Article 9.2 (c) of the Treaty (Resolutions 2/2007, 6/2009, 6/2011, 8/2013 and 5/2015). Resolutions 8/2013 and 5/2015 stress the need for a deliberative debate by specifying that: "The governing body, [...] 4. Invites each Contracting Party to engage farmers' organizations and relevant stakeholders in matters related to the conservation and sustainable use of plant genetic resources for food and agriculture, and consider their contributions to awareness raising and capacity building towards this aim". Second, General Comment 12 to the International Covenant on Economic, Social and Cultural Rights on the right to adequate food (Article 11 International Covenant), determines that: "The formulation of national strategies for the right to food requires full compliance with the principles of accountability, transparency, people's participation, decentralization, legislative capacity and the independence of the judiciary." Once again, this hints at the need for a deliberative debate.

10 The substantive reasons why a deliberative debate is needed are three-fold. First, legislation pertaining to seeds is not implemented seamlessly in many developing countries, among which India.[13] More specifically, Indian patents on Bt cotton have not always been fully enforced.[14][15] As a consequence,

11 Habermas and McCarthy, *The Theory of Communicative Action* (Beacon press 1985).

12 Both treaties relate to food crops respectively to the right to food, whereas cotton is not a food crop. Still, it is justified to derive legal reasons from the two treaties for the present article. The article argues to abandon the yes-or-no controversy regarding patents on Bt cotton and to engage in a deliberative debate regarding GM crops, IP and rural development. 'GM crops' is broader than only 'Bt cotton' and includes GM food crops. Therefore, in the context of the present article, legal reasons can be derived from the two food-related treaties. In this respect, it is also pertinent that the Indian contestation regarding Bt cotton is about to reproduce itself regarding Bt brinjal, a food crop (cf. Entine, 'As success grows for Bangladesh's Bt brinjal (eggplant), Mae-Wan Ho renews GMO disinformation campaign' (*Genetic Literacy Project*, 27 April 2015) <www.geneticliteracyproject.org/2015/04/27/as-success-grows-for-bangladeshs-bt-brinjal-eggplant-mae-won-ho-renews-gmo-disinformation-campaign/> accessed 16 August 2016. vs 'SAY NO TO Bt Brinjal: SAY NO to Release Of Genetically Modified Crops In India' (*Environment Support Group*, 6 February 2010) <www.esgindia.org/campaigns/press/say-no-bt-brinjal-say-no-release-genetic.html> accessed 16 August 2016.). Furthermore, it is argued throughout the article that Bt cotton and GM crops should be seen in relation to rural development. The links between rural development and rural poverty on the one hand and rural food provision on the other hand are well-established, also legally. As a consequence, there are links between cotton and food provision, despite the fact that cotton is no food crop. The legal links between rural development, rural poverty and rural food provision are the following. First, the preamble of the food-related International Treaty on Plant Genetic Resources for Food and Agriculture proclaims that achieving sustainable agricultural development is one of its goals. Second, the General Comment 12 on the right to adequate food links inadequate food provision to poverty.

13 Herring, 'Miracle Seeds, Suicide Seeds, and the Poor' (n 9); Leon, 'National Farmers and Social Strike Gets Seeds Control Law 970 Suspended' (*The Real News Network*, 14 September 2013)<http://therealnews.com/t2/index.php?option=com_content&task=view&id=31&Itemid=74&jumival=10722> accessed 10 November 2015.

14 Tripp, *Biotechnology and Agricultural Development: Transgenic Cotton, Rural Institutions and Resource-Poor Farmers* (Routledge 2009).

15 Herring, 'Miracle Seeds, Suicide Seeds, and the Poor' (n 9) p. 221 argues that 'In practice, farmers seem quite willing to ignore everyone's property claims in seeds'. Research indicates that the enforcement of IP rights and especially plant patents on the Indian countryside is culturally

there is a schism between the law as "agreed upon" and the law as implemented on the terrain. From the point of view of legal certainty, this is problematic. A deliberative debate might contribute to the democratic legitimacy of the seed legislation and eventually to its enforcement. Second, nowadays even agronomists have come to realise that agricultural policy issues do not only involve technical and agronomic questions, but also political, societal and ethical questions.[16] The anthropologist Robert Tripp wrote in the introduction to his seminal work on GM crops in developing countries: "Given the complex nature of the arguments surrounding biotechnology, decisions about its future must ultimately be made by well-informed citizens in appropriate political forums."[17] Consequently, a growing number of scholars seem to agree that the GM crops issue needs a democratic solution based on a deliberative debate. Third, the debate on GM crops, IP and rural development is part of the even broader and extremely important debate on rural development itself. Feeding the world after 2050 in a context of an expanding world population and climate change, will not be a sinecure.[18] Meanwhile, investment in (agronomic research for) the rural south is on the rise. In 2009, the G8 leaders committed themselves to overhaul the decades long decline in rural investment.[19] Furthermore, the International Food Policy Research Institute stressed the importance of investment in rural development specifically for India.[20] In a nutshell, the twenty-first century global and Indian rural challenges, and the means invested to meet those challenges, are significant. Tackling these challenges and deploying those means are not served by a polarised debate on GM crops and IP, narrowed down to a controversy about patents on Bt cotton. The intricacies between GM crops and IP form, after all, only one piece of the puzzle that has to be completed to achieve sustainable rural development.[21]

C. Yes-or-no controversy regarding patents on Bt cotton is insufficiently deliberative

11 Triggered by the swift uptake of Bt cotton, the academic debate on GM crops and rural development in India took off around 2001, involving agronomists, development scholars, economists, anthropologists and the like. This debate has run in parallel to the societal controversy, and shows how complex, sensitive and subtle the Bt cotton topic actually is. The academic debate relates on the one hand to the agronomic effects of Bt cotton ("field"), about which two questions have been raised: "Does Bt cotton perform the way it is supposed to perform?"[22] and "Is Bt cotton environmentally sustainable?"[23]. On the other hand, the academic debate relates to the socio-economic effects of Bt cotton ("farm"). Again, two questions have been raised: "Can poor, marginalised households reap any benefits from Bt cotton at all?"[24] and "Has Bt cotton reinforced existing relationships

inacceptable (Kochupillai, *Promoting Sustainable Innovations in Plant Varieties* (Springer 2016)).

16 Sumberg and Thompson, *Contested Agronomy: Agricultural Research in a Changing World* (Routledge 2012).

17 Tripp (n 14) p. 4.

18 'How to Feed the World in 2050' (*Food and Agriculture Organisation*, 2009) <http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf> accessed 15 January 2016; De Schutter and Vanloqueren, 'The New Green Revolution: How Twenty-First-Century Science Can Feed the World' (2011) 2 Solutions pp. 33-44; Foley, 'Can We Feed the World & Sustain the Planet?' (2011) 305 Scientific American pp. 60-65.

19 'L'Aquila Food Security Initiative (AFSI) Final Report' (*US Department of State*, 2012) <http://www.state.gov/s/globalfoodsecurity/rls/rpt/laquila/202837.htm> accessed 2 September 2016.

20 Thorat, 'Investment, Subsidies, and Pro-Poor Growth in Rural India' (*Vol. 716*, International Food Policy Research Institute 2007) <http://www.ifpri.org/publication/investment-subsidies-and-pro-poor-growth-rural-india> accessed 2 September 2016.

21 Blakeney, *Intellectual Property Rights and Food Security* (CABI 2009) pp. 2-4; Tripp (n 14) pp. xi-xii.

22 Barwale and others, 'Prospects for Bt cotton technology in India' (2004) 7 AgBioForum pp. 23-26; Bennett and others, 'Economic impact of genetically modified cotton in India' (2004) 7 AgBioForum pp. 96-100; Bennett, Ismael and Morse, 'Explaining Contradictory Evidence Regarding Impacts of Genetically Modified Crops in Developing Countries. Varietal Performance of Transgenic Cotton in India' (2005) 143 The Journal of Agricultural Science pp. 35-41; Sadashivappa and Qaim, 'Bt cotton in India: Development of benefits and the role of government seed price interventions' (2009) 12 AgBioForum pp. 172-183.

23 Wolfenbarger and Phifer, 'The Ecological Risks and Benefits of Genetically Engineered Plants' (2000) 290 Science pp. 2088-2093; Jayaraman and others, 'Indian Bt Gene Monoculture, Potential Time Bomb' (2005) 23 Nature Biotechnology p. 158; Ramanjaneyulu and Kuruganti, 'Bt Cotton in India: Sustainable Pest Management?' (2006) 41 Economic and Political Weekly pp. 561-563; Mancini and others, 'Increasing the Environmental and Social Sustainability of Cotton Farming through Farmer Education in Andhra Pradesh, India' (2008) 96 Agricultural Systems pp. 16-25; Shah, 'Social Responses to Crop Biotechnology: Bt Cotton Cultivation in Gujarat, India' in Brunn (ed), *Engineering Earth* (Springer 2011); Krishna and Qaim, 'Bt Cotton and Sustainability of Pesticide Reductions in India' (2012) 107 Agricultural Systems pp. 47-55.

24 Subramanian and Qaim, 'Village-wide Effects of Agricultural Biotechnology: The Case of Bt Cotton in India' (2009) 37 World Development pp. 256–267; Glover, 'Is Bt Cotton a Pro-Poor Technology? A Review and Critique of the Empirical Record' (2010) 10 Journal of Agrarian Change pp. 482-509; Glover, 'Exploring the Resilience of Bt Cotton's "Pro-Poor Success Story"' (2010) 41 Development and Change pp. 955-981; Subramanian and Qaim, 'The Impact of Bt Cotton on Poor Households in Rural India' (2010) 46 The Journal of Development Studies pp. 295–311.

of inequality?"[25].

12 Regarding all these questions, diverging and even opposed academic views have been expressed. No decisive, overarching judgment pro or contra Bt cotton can be discerned. Scientists seem unable to reach a consensus on a comprehensive policy regarding GM crops in relation to rural development. GM crops seem to be beneficial in some circumstances, but detrimental in others, and patents add another layer of complexity.[26] The academic debate indicates how complex the issue is and how nuanced a societal debate on Bt cotton is supposed to be in order for it to be called "deliberative". Yet, it can be derived from the exemplary statements mentioned below that prominent voices in the civil society campaign have made vulgarising and blunt claims, condemning GM crops and IP rights. Moreover, the exemplary statements will show that opposition to IP and to patents forms an important focal point of the civil society campaign.

13 One of the exponents of the civil society campaign has been Vandana Shiva of Navdanya. Shiva wrote in 2006: "Pushed into deepening debt and penury by Monsanto-Mahyco and other genetic-engineering multinationals, the introduction of Bt cotton heralds the death of thousands of farmers... High costs of cultivation and low returns have trapped Indian peasants in a debt trap from which they have no other escape but to take their lives."[27] Shiva does not only refer to the agronomic effects of Bt cotton, but explicitly challenges the socioeconomic effects of Bt cotton, particularly the "dependency of farmers on multinational seed companies" and the "high cultivation costs for farmers". Deccan Development Society, a grassroots female farmers' organisation from Andra Pradesh, goes one step further and directly links the (presumed) negative consequences of biotechnology to IP, in a publication specifically dealing with Bt cotton: "Biotechnology is hailed as a great saviour of the world's poor. A handful of corporations are investing billions of dollars in developing proprietary technologies, anticipating massive returns, using intellectual property rights (IPRs) as tools to exploit farmers."[28] On the website of Shiva's Navdanya, a comparable statement on biotechnology and IP can be read: "The new IPR laws embodied in the TRIPs agreement of WTO have unleashed an epidemic of the piracy of nature's creativity and millennia of indigenous innovation."[29]

14 Meanwhile, proponents of Bt cotton have been quoted writing statements such as: "While a vocal band of opponents is still protesting biotech crops, a growing multitude of farmers around the world is planting them. The reason is no mystery; Monsanto seeds contain genes that kill bugs and tolerate weed-killing pesticides, therefore they are much easier and cheaper to grow than traditional seeds."[30]

15 The statements of proponents and opponents are so different that it seems almost unlikely that they are talking about the same reality. Because of the mutual "trench-mentality", the controversy seems to be a far cry from a deliberative debate. Especially the increased incidence of suicide among cotton farmers in the Warangal district of Andhra Pradesh (now Telangana) has made feelings run high.[31] In this view, it has been remarked that "India is a key battle line in the global war over genetically modified [GM] crops, and both sides interpret the Warangal suicides as supporting their position."[32]

25 Morse, Bennet and Ismael, 'Inequality and GM Crops: A Case-Study of Bt Cotton in India' (2007) 10 AgBioForum pp. 44-50; Shah, 'What Makes Crop Biotechnology Find Its Roots? The Technological Culture of Bt Cotton in Gujarat, India' (2008) 20 The European Journal of Development Research pp. 432-447; Subramanian and Qaim, 'Village-Wide Effects of Agricultural Biotechnology: The Case of Bt Cotton in India' (n 24); Stone, 'The Anthropology of Genetically Modified Crops' (2010) 39 Annual Review of Anthropology pp. 381-400; Shah, 'Social Responses to Crop Biotechnology' (n 23); McKinney, 'Troubling Notions of Farmer Choice: Hybrid Bt Cotton Seed Production in Western India' (2013) 40 The Journal of Peasant Studies pp. 351-378; McKinney, '"Hybrid Cottonseed Production Is Children's Work": Making Sense of Migration and Wage Labor in Western India' (2014) 13 ACME: An International Journal for Critical Geographies pp. 404-423; McKinney, 'Situating Corporate Framings of Child Labor: Toward Grounded Geographies of Working Children in Globalized Agriculture' (2015) 59 Geoforum pp. 219-227.

26 Plahe, 'The Implications of India's Amended Patent Regime: Stripping Away Food Security and Farmers' Rights?' (2009) 30 Third World Quarterly pp. 1197-1213; Plahe, 'TRIPS Downhill: India's Plant Variety Protection System and Implications for Small Farmers' (2011) 41 Journal of Contemporary Asia pp. 75-98; Bhavishyavani, 'Gene Patents in India: Gauging Policy by an Analysis of the Grants made by the Indian Patent Office' (2013) 18 Journal of Intellectual Property Rights pp. 323-329.

27 Shiva, 'Resources, Rights and Regulatory Reform' (2006) 3 Context pp. 85-91.

28 Qayum and Sakkhari, 'Bt cotton in Andhra Pradesh. A Three-Year Assessment' (*Deccan Development Society*, 2005) <http://ddsindia.com/PDF/BT_cotton_-_A_three_year_report.pdf> accessed 16 August 2016.

29 'Biopiracy Campaign' (*Navdanya*, 2016) <http://www.navdanya.org/campaigns/biopiracy> accessed 3 August 2016.

30 Hindo, 'Monsanto: Winning the Ground War' (*Bloomberg*, 6 December 2007) <http://www.bloomberg.com/news/articles/2007-12-05/monsanto-winning-the-ground-war> accessed 28 July 2016.

31 Stone, 'Biotechnology and Suicide in India' (2002) 43 Anthropology News p. 5; Shah, '"A Life Wasted Making Dust": Affective Histories of Dearth, Death, Debt and Farmers' Suicides in India' (2012) 39 The Journal of Peasant Studies pp. 1159-1179; Mishra, 'Farmers' Suicides in India, 1995-2012: Measurement and Interpretation' (*Working Paper 62*, London School of Economics Asia Research Centre 2014) <http://spandan-india.org/cms/data/Article/A2014924102931_11.pdf> accessed 7 April 2016.

32 Stone, 'Biotechnology and Suicide in India' (n 31).

16 After more than twenty years, no appeasement between the positions of proponents and opponents of (patent protection for) Bt cotton is in sight. Moreover, the contestation regarding Bt cotton is about to reproduce itself regarding Bt brinjal, which is once again attracting severe proponents (such as the Genetic Literacy Project)[33] and strong-headed opponents (such as the Environment Support Group).[34]

D. The central demand of the civil society campaign

17 In Section C., Opposition to patents on Bt cotton has been identified as a focal point of the civil society campaign. However, in reality the campaign's central demand relates more specifically to the abolishment of plant[35] patents[36] and not so much to the abolishment of *other* plant-related IP rights[37]. Most of the concerns underlying the civil society campaign's opposition to patents on Bt cotton relate to the effects of these patents upon farmers in the field, and plant patents are the only form of plant-related IP rights which have effects upon farmers in the field.

18 First, it can be derived from statements of the civil society campaign's most prominent NGOs that many of the campaign's concerns relate to the effects of patents upon farmers in the field. When describing why patents on Bt cotton are detrimental, Vandana Shiva (Navdanya) wrote, for instance:

> *Firstly, [the amendment to the Patent Act to make the Act TRIPS compliant] allows patents on seeds and plants through sections 3(i) and 3(j), as we saw above. Patents are monopolies and exclusive rights which prevent farmers from saving seeds; and seed companies from producing seeds. Patents on seeds transform seed saving into an "intellectual property crime".*
>
> *Secondly, genetic pollution is inevitable. Monsanto will use the patents and pollution to claim ownership of crops on farmers' fields where the Bt gene has reached it through wind or pollinators.*[38]

19 Shiva explicitly mentions the potentially detrimental effects of patent law on farmer seed saving and refers to the potentially detrimental effects of patent law on crop ownership. These concerns show that Navdanya is especially concerned about patents that have effects upon farmers in the field. Another example of civil society's explicit concern with the field effects of patents is provided by "No patents on seeds", a coalition of European NGOs. The coalition, not by coincidence named "No patents on seeds", joined forces with Navdanya in 2016 to challenge Monsanto's European patent on Indian melon (EP1962578).[39][40] This patent comprises claims on plants, plant parts and seeds (see EP1962578).

20 Second, plant patents are the only plant-related IP rights which have effects for farmers in the fields. Patents whose product or process claims solely relate to genes, cells, plant tissues or other technological tools have no effect for farmers in the fields as they do not relate to plant materials that pass through the hands of farmers such as plants, plant parts, or seeds. Furthermore, Section 39(4) of the Protection of Plant Varieties and Farmers' Rights Act, which introduces plant variety protection in India, contains extensive farmers' rights which allow farmers to save, sell and resow (sic.) protected seeds. Hence, the Indian plant variety protection does not influence farmer practices on the terrain.

33 Entine, 'As success grows for Bangladesh's Bt brinjal (eggplant), Mae-Wan Ho renews GMO disinformation campaign' (*Genetic Literacy Project*, 27 April 2015) <www.geneticliteracyproject.org/2015/04/27/as-success-grows-for-bangladeshs-bt-brinjal-eggplant-mae-won-ho-renews-gmo-disinformation-campaign/> accessed 16 August 2016.

34 'SAY NO TO Bt Brinjal : SAY NO to Release Of Genetically Modified Crops In India' (*Environment Support Group*, 6 February 2010) <www.esgindia.org/campaigns/press/say-no-bt-brinjal-say-no-release-genetic.html> accessed 16 August 2016.

35 When referring hereinafter to 'plants', the article intends to refer to all plant materials that pass through the hands of farmers (e.g. seeds, other plant reproductive materials, entire plants, parts of plants etc.). The term 'plants' does not refer to genes, cells, plant tissues or other technological tools used to develop GM plants, as farmers do not usually get in touch with these tools, despite the fact that they can also be viewed as plant materials.

36 When referring hereinafter to 'plant patents', the article intends to refer to all patents whose product or process claims directly or indirectly grant the patentee exclusivity rights pertaining to plants (as defined in n 4). Patents whose product or process claims solely relate to e.g. genes, cells, plant tissues or other technological tools used to develop GM plants, are not part of the category of 'plant patents'. In a nutshell, plant patents do have effects upon farmers in the field, whereas other patents do not have such effects.

37 When referring to 'plant-related IP rights', the article intends to refer to the overarching category comprising: plant patents, patents whose product or process claims solely relate to technological tools and plant variety protection to the extent that it is applied to GM varieties.

38 Shiva, 'India Seed Act & Patent Act: Sowing the Seeds of Dictatorship' (*GRAIN*, 2005) <https://www.grain.org/article/entries/2166-india-seed-act-patent-act-sowing-the-seeds-of-dictatorship> accessed 18 May 2016; emphasis added.

39 'Opposition to Monsanto's Patent on Indian Melon' (*No Patents on Seeds*, 2011) <http://no-patents-on-seedsorg/en/information/news/opposition-monsanto-s-patent-indian-melon> accessed 16 August 2016.

40 It is true that Navdanya and "No patents on seeds" are also concerned about appropriation of biological diversity or 'biopiracy' per se, regardless the influence of this appropriation on farmers' practices in the field. However, this concern seems to be less prominent.

21 As a consequence, the civil society campaign's concerns do not relate to patents whose product or process claims solely relate to genes, cells, plant tissues or other technological tools, or to plant variety protection, but these concerns do all the more relate to plant patents. What is relevant in this respect is not whether the signalled concerns regarding plant patents (annihilation of seed saving, expropriation of crops) hold true, but that after 20 years, the civil society campaign is not likely to back down on the central demand for the abolishment of plant patents, regardless of academic evidence[41] denying (or confirming, for that matter) their claims.

E. Legal analysis of the Indian plant patent regime

22 The importance of a deliberative debate on GM crops, IP and rural development has been indicated. It has been shown that persistent stereotypical arguments relating to patents on Bt cotton have brought the debate to a deadlock. The central demand of the civil society campaign - key to the witnessed deadlock - has been identified. Because of the unlikelihood that the influential civil society campaign will back down on its central demand, the article will now examine this central demand and conduct a legal and economic analysis of the Indian plant patent regime.

I. Plants, Seeds and Essentially Biological Processes are not Directly Patentable

23 A first question to be answered is whether plants *are* actually patentable in India. India is a World Trade Organisation (WTO) Member State. As a consequence, India has to comply with the Agreement on Trade-Related Aspects of Intellectual Property Rights or TRIPs Agreement.[42] India has adapted its patent legislation to the TRIPs requirements through subsequent reforms in 1999, 2002 and 2005.[43] Since its adaptation by the Patent Amendments Act 2005, Section 3(j) Indian Patent Act reads as follows: "The following are not inventions within the meaning of this Act: [...] plants and animals in whole or any part thereof other than micro organisms but including seeds, varieties and species and essentially biological processes for production or propagation of plants and animals".

24 As plants, plant parts, seeds, varieties, species and essentially biological processes are not considered patentable subject matter, the direct means for patenting plants and other plant materials that pass through the hands of farmers, have been ruled out. In light of Section 3(j) Indian Patent Act, the only means left to establish plant patents in India are indirect. It might be possible to establish plant patents via patents which contain product claims pertaining to genes, cells, plant tissues etc. or via patents which contain process claims pertaining to non-biological processes,[44] on the condition that these patents' claims have effect in farmers' fields. It remains to be seen whether patents which contain such claims are actually permissible in India.

41 For authors who discuss the effects in positive and in negative sense of plant-related IP rights in general and plant patents in particular, see Douglas, *Successful Seed Programs: A Planning and Management Guide* (Westview Press 1980); Borlaug (n 7); Barton and Berger (n 7); Srinivasan, 'Concentration in ownership of plant variety rights: some impli-cations for developing countries' (2003) 28 Food Policy pp. 519-546; Louwaars, 'Seeds of Confusion' (PhD thesis, Wageningen UR 2007); Nagarajan and Smale, 'Village Seed Systems and the Biological Diversity of Millet Crops in Marginal Environments of India' (2007) 155 Euphytica pp. 167-182; Pandey and others, 'Role of Informal Seed System in Promoting Landrace Diversity and Their on-Farm Conservation: A Case Study of Rice in Indian Himalayas' (2011) 58 Genetic Resources and Crop Evolution pp. 1213-1224; 'Concentration in Seed Business' (ETC Group, 2015) <http://www.etcgroup.org/sites/www.etcgroup.org/files/files/etcgroup_agmergers_17nov2015.pptx__0.pdf accessed> 16 August 2016.

42 Annex 1C of the Marrakesh Agreement Establishing the World Trade Organization, signed in Marrakesh, Morocco on 15 April 1994.

43 Plahe, 'The Implications of India's Amended Patent Regime: Stripping Away Food Security and Farmers' Rights?' (2009) 30 Third World Quarterly pp. 1197-1213.

44 Monsanto's much debated patent on Bt cotton (Indian Patent no. 232681) contains both product claims which relate to genes (see claim 1) and process claims which relate to non-biological processes (see claim 12).

"1. A synthetic DNA molecule, comprising at least fifteen nucleotides of SEQ ID NO: 11 or SEQ ID NO: 12, and overlapping the junctions of the Cr>'2Ab insertions in cotton event MON 15985 or the junctions of the Cr>'2Ab insertions and the genomic sequence in cotton event MON 15985, or the complement thereof, wherein said cotton event MON15985 occurs in the cotton seed having been deposited with the American Type Culture Collection under accession number PTA-2516."

"12. A method of producing an insect resistant progeny cotton plant comprising

(a) modifying a cotton plant's genome to incorporate nucleotide sequences of SEQ ID N0:14; SEQ ID N0:15; SEQ ID N0:16, SEQ ID NO: 17, and SEQ ID NO: 18, thereby producing an insect resistant cotton plant;

(b) crossing said insect resistant cotton plant with another cotton plant

(c) obtaining at least one progeny cotton plant derived from the cross of (b); and

(d) selecting a progeny cotton plant that is insect resistant and comprises nucleotide sequences of SEQ ID NO: 14".

II. Genes are Patentable

25 It will be argued that product claims pertaining to genes[45] are indeed permissible in India.[46] The Indian Patent Act does not contain an express provision on the patentability of genes. According to Bhavishyavani,[47] there is no authoritative case law that determines whether or not product claims pertaining to genes are permissible either. Awaiting a final answer, Bhavishyavani[48] has tried to uncover to what extent genes have been considered patentable subject matter, by scrutinising the Manual of Patent Practice and Procedure and the granting practise of the Indian Patent Office. On the basis of the remarks regarding Sections 3(c)[49] and 3(j) Indian Patent Act in the draft Manuals of 2005 and 2008,[50] concludes that under Indian law, a gene is patentable if "it is recombinant and having inventive step and industrial application", and that the patentability of genes requires "substantial human intervention". Scrutinising granted patents compels Bhavishyavani[51] to add that "[Indian patent officials] mention that the exclusion referring to plants/animals/parts of plants or animals are not applicable at the molecular/cellular level where genes are involved" and that: "A lot of these patents cover an isolated sequence, it being placed in a vector and put into a host cell to express the desired characteristic or protein/to use the sequence to diagnose using a kit having a probe that is nothing but the complementary sequence etc."

26 Valuable clues can also be found in the Report of the Technical Expert Group on Patent Law Issues,[52] which pays specific attention to the patentability of "new chemical entities" and "new medical entities" (Section 3(d) Patent Act):

> *Entirely new chemical structures with new mechanisms of action are a rarity rather than a rule. Therefore, "incremental innovations" involving new forms, analogs, etc. but which have significantly better safety and efficacy standards, need to be encouraged. What is important, however, is for the patent office to be vigilant about setting high standards of judging such innovations so that efforts on "evergreening" are scrupulously prevented.*

27 The Report further states that: "Genes and gene products are treated similar to chemical compositions. Patenting of animal and human genes quite often attracts issues regarding public order and morality." The Report's comments on Section 3(d) suggest that new alleles of the same gene are patentable to the extent that they provide better safety and efficacy standards.

28 In view of the Report of the Technical Expert Group on Patent Law Issues[53] and the research done by Bhavishyavani,[54] it seems warranted to suppose that genes are, under certain conditions, patentable in India. These conditions seem to be that:

- The invention related to the gene fulfils the criteria of novelty, inventiveness and industrial applicability;
- The invention related to the gene has required substantial human intervention;
- The gene has been isolated;
- The gene is recombinant, for instance by having been inserted into a vector or into host DNA;
- The gene induces the expression of a certain characteristic or the production of a protein in a host cell or can be used to have a certain effect (e.g. for diagnosis);
- New forms of existing genes (new alleles) seem to be patentable on the additional condition that the new form allows a higher safety or efficacy standard.

III. No Interpretation of the Scope of Claims pertaining to Genes

29 Hence, under certain conditions, product claims pertaining to genes seem to be permissible in principle in India. Furthermore, patents which contain product claims pertaining to genes have

45 The article will not look into the patentability of animal or human genes, for which additional conditions might apply, especially regarding public order and morality.

46 The patentability of cells, plant tissues, non-biological processes etc. will not be discussed in this article. In Europe, a discussion about the indirect patentability of plants was going on in the 1990s. The European discussion mainly revolved around the patentability of plant cells, instead of genes. The European discussion culminated in two European Patent Office cases: Plant Genetic Systems (T 0356/93 (Plant cells) of 21.2.1995) and Novartis (G 0001/98 (Transgenic plant/NOVARTIS II) of 20.12.1999). In view of the available literature about Indian patent law, the article will focus on the patentability of genes and not on the patentability of cells.

47 Bhavishyavani (n 26).

48 ibid.

49 Section 3(c) determines that discoveries do not constitute patentable subject matter.

50 Bhavishyavani (n 26).

51 ibid.

52 Mashelkar and others, 'Report of the Technical Expert Group on Patent Law Issues' (*Government of India*, 2007) <https://ideas.repec.org/p/ess/wpaper/id830.html> accessed 5 August 2016.

53 ibid.

54 Bhavishyavani (n 26).

been granted in India.[55] Still, it is not clear whether or not these product claims are at odds with the central demand of the civil society campaign ("no patents on plants"). This depends upon the effect of these product claims on farmers in the field, which in turn depends upon the scope of protection of these product claims. Do the rights of the patent holder of the patented gene (or patented cell, tissue, process, to the extent that these would turn out to be patentable) extend to the plant materials into which the patented gene was inserted? To satisfy the central demand of the civil society campaign, the answer to this question would have to be no. As of yet, this question has received no authoritative (legislative or judicial) answer under Indian patent law. Before arguing in favour of a negative answer (Section 7), the article will conduct an economic analysis of the Indian plant patent regime (Section 6).

F. Economic analysis of the Indian plant patent regime

30 According to Indian patent law, it cannot be ruled out that patents which contain claims pertaining to genes (or cells, tissues, processes, to the extent that these would turn out to be patentable) would have an effect upon farmers in the field (i.e. constitute plant patents). It is crucial to assess to what extent and how the Bt cotton industry has used patents that contain claims pertaining to genes. Have these patents been used at all? Have these patents been used in such a way that they influence farmers' practices in the field?

I. Introduction of Bt Cotton by Local Seed Companies

31 Bt cotton was first introduced to the Indian fields by a local seed company called Navbharat,[56] based in Ahmedabad (Gujarat, West-India). The company reportedly crossed non-GM Indian varieties with a GM parental line developed by Monsanto, without the permission of Monsanto.[57] At first, Navbharat denied the transgenic character of the resulting GM Bt cotton variety Navbharat 151. The variety was advertised as merely "insect-resistant".[58] However, in 2001, Navbharat 151 withstood a particularly severe bollworm pest and observers grew suspicious. The seed was tested and turned out to be transgenic.[59] In 2001, the acreage of Bt cotton in Gujarat amounted to 10,000 acres. By 2004, the area planted with Bt cotton had increased to 3 million acres in India as a whole.[60]

32 In 2001, GM crops were not patentable in India under the Indian Patent Act 1970[61] and the Protection of Plant Varieties and Farmers Rights Act was still under negotiation. Hence, in 2001, there were no IP rights on GM crops. Moreover, there were no enforceable biosafety requirements whatsoever either, given the defunct character of the Environment Protection Act.[62]

33 Scholars have claimed that the quick spread of Bt cotton was fuelled by a lack of enforceable IP and biosafety legislation and by the vitality of the informal seed system.[63] The new technology could be adopted quickly precisely because there were no legal requirements for its spread. As a consequence, there were no legal impediments to the quick exchange and sale of seeds through social networks, especially in Gujarat.[64] In 2001, the Government of India did try to confiscate cotton that was illegal from the point of view of biosafety legislation, but farmers themselves prevented the destruction of the cotton.[65] Hence, IP rights on GM crops in general, and plant patents in particular, have played no role in the initial introduction of Bt cotton to the Indian cotton fields.

II. Patents and the Business Model of Multinational Seed Companies

34 After the initial introduction of Bt cotton by local seed companies, multinational seed companies did not stay behind for a long time. Having been denied permission to test Bt cotton in India in

55 ibid.

56 Bharathan, 'Bt-Cotton in India: Anatomy of a Controversy' (2000) 79 CURRENT SCIENCE-BANGALORE pp. 1067-1075; Jayaraman, 'Illegal Bt Cotton in India Haunts Regulators' (2001) 19 Nature Biotechnology p. 1090.

57 Jayaraman (n 56); Jayaraman, 'Illegal Seeds Overtake India's Cotton Fields' (2004) 22 Nature Biotechnology pp. 1333-1334.

58 Tripp (n 14) p. 95.

59 ibid.

60 Jayaraman, 'Illegal Seeds Overtake India's Cotton Fields' (n 57).

61 Plahe, 'The Implications of India's Amended Patent Regime: Stripping Away Food Security and Farmers' Rights?' (n 42).

62 Jayaraman, 'Illegal Bt Cotton in India Haunts Regulators' (n 56); Jayaraman, 'Illegal Seeds Overtake India's Cotton Fields' (n 57).

63 Jayaraman, 'Illegal Seeds Overtake India's Cotton Fields' (n 57); Shah, 'What Makes Crop Biotechnology Find Its Roots? (n 25); Shah, 'Social Responses to Crop Biotechnology' (n 23); McKinney, 'Troubling Notions of Farmer Choice' (n 25).

64 Shah, 'What Makes Crop Biotechnology Find Its Roots?' (n 25); Shah, 'Social Responses to Crop Biotechnology' (n 23); McKinney, 'Troubling Notions of Farmer Choice' (n 25).

65 Herring, 'Miracle Seeds, Suicide Seeds, and the Poor' (n 9); Herring, 'WHY DID "OPERATION CREMATE MONSANTO" FAIL?' (n 4); Sadashivappa and Qaim (n 22).

1990,[66] Monsanto established a joint venture in 1998 with the local seed company Maharashtra Hybrid Company (Mahyco), called Mahyco Monsanto Biotech (MMB).[67] In 2002, MMB obtained biosafety clearance to market a first generation of Bt cotton technology in India.[68] From 2004 onwards, Monsanto has licensed its Bt cotton technology (i.e. the Bt gene, the Bt trait and the related processes) via MMB to over 28 local seed companies.[69] From 2006 onwards, other institutions and companies such as Biocentury (China) and the Indian Institute of Technology have started to license the Bt cotton technology to local seed companies as well.[70]

35 The Times of India recently published an article indicating that it is unsure whether the first generation of Monsanto's Bt cotton technology ("Bollgard") was actually patented in India.[71] Government sources appear to be equivocal when confronted with the question of whether the technology was patented. It has been confirmed that in 2009, Monsanto has been granted patent protection in India for the second generation of its Bt technology ("Bollgard II") (Indian Patent No. 232681). Monsanto's Bt gene (more specifically the cotton event MON 15985) has thus been patented in India, but only since 2009. Nevertheless, Monsanto has also collected royalties for its Bt cotton technology between 2002 and 2009.[72] It has been claimed that Monsanto originally licensed the biosafety data needed to obtain variety approval, instead of the patent.[73] Hence, originally the biosafety legislation functioned as a kind of quasi-patent protection.

66 Iyengar and Lalitha, 'Bt Cotton in India: Controversy Visited' (2002) 57 Indian Journal of Agricultural Economics p. 459.

67 Jayaraman, 'Illegal Bt Cotton in India Haunts Regulators' (n 56); Jayaraman, 'Illegal Seeds Overtake India's Cotton Fields' (n 57); Herring, 'Miracle Seeds, Suicide Seeds, and the Poor' (n 9); Herring, 'WHY DID "OPERATION CREMATE MONSANTO" FAIL?' (n 4).

68 Tripp (n 14) p. 95; 'Mahyco Monsanto Biotech (India) Private Limited - Who we are' (*Monsanto*, n.d.) <http://www.monsanto.com/global/in/whoweare/pages/mahyco-monsanto-biotech-private-limitedaspx> accessed 29 July 2016.

69 Tripp (n 14) p. 90; 'Mahyco Monsanto Biotech (India) Private Limited - Who we are' (*Monsanto*, n.d.) <http://www.monsanto.com/global/in/whoweare/pages/mahyco-monsanto-biotech-private-limitedaspx> accessed 29 July 2016.

70 Tripp (n 14) p. 90.

71 Arya and Shrivastav, 'Seeds of Doubt: Monsanto Never Had Bt Cotton Patent' (*The Times of India*, 8 June 2015) <http://timesofindia.indiatimes.com/india/Seeds-of-doubt-Monsanto-never-had-Bt-cotton-patent/articleshow/47578304.cms> accessed 4 May 2016.

72 ibid; Smyth, 'A Monsanto Case That Could Alter the Dynamics of Technology Transfer to India' (*The IPKat*, 4 March 2016) <http://ipkitten.blogspot.com/2016/03/a-monsanto-case-that-could-alter.html> accessed 21 May 2016.

73 Tripp (n 14) p. 95.

36 Since the licensing of technology is prominently used as a business model, and because multinational seed companies do hold Indian patents containing claims related to the Bt cotton technology,[74] it is very likely that patents do play a role in the business model of multinational seed companies, at least since 2009. Before 2009, multinational seed companies derived quasi-patent protection from licensing biosafety data. Still, even since 2009, patents are predominantly used to license technology to local seed companies, and not to sell seeds to farmers. Consequently, the Bt cotton industry does not seem to make use of patents whose effects extend to farmers' fields.

III. Technological Barriers and the Business Model of Local Seed Companies

37 Local seed companies cross the Bt gene - which they obtain from multinational seed companies through licensing contracts - into local hybrid varieties. The hybrid character of these local varieties provides a technological barrier against further propagation. The seeds from a hybrid plant no longer yield plants with hybrid vigour and increased production.[75] Hence, it is not useful to save seeds of hybrid varieties. Therefore, local seed companies, who sell hybrid Bt cotton seeds to farmers, do not need patent protection to make their business model viable: their customers will come back to buy new seeds each year in any case. Hence, in relation to plants, seeds or other plant materials that pass through the hands of farmers, patents do not play a significant role as technological barriers are more efficient.[76]

38 It can be concluded that plant-related IP rights in general and plant patents in particular play only a minor role in the Bt cotton industry. Patents play a role for seed companies whose business model

74 A quick search on the 'Indian Patent Advanced Search System' for patents with 'Bacillus Thuringiensis', 'Bt' or 'cry gene' in their title, taught that also other entities than Monsanto, including other multinational seed companies have acquired patent protection for the Bt technology in India. The search resulted in a total of 14 granted patents. In 10 out of 14 cases, the grantees were multinational seed companies, including Bayer (4), Monsanto (3), Syngenta (1), Pioneer (1) and Dow (1). In the remaining 4 cases, Indian public research institutions (3) and universities (1) were the grantees (May 2016).

75 Loden and Richmond, 'Hybrid Vigor in cotton—Cytogenelic Aspects and Practical Applications' (1951) 5 Economic Botany pp. 387-408; Turner, 'A Study of Heterosis In Upland Cotton II. Combining Ability and Inbreeding Effects' (1953) 45 Agronomy Journal pp. 487-490.

76 Herring, 'Miracle Seeds, Suicide Seeds, and the Poor' (n 9) p. 221.

is based on licensing the Bt cotton technology. Often, these seed companies are multinational seed companies. However, patents do not play a role in the business model of seed companies who sell seeds, as these seeds are hybrids and thus protected by technological barriers. Mostly, seed companies who sell seeds are local seed companies. To sum up, patents are used to license technology, but not to sell seeds. Consequently, patents whose claims solely relate to e.g. genes, cells, plant tissues or other technological tools used to develop GM plants are important for the development of the Bt cotton industry, but plant patents are not.

G. Potential legal pathways to establish the unpatentability of plants

39 Complying with the central demand of the civil society campaign ("no patents on plants") does not seem to be insurmountable for the Indian seed companies, as plant patents are not that important after all. In parallel, it follows from the relative irrelevance of plant patents that abolishing them will only have a minor impact on resolving the agronomic and socioeconomic issues related to GM crops, IP and rural development.

40 Hereunder it will be argued that it is possible to rule out plant patents by interpreting product claims pertaining to genes in such a way that plants and other plant materials that pass through the hands of farmers are not within their scope. This suggested restriction can be achieved either via limiting the scope of these claims (Section 7.1) or via introducing tailor-made exceptions to the scope of these claims (Section 7.2). The reasoning in the two scenarios set forth could also be applied to limit the effects of claims pertaining to cells, plant tissues, processes etc., to the extent that these claims are permissible in India.[77]

I. Limiting the Scope

41 The legal argument underpinning a limitation of the scope can be found in Section 3(j) Indian Patent Act, which stipulates since 2005 that "plants and animals in whole or any part thereof other than micro organisms but including seeds, varieties and species and essentially biological processes for production or propagation of plants and animals" are not considered to be inventions. As a consequence they are not patentable. The legal argument essentially boils down to the following: if plants or other plant materials that pass through the hands of farmers would be within the scope of product claims pertaining to genes, then they would be patent protected and the prohibition of Section 3(j) on patents on plants, parts of plants, seeds etc. would become obsolete.

42 More extensively phrased, the argumentation reads as follows: the Indian Patent Act determines that genes are patentable (Section 3(j) Indian Patent Act *a contrario*; also according to Bhavishyavani[78]). The Indian Patent Act also determines that plants, parts of plants, seeds etc. are *not* patentable (Section 3(j) Indian Patent Act). It is valid to argue that Section 3(j) limits the scope of protection of permissible product claims pertaining to genes. It is valid to argue that Section 3(j) and the unpatentability of plants, parts of plants, seeds etc. would be deprived of their meaning if plants which incorporate GM technology would be in the scope of protection of product claims pertaining to genes. Such an extensive scope would imply an alternative way of patenting unpatentable plants, parts of plants, seeds etc.

43 As there is no express provision in Indian law which states that genes are patentable, there is no provision to be deprived of its meaning if plants, parts of plants, seeds etc. would *not* be in the scope of protection of product claims pertaining to genes. More importantly, even if plants, parts of plants, seeds etc. are not in the scope of product claims pertaining to genes, these claims can still play a role in relation to licensing the Bt technology to local seed companies. Furthermore, they can play a role e.g. in relation to genes which are used as mere research tools (markers).

44 A disadvantage of this first pathway is that the protection provided by patented genes would stop as soon as the gene has been inserted into a plant with the permission of the patent holder, even if this plant is still the property of a seed company. The multiplication of GM seeds via sexual reproduction by local seed companies would thus not be patent protected under the first pathway. This could limit the patent protection granted to multinational seed companies vis-à-vis local seed companies. This potential disadvantage is remedied under a second pathway.

77 For feasibility reasons, the permissibility of these claims is not discussed in this article, see *supra* footnote 46.

78 Bhavishyavani (n 26).

II. Introducing Tailor-made Exceptions to the Scope

45 An alternative scenario to restrict the scope of patent claims pertaining to genes is to introduce a tailor-made exception to these claims' scope especially for farmers, similar to what is foreseen in the Protection of Plant Varieties and Farmers' Rights Act (PPV&FR Act). The PPV&FR Act stipulates in its Section 39(4) that farmers are allowed to "save, use, sow, resow, exchange, share or sell their farm produce including seed of a variety protected under this Act in the same manner as he was entitled before the coming into force of this Act: Provided that the farmer shall not be entitled to sell branded seed of a variety protected under this Act" (sic.). The second legal argument essentially boils down to extending farmers' rights to "save, use, sow, resow, exchange, share or sell their farm produce including seed" from the PPV&FR Act to the Indian Patent Act. Without the proposed extension, this farmers' right risks becoming obsolete for farm produce including plants and seeds protected under both the PPV&FR Act and the Indian Patent Act.

46 More extensively phrased, the argumentation reads as follows: it is virtually certain that there is a considerable number of cotton plants in India that are protected via plant variety protection and that could turn out to be indirectly patent protected via product claims pertaining to genes. On the one hand, cotton features prominently among the species of which a considerable amount of varieties have been protected via plant variety protection:[79] between 2007 and 2010 there were 562 applications for plant variety protection related to cotton out of a total of 1853 applications.[80] On the other hand, 95 per cent of all cotton in India contains the Bt gene,[81] which is in many cases patent protected since 2009.

47 For plants that are protected via both plant variety protection and patents, the following dilemma could emerge. On the basis of the PPV&FR Act, farmers would have the right to save and exchange the plants, seeds and the other farm produce which they have obtained from their harvest (Section 39(4)). The Indian Patent Act, however, does not have a section which is comparable to Section 39(4) PPV&FR Act. Hence, under the Indian Patent Act, farmers are not allowed to save the plants, seeds and the other farm produce which they have obtained from their harvest. The question is whether farmers enjoy the right to save and exchange plants, seeds and other farm produce which, on the one hand, contain patented genes, but which, on the other hand, belong to a variety protected via plant variety protection.

48 It is valid to argue that if the right to save and exchange plants, seeds and other farm produce which farmers possess under the PPV&FR Act would not be honoured under the Indian Patent Act, Section 39(4) of the PPV&FR Act would be deprived of its meaning regarding plants, seeds and other farm produce protected via both plant variety protection and patents. That constitutes an argument to copy-paste the right to save and exchange farm produce - including plants and seeds - from the PPV&FR Act into the Indian Patent Act, at least for those plants that are protected under both Acts.

49 A comparable copy-paste approach was adopted by the EU in its Biotech Directive (Article 11 Directive 98/44/EC), which copy-pastes the farmers' privilege, i.e. farmers' rights to replant the product of their harvest on their own farm, from the EU Regulation on Community plant variety rights (Article 14 Regulation (EC) No 2100/94) to the patent laws of the EU Member States.

H. Compliance of the Indian plant patent regime with international patent law

50 It remains to be seen whether the Indian plant patent regime complies with international patent law. Especially Article 27(3)(b) TRIPs Agreement is important in that respect. The Article reads as follows:

> *3. Members may also exclude from patentability:*
>
> *(a) [...]*
>
> *(b) plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof.*
>
> *[...]*

79 Kochupillai, 'India's Plant Variety Protection Law: Historical and Implementation Perspectives' (2011) 16 Journal of Intellectual Property Rights pp. 88-101; Venkatesh, Sangeetha and Pal, 'India's Experience of Plant Variety Protection: Trends, Determinants and Impact' (Agricultural and Applied Economics Association & Western Agricultural Economics Association Joint Annual Meeting, San Francisco, 26-28 July 2015) <http://ageconsearch.umn.edu/bitstream/200413/2/P%20Venkatesh-paper.pdf> accessed 15 December 2015.

80 Kochupillai, 'India's Plant Variety Protection Law: Historical and Implementation Perspectives' (n 79).

81 James and others (n 3).

51 Article 27(3)(b) allows WTO Member States to exclude plants and plant varieties from patentability. Article 27(3)(b) TRIPs Agreement does not state anything about the possible exclusion of seeds or parts of plants. Yet, it has already been remarked that the Indian Patent Act does exclude seeds and parts of plants from patentability (Section 3(j) Indian Patent Act). Is this exclusion from patentability of seeds and parts of plants in accordance with the TRIPs Agreement? Furthermore, the TRIPs Agreement does not say anything about the permissibility of restrictions to the scope of product claims pertaining to genes. Still, the article suggests that India would additionally restrict the scope of product claims pertaining to genes. Is the suggested restriction to the scope of product claims pertaining to genes in accordance with the TRIPs Agreement?

52 To answer the first question (patentability), two arguments can be derived from the "Patent Declaration.[82] First, Article 27(1) TRIPs Agreement requires WTO Member States to provide patent protection for "any invention [...] in all fields of technology". The Patent Declaration states, however, that there are no codified nor customary international rules determining what the concept "invention" means (Consideration 10). More specifically, it is not crystal-clear what the dividing line is between an "invention" and a "discovery". Therefore, the Patent Declaration states that it is perfectly possible for WTO Member States to determine that biological materials such as seeds, parts of plants or genes are not patentable subject matter because they are discoveries and not inventions. Consequently, TRIPs does not require the patentability of seeds, parts of plants or genes.

53 Second, Article 27(1) TRIPs Agreement states that WTO member states will provide for patent protection for inventions in all fields of technology, to the extent that these inventions are not excluded on the basis of Article 27(2) or 27(3), if these inventions are "new, involve an inventive step and are capable of industrial application". The Declaration states that WTO Member States enjoy discretion in applying these criteria (Consideration 11). They can for instance, decide to deny product patents for biological material as biological materials are not "new" or "inventive". Consequently, TRIPs does not require the patentability of seeds, parts of plants or genes.

54 These two arguments lead to an answer to the patentability question: the TRIPs Agreement does not require the patentability of seeds and parts of plants (and genes, for that matter). Hence, according to the Patent Declaration, Section 3(j) Indian Patent Act does not violate the TRIPs Agreement. Building on these two arguments, an additional step must be taken to answer the question related to the scope restriction of product claims pertaining to genes. Despite the fact that India is not obliged to provide patent protection for genes, India seems to have chosen to provide patent protection for genes. Still, as India was not obliged to provide patent protection for genes in the first place, it is all the more so not obliged to interpret the scope of product claims pertaining to genes broadly. Hence, according to the Patent Declaration, it is perfectly permissible for Indian courts to make sure that the scope of product claims pertaining to genes (or of claims pertaining to cells, plant tissues, processes etc.) does not include plants.

I. Conclusion: Judicial interpretation to establish the unpatentability of plants

55 Only patents directly related to the GM technology, such as patents whose claims solely relate to cells, genes, tissues, processes etc., have played a role for the transformation of the Indian cotton areal. However, the seed companies that directly sell seeds to farmers have not made use of these patents. This is partly caused by the fact that these seed companies profit from technological barriers to seed saving. Another reason is eloquently phrased by Herring: "In practice, farmers seem quite willing to ignore everyone's property claims in seeds."[83]

56 To enhance legal certainty and to adapt the Indian plant patent regime to the economic reality of the seed industry, it would be useful to clarify that plants (as in "all plant materials that pass through the hands of farmers") are not in the scope of product claims pertaining to genes. There are sufficient legal and societal arguments to underpin this restriction. Those same legal and societal arguments underpin a parallel restriction of the scope of claims pertaining to cells, plant tissues, processes etc.

57 Because the scope of the abovementioned claims is not determined in the Indian Patent Act, the power and the responsibility to restrict this scope rests with the Indian higher courts, more specifically

82 The "Declaration on Patent Protection – Regulatory Sovereignty under TRIPS" (Burk and others, 'Declaration on Patent Protection' (2014) 45 IIC - international review of intellectual property and competition law pp. 679-698.) will be used as the main source to provide guidance. The "Patent Declaration" is a joint endeavour of more than ten eminent patent scholars from different continents which is meant to clarify the amount of regulatory sovereignty retained by WTO Member States in the area of patent protection after ratification of the TRIPs Agreement.

83 Herring, 'Miracle Seeds, Suicide Seeds, and the Poor' (n 9).

with the High Courts and with the Supreme Court of India. Hence, no change to the Indian Patent Act is needed. In the past, the Indian higher courts have not shied away from interpreting patent law in a restrictive fashion in sensitive cases related to the pharmaceuticals (Novartis AG v. Union of India, Madras High Court, 2007; Novartis AG v. Union of India & Others, Supreme Court of India, 2013).

58 Eventually, the suggested restriction would result in a simplification of Indian patent law. It would be possible to summarise Indian patent law regarding GM crops via the following buzz phrase: "(There are) no patents on plants!". As plant patents have been identified as the central demand of the civil society campaign, achieving a situation in which there are no patents on plants might settle the controversy on patents on Bt cotton. This might remove the focus from IP to the bigger picture of rural development, food security and environmental sustainability in India, the country that will have the largest population of the world by 2050, hosting 1.7 billion people on a relatively small surface.[84] A deliberative debate regarding this bigger picture is thus long overdue.

Year	Factual event	Legal event
1986		**Environmental Protection Act**
1990		Multinational seed company Monsanto denied permission to test Bt cotton technology in India (Bt cotton is genetically modified cotton)
1995		**WTO TRIPS Agreement**
1998	Establishment MMB (Monsanto-Mahyco Biotech), a joint venture between local seed company Maharashtra Hybrid Company and Monsanto	
1999		**First (minor) amendment to Indian Patent Act 1970**
Before 2001	Introduction of cotton variety Navbharat 151 to the Indian fields by local seed company Navbharat	
2001	Navbharat 151 survives fierce bollworm pest; test reveals that Bt cotton becomes controversial in India	
2001		**Protection of Plant Varieties and Farmers' Rights Act**
2002		MMB acquires biosafety approval for first generation Bt cotton technology (Bollgard)
2002		**Second (minor) amendment to Indian Patent Act 1970**
2004	MMB starts licensing Bt cotton technology to local seed companies	
2004	Rapid uptake of Bt cotton varieties all over India	
2005		**Third amendment to Indian Patent Act 1970, resulting in current Indian Patent Act**
2006	Biocentury (multinational seed company) and the Indian Institute of Technology (national research institute) start licensing Bt cotton technology to local seed companies	
2009		Monsanto acquires Indian patent on second generation of Bt cotton technology (Bollgard II)
2010	Bt brinjal becomes controversial in India	
2015	95 percent of the Indian cotton areal consists of Bt cotton varieties	
2016	Government sources doubt whether Monsanto had Indian patent on Bollgard	
2016		Several multinational seed companies have acquired patents on Bt cotton technology

Table 1: Historical Overview.

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84 'Word Population Prospects: the 2015 Revision - Key Findings and Advance Tables' (*UN Department of Economic and Social Affairs - Population Division*, 2015) <https://esa.un.org/unpd/wpp/publications/files/key_findings_wpp_2015.pdf> accessed 16 August 2016.

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