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Epistemic Seeds of Green Revolutions: Informing Ecological Transitions in India through a Comparative Study of Bayer CropScience and Navdanya

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Epistemic Seeds of Green Revolutions:
Informing Ecological Transitions in India through a Comparative Study of
Bayer CropScience and Navdanya.

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Table of contents:

1. Introduction.....	3
2. Literature review.....	6
2.1 Patents, seeds, and GM crops in India: an ongoing debate.....	6
2.2 Bayer CropScience Ltd. (India).....	9
2.3 Navdanya.....	11
2.4 Conclusion.....	12
3. Theoretical Framework and Methodology.....	12
3.1 Theoretical Framework.....	12
3.2 Methodology.....	14
4. Research Findings: What do they do? comparing economic systems and agricultural practices.....	15
4.1 Bayer CropScience Ltd. (India).....	15
4.2 Navdanya.....	16
4.3 Comparison of Bayer and Navdanya’s economic and agricultural systems.....	17
5. Analysis: from discourse observation to epistemological systems.....	21
5.1 Bayer CropScience Ltd. (India).....	21
5.2 Navdanya.....	23
5.3 Comparison of Bayer and Navdanya’s epistemic assumptions.....	26
6. Discussion.....	27
6.1 Identifying the embedded paradigms from which Bayer and Navdanya’s agricultural practices and beliefs stem from.....	27
6.2 Informing ecological transitions in India.....	29
7. Concluding remarks.....	30
8. Reference list.....	32
9. Primary Sources references.....	37

1. Introduction

Climate change is driven by human activities, notably greenhouse gas emissions, and has already led to a rise in global surface temperature of 1.1°C above 1850-1900 level (IPCC 2023, 4). Finding new ways to produce energies is of prime importance, but the challenge to divide resources amongst ever more numerous people will not go away in the face of scientific discoveries (Smith, Voß, and Grin 2010, 439). The Intergovernmental Panel on Climate Change (IPCC) highlights that unsustainable energy and land use, lifestyles, and production and consumption patterns continue contributing to the ongoing rise in global greenhouse gas emissions (IPCC 2023, 4). Numerous climatic and weather extremes in every continent have already led to widespread negative effects, associated losses, and harm to both nature and people with “vulnerable communities who have historically contributed the least to current climate change [being] disproportionately affected” (IPCC 2023, 5). The IPCC demonstrates that climate mitigation and adaptation must be developed at significantly greater speeds across all sectors to “secure a liveable and sustainable future for all” (IPCC 2023, 10, 30). Climate mitigation aims to reduce human activities’ impact on climate change, including by reducing greenhouse gas emissions (carbon mitigation), while climate adaptation aims to increase adaptation to existing environmental changes, for instance through climate resilience.

India is in the top 5 biggest CO₂ emissions producer in the world (Ritchie, Roser, and Rosado 2020). At the same time, poverty remains a decisive challenge in the country (Banerjee, Banik, and Mukhopadhyay 2015). Academics differ on ways to develop a sustainable economic system able to lift the Indian population out of poverty for good. Some argue that GDP growth will trickle down to the poorest households and reduce poverty most effectively (Bhagwati et al. 2012). Other scholars defend that wealth redistribution, particularly in the form of investment in social services, health and education would be most efficient to lift the country out of poverty (Drèze and Sen 2002). Meanwhile, Banerjee and Duflo focus on the possibilities offered by micro credits to lift the poorest from deprivation (2010). Kothari yet argues that all these economic models exclude “the centrality of the ecological precipice” (Kothari 2014, 37). As can be seen, debates on the subject remain lively, and the academia does not seem to be reaching a consensus on how to sustainably eradicate poverty in India.

Taking Kothari’s observation as a starting point, this thesis aims to study and compare two different approaches to the ecological transition in India. On one hand, this thesis will present the system put forward by sustainable development defenders, and on the other,

solutions proposed as alternatives of a growth-based system. Sustainable development's aim is to keep on developing economies using capitalist models while also reducing emissions and enabling climate adaptation. The term 'sustainable development' was internationally introduced in the report of the World Commission on Environment and Development 'Our Common Future' as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland 1987, 41). Proponents of sustainable development argue that economic growth provides the necessary resources to remedy environmental damage and achieve sustainability (Spaiser et al. 2017; Ruggerio 2021). Concepts and methods put forward by the idea of sustainable development have been incorporated in numerous international frameworks, such as the United Nations, or the yearly Conference of Parties held with the responsibility to address challenges raised by climate change.

Notwithstanding this international trust pledge, several scholars have argued that sustainable development is an oxymoron (Spaiser et al. 2017): they highlight the historical link between economic growth, development, and CO₂ emissions as too strong to overcome preservation challenges. These criticisms go back to the 1970s with the 'Club of Rome' arguing that given the state of natural resources, economic expansion is not sustainable, thus it needs to be slowed down to safeguard the environment. Critics also blame too loose definitions of sustainable development as impeding coordinated action to effectively protect natural resources (Ruggerio 2021, 3).

Emerging from such and similar critics, an academic movement looking for ways to develop wellbeing outside of the growth paradigm has emerged (Escobar 2011; Latouche 2009; Alexander and Gleeson 2020). Degrowth scholars argue that an economy that always needs to keep producing more, regardless of the population's needs and the limits of resources, cannot keep sustaining itself (Magdoff 2011). They define the growth paradigm as "a worldview institutionalized in social systems proclaiming that economic growth is necessary, good, and imperative" (Kallis et al. 2018, 295), and argue that as long as technological innovation and efficiency advancements are used inside this growth paradigm of economy, ecological violations will persist (Alexander and Gleeson 2020, 355; Hickel and Kallis 2020). Proponents have thus defined degrowth as a "process of political and social transformation that reduces [the energy and resource flows in and out of an economy] while improving the quality of life" (Kallis et al 2018, 292). Degrowth rejects the centrality of economic growth, nevertheless it does not advocate for a decrease of the GDP, that phenomenon has a different name: recession (Demaria and Kothari 2017). Nevertheless, certain scholars go as far as to argue that over a

certain GDP threshold income does not affect wellbeing, instead equality does, and that if redistribution, cooperation, and value shifts are present, then an economic downturn may not lead to a loss in wellbeing (Kallis et al. 2018, 298).

The debate on sustainability is ever more relevant and equally lively. The diverging values of degrowth development scholars tend to be pinned against each other in an unreconcilable discourse and framed as unable to communicate with each other. Nevertheless, this thesis tries to look for useful insights and proposed solutions from both sides of the debate. This thesis aims to study degrowth and sustainable development initiatives in relation to each other, and to effectively compare their underlying economic systems as well as the values they are based upon. This research makes use of epistemology, the study of paradigms, to better apprehend the dynamics at hand between the two presented discourses.

It appears important to note here that the researcher conducting this thesis has a background in environmental activism, and a personal sensibility to the risks that growth-based systems expose vulnerable populations to. In order for this positionality not to influence the objectivity of the research, the researcher has been attentive to present and critically analyze data from development and degrowth perspectives in equitable and equivalent ways, using scientific methods. Methodologies inspired from autoethnography have also been incorporated in some parts of the research to acknowledge the author's position and annul a potential bias on the research results. The beliefs of the author are a motivation behind this research, and this motivation provides yet another reason for the author to preserve the integrity of the scientific processes used here.

This thesis, concerned with ecological transitions, is more specifically set in the debate of sustainable agricultural practices in India. The chosen approach is a comparative study of two organizations providing seeds to farmers in India: one promotes the use of hybrid, genetically modified (GM) crops and chemical pesticides while the other turns to the preservation and development of traditional seeds and practices.

As such, this thesis engages in a comparative study of Bayer CropScience Ltd. (India) and of the Navdanya movement. Bayer is a multinational company (MNC) based in Germany that researches and sells pharmaceutical and agricultural – mainly chemical – products. The Indian 'CropScience' division produces and sells various seeds (mainly hybrid crops, and GM cotton), as well as chemical pesticides and fertilizers. Navdanya is a farmer-led militant cooperative movement created by Vandana Shiva in 1987 to preserve traditional seeds and

biodiversity. In addition to activist activities, Navdanya has developed traditional seed banks, and a training center mainly concerned with agroecology practices.

The primary aim of this research is to establish a clear link between belief systems and economic ecological practices. From this link, this research proposes a comparison of the values that have a significant effect on Navdanya's inner workings and economic endeavors to values ruling over Bayer India in order to inform societal transitions towards sustainable economic models. As such, this research is multidisciplinary, using knowledge and methods from the economic field as well as epistemology. It studies the processes of transition towards sustainable models of societies. This research will make apparent the underlying assumptions of development and post-development ideologies and put them in relation to each other through the method of comparison to inform potential paths and challenges to ecological transitions in India. Thus, this research aims to answer the following research question:

What insights into ecological transitions in India, if any, can be derived from a comparative economic and epistemic analysis of Bayer CropScience Ltd. (India) and Navdanya's *modi operandi*?

2. Literature review:

This thesis studies and compares the epistemes and ideologies upheld by Bayer CropScience Ltd. (India) and by Navdanya in regard to their agricultural and economic practices. Studies of epistemology used in this thesis will be presented in the theoretical framework (chapter 3). This thesis touches upon a diversity of academic debates, nevertheless, this paper is restricted in time and space and the scope of the following literature review is thus limited to topics most closely related to the economic and agricultural systems Bayer and Navdanya propose. Thus, the following literature review succinctly presents the debates on industrial agriculture in India, particularly regarding patents on seeds and genetically modified crops, before presenting studies more closely revolving around Bayer CropScience Ltd. (India) and Navdanya's operations, with a focus on debates surrounding sustainability.¹

2.1 Patents, seeds, and GM crops in India: an ongoing debate.

¹ Bayer and Navdanya are presented in alphabetical order by default throughout the paper.

The ‘Green Revolution’ started in India in the 1960s, with many institutions and farmers turning to technology advances to raise their farming productivity. This green Revolution included the adoption of hybrid seeds, double-cropping (planting two crops per year instead of one), increased use of inorganic fertilizers and pesticides, improved irrigation systems, improved agricultural equipment, and crop protection strategies (John and Babu 2021, 1). The large-scale introduction of fertilizers, pesticides and hybrid crops led to a significant change in agricultural practices and productivity. In turn, this ‘Green Revolution’ substantially increased food output in India and in the world (Davis et al. 2019, 25034). Nevertheless, its long-term effect on food security in India is still up for debate (Stone 2019), primarily because while the green revolution increased the output of food, access to that food was never economically accessible for a substantial part of the population. Food security is defined as achieved “when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (World Food Summit 1996).

In the 1990s, genetically modified (GM) crops started being developed: their introduction has been qualified by some as a “Second Green Revolution” (Aga 2021b, 13). Both hybrid and GM crops are more resistant to certain diseases or specific climate conditions, but they are sterile: no crop can be grown from one year to the next as vegetables or wheat grown from hybrid and GM organisms does not produce fertile seeds. Thus, farmers must buy these crops from the laboratories that produce them every year. GM crops are seeds which are modified through rDNA technology: the method consists in taking a foreign gene from a plant A (e.g. resistance to salinized water), and transplant it into plant B, creating a plant C which will then have all characteristics from both initial crops (Aga 2021b, 4). GM and hybrid crops differences stems from the different set of techniques and knowledge the two require (GM involve rDNA technology while hybrids rely on the more traditional technique of plant breeding) and the different sets of risks they involve (Aga 2021b, 3-6). Today, a variety of hybrid crops are available in the Indian market, while BT cotton is the only GM crop currently allowed for cultivation in the country. Debates arose in recent years about the introduction of other GMs, notably BT Brinjal (eggplant).

Nevertheless, the Green Revolution did not succeed in avoiding an agrarian crisis that has been plaguing the world and India for more than 50 years. In India, an estimated 200 million people still suffer from hunger (Agarwal 2022, 4). India has been the setting of an acute crisis whose strongest example is the 300,000 farmers that took their lives between 1995 and 2016 (Aga

2021b, 10-11). Debates on the causes of Indian farmers' distress are still going on, although many point to insufficient and inadequate public action and investments in recent years (Aga 2021b, 11). Aga also emphasizes changing and eroding environment (e.g. lack and salinization of water), rising inequalities between landowners and landless laborers, and rising farmers' debts as major factors behind this tragedy (2021b, 10-11). Some scholars and activists also argue that Indian farmers' lack of food sovereignty has played a dominant role in this crisis (Shiva 2018). Food sovereignty has been primarily defined by grassroots movements as "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems" (Nyéléni 2007, 1). Shiva indeed argues that multinational companies (MNCs) who have created patents on seeds – that is, appointing intellectual property rights on a seed variety - took away farmers' control and knowledge over their own seeds and plants (Shiva 2017, 14). She particularly argues against the use of GM crops, most heavily in India.

The debate on genetically modified (GM) crops in India has been remarkably lively and public with corporate, state, and civil society actors evolving in the Indian democratic debate between confrontation and cooperation (Aga 2021b, 1). Amongst scholars, the debate has been primarily divided between two opposing schools of thought in the past 20 years (Aga 2021a, 167). One argues that GM seeds are a useful tool to increase food security and farmers' income (Swaminathan 2010) while the other responds that GM crops' gains are outweighed by the loss of biodiversity and farmers' sovereignty (Shiva 2018). Further debates arise on the role that actors such as the Indian state, the colonial rule, contemporary civil society, and companies (national and foreign) have been playing in the introduction of GM crops in India since the 1960s. Aga (2021a) outlines the role that the diverging 'legal-administrative' and 'scientific' epistemologies ruling over Indian bureaucracy have played in shaping authorizations and interdictions of GM crops use in India. He concludes that because the two 'legal-administrative' and 'scientific' epistemologies construct environmental regulation differently, "there is room to maneuver in their interstices" (178-180).

Vandana Shiva's opposition to GM crops is amongst the longest-held ones (Shiva 2018). Shiva argues that globalization, legal-economic frameworks from the West, and MNCs are the primary actors to blame for the introduction of GMs and biotechnology in India. It has been highlighted that she draws a straight line from Washington to smallholder farmers in India and the country's high numbers of farmers suicides (Aga 2021b, 19). Indeed, Shiva blames

biotechnology companies and the introduction of GM crops in the context of globalized economies for the wave of Indian farmers' suicides (Shiva et al. 2000, 140-201).

However, Vandana Shiva's identification of the issues at hand is not shared by all scholars. Herring (2008) notably argues that Monsanto was only doing field trials when Shiva started accusing the company of seed monopolization. Furthermore, biotechnology proponents (cf. Herring 2008; Stone 2012) argue that several GM seeds are not protected by patents and that their prominence is only due to advantageous market mechanisms: in conclusion, they argue that the increasing numbers of farmers' suicides cannot solely be attributed to patent monopoly ruling over hybrid and GM crops (Mallick 2021, 85-86).

The debate on GM crops is similar to the one on the first Green Revolution. Aga however highlights that this 'Second Green revolution' is led by powerful agribusinesses while the first one was subject to more governmental control (Aga 2021b, 13). Tups and Dannenberg have also demonstrated that suppliers of agro-industrial products hold a power over the global supply chain that is increasing on the long-term (2023, 16). Bayer is one of these agribusinesses.

2.2 Bayer CropScience Ltd (India).

Bayer AG (Global) is a multinational pharmaceutical and agrochemical company founded in Germany in 1863. Bayer first established its presence in India in 1896. Today, the Bayer group in India includes Pharmaceuticals, CropScience, and Consumer Health Divisions (Bayer CropScience Limited 2022). Studies of the Indian branch of Bayer include the discrepancies faced by the group as well as research on the efficiency of their sustainable development programs, notably within frameworks of Corporate Societal Engagement (CSE).

Controversies regarding the group Bayer India have included patents, sustainability, but also child labor. Indeed, Bayer India CropScience was accused in the 2000s of "having the worst forms of child labour in its hybrid cotton seed production supply chain" (Roy 2013). Furthermore, The Bayer group bought Monsanto along with their patents, a fusion that became effective on June 7, 2018. Bayer CropScience has thus inherited the controversies around Monsanto practices and scandals. Monsanto was the world leader of agrochemical and biotechnology for decades. The company's ethics have been heavily criticized as it was involved in several big-scale scandals, notably regarding the unsafety and unsustainability of products they offered (Robin 2010, 9-48).

Nevertheless, the multinational Bayer - including its CropScience department - has been evolving fast in the past years, notably towards the promotion of human rights and of sustainable agro-economic models. Several scholars have researched the initiatives taken by Bayer to try and improve the quality of life in India in general, and of its own customers particularly. For instance, in the last two decades, Bayer implemented large-scale programs to stop child labor in its plantations. There is a relative consensus on the fact that these Child Care programs have significantly reduced child labor in Bayer plantations in India (Roy 2013).

Most studies of Bayer CropScience's sustainability efforts outline that the company has been relatively successful in its endeavors. Concerning chemical safety and environment, Narula and Upadhyay conclude that Bayer CropScience is developing safer products faster than its competitors (2011, 288). Studies on Bayer's attempts to heighten human development in India also outline that the programs are mainly successful. For instance, Volkert, Strotmann, and Moczadlo study the opportunity and risks that transnational corporations face when investing in places with high or low Sustainable Human Development (SDH), and their potential interest in enhancing it through a study of Bayer CropScience's Model Village Project (MVP) in rural Karnataka (Volkert et al. 2014). They highlight that Bayer was able to build trust with the villagers and empower them in a way that could enhance human development. Trebbin and Franz's research studied Bayer's attempt to advance and coordinate relations between different actors of the food chain (2010). They conclude that this 'Food Partnership Program,' although interesting to enhance private governance within agrofood networks in an attempt that could replace some institutions like the state, cannot be widely implemented because the company is extremely selective concerning eligible farmers. Indeed, they concentrate exclusively on areas and goods that will bring in the greatest revenue to the businesses (Trebbin and Franz 2010, 2043). Notwithstanding these accomplishments, Strotmann et al. also emphasize that large businesses operating in India are required by Section 135 of the 2013 Indian Companies Act to invest at least 2% of their average pretax net profit of the three prior financial years in Corporate Social Responsibility (CSR) initiatives (2019).

To conclude, the limited available literature on Bayer CropScience in India seems to be quite unanimous about the fact that Bayer's Corporate Social Responsibility programs are implemented when beneficial for the company and are usually quite successful in achieving their goals.

2.3 Navdanya.

Vandana Shiva created Navdanya as a branch of the Research Foundation for Science, Technology and Ecology (RFSTE) in 1987 to respond to this crisis on the terms she identifies. Navdanya signifies ‘nine seeds’ but also ‘new gift’: put together these illustrate a desire of renewal in the relationships in-between humans and nature and desire for food security and sovereignty (Virmani and Lépineux 2015; Mallick 2021, 92). Academic research on the Navdanya movement has the specificity of being headed by Vandana Shiva who is herself a leader of the movement. She has been devoting much energy to Navdanya’s development: she mentions the movement and issues closely related to it in most of her essays (Mallick 2021, 89; Shiva 2015). Vandana Shiva’s contribution to Navdanya and to its literature seems to have the multiple roles of presenting, advertising, and analyzing the movement: both for members of the movement itself and for external recognition.

A major consensus within the different studies of Navdanya is that the organization has been successful in achieving most of its goals. First, scholars outline the international notoriety Navdanya has been able to gain, notably via the use and recognition of the values surrounding *Satyagraha* (Mallick 2021, 101). Second, they argue that Navdanya has been quite successful in “stopping the abuse of power by large agribusiness” (Mallick 2021, 101). Third, they argue that the organization has succeeded in upholding and defending “basic human dignities (Mallick 2021, 102; Glasberg and Armaline 2009), and in raising awareness concerning the limitations and dangers of GM crops and biopiracy (Kumari and Mallick 2015). Last, scholars highlight that Navdanya has been quite successful in self-relying and self-organizing, notably in its fight against GM introduction by the Indian state and transnational companies (Armaline & Glasberg 2009; Mallick 2021, 101-102).

Nevertheless, the political effect of Navdanya’s movement is still up for debate. Shiva has argued that Navdanya’s focus is on grassroots action such as local empowerment and sovereignty: it is not to change legal frameworks. However, Shiva has been involved in several actions to demand protection against GMs from the state. Mallick outlines that although several Indian environmental movements have been lobbying against the introduction and development of GM crops, the Indian government is slowly sliding towards GM crops use (2021, 106). Mallick also highlights that despite its ideological opposition to the corporate food regime, Navdanya has effectively sided with it by receiving donations from major corporations (2021, 27).

Following their demonstration of Navdanya's successes, several scholars (i.e. Mallick 2021, Shiva 2018, Armaline and Glasberg 2009) use Navdanya to derive a model, or recommendations for postdevelopment societies. Indeed, most studies of Navdanya tend to be more descriptive than critical. For instance, Shivhare and Agarwal's analysis highlights the mutually strengthening qualities of Navdanya's goals to ensure food sovereignty and empower women (2022, 71). Armaline and Glasberg (2009) argue that Navdanya's effectiveness can be partly attributed to its capacity to confront private transnational corporations in addition to local, national, and transnational governmental systems.

2.4 Conclusion

Academic research on the Navdanya movement in English is relatively limited considering that the movement has existed for over 30 years. Most of the studies take a descriptive approach to the study of Navdanya, and mainly present – under a positive light - the history, organization, and actions taken up by Navdanya since its creation (Mallick 2021; Shivhare and Agarwal 2022; Shiva 2017; Virmani and Lépineux 2014). Meanwhile, recent literature analyzing the sustainable direction Bayer is aiming to take is also sparse and focus on the actions proposed much more than the defended ethics. To this day, there is no in-depth analysis of the similarities and differences between the belief systems of Navdanya and Bayer CropScience Ltd.

Parallely, academic debates on ways forward from the agrarian crisis India faces are lively. Although several internal consensuses about the effects of biotechnology exist, discussions remain unsolved within broader academia. As climate stresses are reinforcing the difficulties faced by farmers, research on ways forward is still scarce. Several scholars agree that Navdanya forms a useful model for an alternative post-development society. Some have started outlining the necessary changes that would enable a transition towards economic organization outside of the growth paradigm. Research on the process of ecological transition using Navdanya as a model nevertheless remains scarce. Looking at the epistemes upholding diverging agricultural practices, this thesis takes a novel approach to the study of ecological transitions in agricultural development in India.

3. Theoretical Framework and Methodology

3.1 Theoretical Framework

Kuhn's paradigms have been significantly used in studies of the 'growth paradigm' and how to move away from it (Spash 2020; Shiva and Pandey 2006). Kuhn's definition of paradigms as set of rules specific to academic disciplines that hinder communication between different disciplines is indeed relevant to transition studies in that it outlines the boundaries between disciplines and sets of assumptions while also highlighting the inner workings of 'revolutions' when paradigms change (Bird 2022). Nevertheless, this thesis is concerned with the underlying assumptions of Bayer and Navdanya in the aim to understand the structural ideological commonalities and differences of the two organizations. Foucault's analysis of epistemes in its attention to unconscious pre-conditions of knowledge are thus deemed more appropriate to understand the limits of what is possible to think in both structures of knowledge, that will be referred here as epistemes (cf. Birkin and Polesie 2011, 240-243). While Foucault's study of major epistemic trends is useful to transition studies and to situate studied sets of beliefs in wider trends spanning centuries, this study is more so concerned with actual and potential change occurring between two epistemes contemporary of each other. Foucault's definition of epistemes moves away from the level of consciousness of subjects to study the background assumptions that determine scientific knowledge within a specific time-space (Birkin and Polesie 2011; Foucault 1994; Gutting and Oksala 2022). This is particularly relevant here as this thesis is concerned with what is deemed possible or impossible within the set of assumptions and beliefs governing behaviors at Bayer and Navdanya, and how these sets of beliefs are structured (cf. Orman Quine 1976). In that sense, this thesis is also close to Karin Knorr Cetina's methodology to uncover and compare the "epistemic cultures" of two diverging laboratories (1999, 24).

Furthermore, postcolonial analyses of knowledge dynamics are relevant to enhance understanding of the power struggle characterizing two apparently competing epistemes in the aftermath of colonialism, and an economic and epistemic context that has been identified by some as perpetrating colonial domination (Quijano 2007, 169). Some scholars notably argue that "ego-politics of knowledge" have historically enabled male Western knowledge to deem itself "the only one capable of achieving a universal consciousness," and to dismiss other forms of knowledge as "particularistic" (Grosfoguel 2007, 213-214). Grosfoguel further asserts the role of this "epistemic strategy" in constructing a hierarchy of knowledge throughout the colonial process, and in time, a hierarchy of people still omnipresent today (2007, 214). Quijano outlines several characteristics in the rational/modern paradigm that have enabled coloniality to be pervasive to this day. He notably argues that 'totality' in rational paradigms have led to "structural-functionalism" in which societies are structured organically – following

representations of the human body – in a hierarchy ruled by an elite (the brain) and where ‘the rest’ can only exist as subordinate (Quijano 2007, 175). Such arguments allow for further analysis of the economic and postcolonial power structure in which Bayer and Navdanya’s epistemes have been constructed. The epistemic debate at play here also apprehends postcolonial arguments for “epistemological decolonization” (Quijano 2007, 177) that emphasize the need to rethink modern epistemes from and with cosmologies of Global South thinkers, particularly in subalternized spaces (Grosfoguel 2007; Santos 2014). These discussions of the modern episteme, neocolonialism and ecological transitions will be resumed in relation to this thesis’ findings in chapter 6.

3.1 Methodology

This thesis uses critical discourse analysis (CDA), as well as the poststructuralist lenses presented above to collect and analyze data in the aim to apprehend the epistemes of Bayer CropScience Ltd. (India) and Navdanya. The goal of CDA is to analyze linguistic components in order to discover linkages between language, power, and ideology that are concealed (Mayr 2012, 5). The following analysis aims to outline the epistemic premises on which the economic system of each case study relies on. The analysis builds on data collection on the economy, agricultural practices, and environmental discourse of Bayer and Navdanya. This data collection encompasses both quantitative and qualitative data.

Data was collected by analysing the reports and websites of both organizations and copy-pasting relevant material in data collection documents and tables. The researcher drew inspiration from autoethnographic methods to try and perceive personal ideals and assumptions that influenced the choice of data they collected, as well as their analysis (cf. Kumashiro 2002; Lapadat 2017). The early compilation of data in tables allowed the researcher to put both case studies in relation throughout the research, shining light on information missing for one case study when it was prominent for the other.

The data collection was made that more difficult by the lack (Bayer) or extreme scarcity (Navdanya) of answers provided by the organizations to the variety of messages sent to them by the researcher. To compensate for this, the researcher notably attended a conference by Vandana Shiva in Brussels in May 2023. Lack of responses also hindered the initial choice to conduct interviews, and only one interview with a member of Navdanya went through. The interview was semi-structured as to enable the interviewee to express any views that might be valuable in outline epistemic assumptions while also allowing the researcher to ask specific

questions, notably related to missing or contradictory data (Galletta 2013, 1-3). The interviewee is anonymized and referred to here as Dushyanta Marathe, a name that is close to the gendered and ethnic connotations of the interviewee's original name.

4. Preliminary Findings: What do they do? Presenting data and comparing economic systems.

This part of the research presents the activities, agricultural practices, and economic system of both case studies. Critical assessment of the efficiency, sustainability, or financial state of the case studies are outside of the scope of this thesis whose primary aim is to understand the inner workings of the case studies.

4.1 Bayer CropScience Ltd. (India).

Bayer CropScience Ltd. (India) is a multinational company producing and selling hybrid and genetically modified seeds, pesticides, herbicides, and fertilizers on the Indian market. Bayer India CropScience's laboratory develops a variety of agricultural products to be bought by farmers (<https://www.cropscience.bayer.in/Products-H/Key-Crops>)². In addition to their main activity of agricultural product manufacturing, Bayer India has been developing programs to accompany customers in their work, but also initiatives to meet corporate CSR ideals (<https://www.cropscience.bayer.in/Sustainable-Crop-Solutions>).

As seen above, Bayer AG (Global) is a multinational pharmaceutical and agrochemical company founded in Germany in 1863 that first established its presence in India in 1896. Today, the Bayer group (that encompasses what was Monsanto) in India includes Pharmaceuticals, CropScience, and Consumer Health Divisions (Bayer India 2022).

For the sake of clarity, Bayer CropScience Ltd. (India) will be here referred to as 'Bayer,' unless indicated otherwise. In the financial year 2021-2022, Bayer had a revenue of over Rs 47 billion, an 11% growth compared to the previous year (Bayer CropScience Limited 2022, 35). Bayer was the main source of income attributable to noncontrolling interests amongst Bayer AG companies in 2022 (Bayer AG 2023a, 182). In 2021, Bayer employed over

² References from Bayer and Navdanya's websites are presented in the form of hyperlink to reference the specific parts of said websites.

13,000 individuals in India, collaborated with 20 million smallholder farmers, and had developed 76 Food Chain Partnerships benefitting 90,000 farmers (Bayer CropScience Limited 2022, 5).

In recent years, Bayer has been extensively working on its image and currently claims to be a leader in terms of environmental sustainability. In the financial year 2021-2022, Bayer spent Rs 126.79 million on CSR. By doing so, Bayer spent Rs 0.68 million more on CSR than it was required to do by Indian law (section 135(5)), i.e. 0.27% of its total revenue (Bayer CropScience Limited 2022, 45-46). Bayer's CSR initiatives in 2021-2022 have focused on "rural development initiatives", promoting scientific education, "comprehensive telemedicine solutions" and "initiatives to combat COVID-19" (Bayer CropScience Limited 2022, 45-47).

4.2 Navdanya.

Navdanya is a "multi-pronged organization," being at the same time an NGO, a cooperative militant movement, a private company, a solidarity network, an internationally connected activist group and a university (Virmani and Lépineux 2015, 130). Navdanya revendicates itself as ecofeminist, that is, they aim to fight against violence towards women and the earth and for the broader recognition that women and the earth are, like "all beings[,] creative, intelligent, productive" and have been sustaining economies consistently (<https://www.navdanya.org/eco-feminism>). Navdanya is active in 22 Indian states and works with around 1,000,000 smallholder farmers, primarily women (Mège 2021, 7). Its main activities consist in supporting smallholder farmers transition towards regenerative biological agricultural practices and protecting biodiversity, particularly traditional seeds. Navdanya has created over 150 community seed banks throughout the country in which it has saved over 21,000 varieties of seeds (Marathe 2023). These seed banks represent well the main goals of Navdanya: to protect biodiversity, farmer's exchange networks and sovereignty over their own seeds, as well as traditional agricultural practices. The seed banks operate based on common property: the seeds belong to the collective of farmers (Shiva 2023a, 56). If a farmer wants seeds from a seed bank, they must let the seed bank know one season before and give a seed back the following season (Marathe 2023). This exchange is free of monetary costs (Marathe 2023).

Navdanya has also developed partnerships with local communities to enhance their involvement in seed saving and organic practices. Over 35,000 farmers form Navdanya's network and an additional 2,000 farmers are trained every year (Mège 2021, 7). Navdanya's

Biodiversity Farm (*Bija Vidyapeeth*) hosts a bank of around 5,000 varieties of seeds and offers agroecology courses (Marathe 2023). In order to offer women a voice on issues of biodiversity, cultural variety, and food security, Navdanya also developed the Diverse Women for variety program (Mège 2021, 7).

Navdanya has also developed a business operating on the organic market, ‘Navdanya Ltd.’ As such, it sells more than 100 organic products in shops in Delhi, Mumbai, and Dehradun, and it has been looking to expand its cafes and outlets throughout India (Virmani and Lépineux 2015, 131; Marathe 2023). Navdanya’s marketing strategy is merged with its activism: the marketing includes heavily questioning the current system and pushes for drastic changes in production and consumption habits (Virmani and Lépineux 2015, 131-32).

4.3 Comparison of Bayer and Navdanya.

Below is a table presenting relevant activities by Bayer India and by Navdanya. Namely, the table summarizes agricultural products and practices, but also endeavors related or impacting sustainable development. The table summarizes the similarities and differences between Bayer and Navdanya’s practices and system, it is crafted for understanding and is not an exhaustive list of Bayer and Navdanya’s activities and goals.

Agricultural Practices	Similarities	Differences and specificities	
		Bayer	Navdanya
Seeds	Both use seeds, and grow/create seeds.	<u>GM crops:</u> - GM cotton - Pearl Millet (Bajra) ('9444 Gaucho') <u>Hybrid crops:</u> - rice (Arize) - DEKALB corn (25 varieties). - Mustard https://www.cropscience.bayer.in/Products-H/Key-Crops .	Traditional seeds: - over 21,000 varieties of seeds over all seed banks (Marathe 2023).
Pesticides	Both use and sell pest repellents.	Use a great variety of industrial pesticides. Developed integrated pest management programs https://www.cropscience .	- Use plant-based pesticides (e.g. marigold as pest repellent, sprayable mix of 12 pest-

		bayer.in/Products-H/Pest-Management).	repellant plants) (Thernsjö 2018, 17-19). - strong biodiversity as prevention against pest and diseases (Shiva 2023a)
Fertilizers		Great variety of chemical fertilizers, biofertilizers.	Promotes self-produced biofertilizers out of waste.
Main problems faced by farmers	Climate disasters Pests	- “15-25% of crops are lost due to pests every year.” - “45% gross loss of crops due to the infestation of pests and diseases” (Bayer CropScience Limited 2022, 110) - Lack of protection of regulatory data that hinders research. - Climate disasters	- Finances, debt - Lack of biodiversity, pests - climate disasters - lack of food sovereignty.
Solutions proposed		Crop protection chemicals (https://www.cropscience.bayer.in/Products-H/Key-Crops).	Biodiversity, agroecology. (Navdanya 2022)
Biological products	Research, and aim to have increasing number and diversity of biological products in the future.	Very few. Not on the market yet. “working on the introduction of biological products” for fruits cultivation, and “soon we will launch biological products” for vegetables. ³ (https://www.cropscience.bayer.in/Products-H/Key-Crops/Fruits).	All products of Navdanya on the market are biological. Advertising for large-scale use of biological products. (https://www.navdanya.org/).
Research goals	Innovation. Scientific research and discoveries.	- Developing faster data return - improving efficiency and optimize resources - Reduce time to launch new products through AI	- Develop health per acre and nutrition per acre through agroecology methods.

³ Bayer India CropScience. “Key crops.” <https://www.cropscience.bayer.in/Products-H/Key-Crops/Fruits>, last Accessed April 26, 2023.

		(Bayer CropScience Limited 2022, 50-51). - high-performing, disease tolerant seeds (https://www.cropscience.bayer.in/Products-H/Key-Crops). - “indigenous development of eco-friendly, innovative and internationally compliant quality agrochemicals.” (https://www.cropscience.bayer.in/Products-H/Research-and-Innovation)	
Land productivity		Monoculture.	Polyculture (mixed crops)
Productivity Measures		Yield per hectare. Productivity. Profit.	Nutrition per acre. Health per acre.
Property Rights	Both function within a private property rights system at the merchandising level.	Private Property Rights. Patents.	Common property Rights on Seeds.
Shops:	Sell seeds and agricultural products.	Mainly through resellers, and online.	3 shops (Dehradun, Mumbai, and Delhi), and online (Marathe 2023).
Training & education	Both train farmers and scientists	From 2019 to 2021: - 100 Research fellowships for students - 10,000 youth trained to be future leaders in agriculture - 9,000 children benefitted by STEM learning (Bayer India 2022, 7)	Trained over 2,2 million women farmers across India since 1987 (Marathe 2023).
Women	Aim to increasingly empower women.	- “support” to women farmers. - Training to women farmers (Bayer	Idem.

		CropScience Limited 2022, 05)	
Goal of agricultural practices	Increasing agricultural productivity. Ensuring food security in India.	Focus on short-term productivity.	Emphasize importance of long term. “to leave something for the next generation” (Marathe 2023)
	Be financially and economically sustainable.	Food security. Profit. ‘Economic sustainability.’	Food sovereignty. Organization financially sustainable in time.
Official Climate change strategy	- Research climate resilience - reduce carbon emissions	“We are driving the fight against the climate crisis” (Bayer AG 2023b, 3) ‘Sustainability Corporate goals:’ “- Create inclusive growth and value added for society and our investors - Reduce our ecological footprint - Embrace responsible business practices along our value chain” (Bayer AG 2023b, 5)	“- [Breed] climate resilient seeds [...] - [increasing resilience through] diversity of crops [...] - biodiversity intensification [to decrease] excess carbon in the atmosphere [and increase] the resilience of soils to draught, floods and climate change.” - increase climate and economic resilience by the ability of farmers to replant their seeds after a climate disaster (https://www.navdanya.org/climate-change/seed-of-resilience).
Main strands of concrete climate change strategy		- Bayer AG carbon neutral by 2030. (Bayer AG 2023a, 10). - Research “climate resilient farm solutions (Bayer AG 2023a, 56) -2030 target: Reduce environmental impact of Bayer’s crop protection products by 30% (Bayer AG 2023b, 6)	- Collect seeds. - Breed climate-resilient seeds. - Protect and intensify biodiversity and diversity of crops (Marathe 2023; https://www.navdanya.org/climate-change).

A major issue in the epistemological study of Bayer and Navdanya stems from the diverging ways in which they measure their efficiency. Navdanya primarily measures its productivity in terms of nutrition per acre and health per acre while Bayer measures it with yield or crops per acre.

For Navdanya, this divergence is based on the argument that “when you turn a field into a monoculture, there will be more of that monoculture: that’s a tautological statement.” (Shiva 2023a, 57). Shiva argues that yield is not a comprehensive measure of agriculture systems efficiency: she emphasizes that, like growth, it only measures extraction and fails to measure the health of an acre of land, its ability to keep producing in future crops, or even its overall productivity (Shiva 2023a, 56-59). Thus, using these measuring tools, Navdanya presents biological farming as more productive (Navdanya 2022). Indeed, Navdanya highlights that smallholder farmers using biodiversity and their own seeds have a ten times higher productivity (Shiva 2023a, 44). Navdanya also emphasizes the higher nutrition found in agricultural products compared to intensive agriculture – i.e. 391% more keratin, 175% more potassium, 164% more zinc (Shiva 2023a).

Bayer AG’s approach to productivity seems rooted in a comparison showing that yield - from monoculture fields - is much higher in other countries and thus that it can be thoroughly improved in India, which would then increase food supply and potentially reduce hunger. Bayer highlights that India uses on average 307 g/ha of crop protection (pesticides) compared to 13 kg/ha in the United States of America or China (Bayer CropScience Limited 2022, 111).

The diverging tools that Bayer and Navdanya use to observe their results also shows that they have different goals: Navdanya focuses on preserving the biodiversity and the intactness of crops’ nutrition values; Bayer on heightening the quantity of food produced while maximizing human labor. A very simplified way to present it would be to say that Navdanya focuses on the fight against malnutrition and biodiversity loss, while Bayer prioritizes fighting undernutrition.

5. Analysis: from discourse observation to epistemological systems.

5.1 Bayer CropScience India.

Bayer’s practices focus on food security, with a notable emphasis on high yield of crops. This appears to be mixed with the goal to increase profit for investors. The omnipresent focus on both yield and economic productivity can also be linked to the goal of eradicating hunger, as

seen in Bayer's official vision: 'Health for all, Hunger for none' (Bayer CropScience Limited 2022, 11). Bayer's whole organization is based on the claim that hybrid/GM seeds and chemical pesticides create more yield than traditional practices. Indeed, Bayer's agricultural practices are based on the idea that "agricultural productivity is directly related to the input of crop protection" (Bayer CropScience Limited 2022, 111). Bayer's functioning is entirely focused on monocultures, a choice which is also rooted in the aim to switch agricultural productivity towards low labor intensity (mechanization).

These underlying assumptions in Bayer's episteme also explain why research forms an important part of the company's resources and activities, and it is interesting to note that Bayer appears to see progress as the "digitization and mechanization [of] agriculture" (Bayer CropScience Limited 2022, 13). These include drone-based technology to collect data, or the development of AI: research is notably turned towards developing climate-resilient farming methods, such as crops resistant to heat and requiring less water.

Bayer's goals also include longer-term development initiatives such as training, Food Chain Partnerships, to enhance the usefulness of Bayer towards farmers' challenges and to better accompany their customers in their needs. Bayer is also active in accompanying development in India with CSR initiatives aimed at reducing hunger, heightening education, or rural development initiatives. Bayer India also supported 1,000,000 front line workers throughout the COVID crisis (Bayer India 2022, 7).

The desirability of progress, understood as yield increase, technological intensification, and life quality improvements appear as a given in Bayer's episteme that determine the direction the company is taking in its development.

Bayer puts forward a centralized system where both knowledge and material means are held by the company and access to crops and research is restricted and granted to farmers based on money. This develops a dependence of farmers to Bayer's company which can be heightened by increasing number of patents privately kept within the company. This is set in capitalist assumptions that the division between labor and capital heightens productivity, and that private property induced competition boosts progress. This also reflects the division between the subject and object central to capitalist epistemes wherein each subject is supposed to defend its best interests and this individualistic competition is a catalyzer of growth. The individualistic vision of Bayer is also slightly reflected in the focus on individual stories in Bayer's marketing (Bayer AG 2023b; Bayer India 2022). Nevertheless, Bayer's system also includes some collectivization traits, notably in the collaboration with Farmer Producer Organizations in

which they encourage farmers to collaborate with each other in order to afford agrochemical equipment (Bayer CropScience Limited 2022, 3). These collectivization processes do not however hinder in any way the strict division of property between Bayer and farmers.

Bayer's one omnipresent goal is to increase yield, productivity, and profit. Bayer needs to have high yields so that farmers keep buying seeds and other agricultural products from them year after year, but the company must also ensure to generate profit in order for its shareholders to maintain their financial support. Bayer sets an emphasis on the values of accountability, or "transparent style of management and supervision" (India CropScience 2022, 60). Based on this relationship of need and dependence, relationships with partners, shareholders and consumers appear to be elevated to near-sacred heights. Bayer is set in an equilibrium between the need to make consumers dependent on them, and the necessity to maintain private property of knowledge in order to uphold its existence. This co-dependence explains the exclusive focus on industrially produced hybrid seeds and agrochemicals, without considerations of potential other solutions.

This co-dependence also makes it profitable to better the conditions of life, the security and health of the farmers. Ethical projects by Bayer have a non-negligible place in the company and take place as long as they do not hinder shareholders' interests and monetary investments. It appears Bayer develops a relationship with its consumers by being useful, notably through innovation, training centers, support, etc... but also by making it difficult to impossible to change. Bayer has been buying several competing companies and is approaching situations close to monopoly where the farmers would entirely rely on prices set by Bayer (i.e. Monsanto, Syngenta), which would shape the co-dependence between Bayer and its consumers in an economic power struggle increasingly biased towards Bayer.

The word *sustainable* is used in Bayer's reports with ambiguity alternatively to refer to environmental sustainability and financial or economic sustainability. This appropriately summarizes Bayer's search of equilibrium between the need to protect and increase financial value and profit for its investors, shareholders and stakeholders, and the necessity to keep up with progress and to face the challenges their consumers are confronted with – i.e. debt, climate change, yield... (Bayer CropScience Limited 2022, 12, 60).

5.2 Navdanya

Navdanya's agricultural practices are embedded in the idea that "spraying chemical pesticides kill the pest but also the predator of the pest which then leads to a super-pest" (Thernsjö 2018, 18). Furthermore, they emphasize the quantity of chemical pesticides which is not absorbed by the plant but remains in the air and the water, leading to modifications in ecosystems throughout the planet (Thernsjö 2018, 18). They view these changes as disruptions of the harmony of nature (Thernsjö 2018, 18).

One can notice that Navdanya's discourse is based on the idea that nature and natural processes are self-efficient, if not almost considered as sacred in the agricultural methods they use. Indeed, disruptions in the 'natural' cycle of biodiversity, or *nature's* (also referred to as 'Mother Earth,' 'Gaia') creations are understood as more than counter-productive but even as transgressions of a sacred 'cycle of life,' arguably to a blasphemous level (<https://www.navdanya.org/climate-change/contribution-of-industrial-agriculture-to-climate-change>). In such episteme, pollution is then understood as more than a nuisance, a danger or an externality: it is a violence towards beings, towards living organisms and 'Mother Earth,' and it is part of what can be understood in this episteme as blasphemous violence.

On Navdanya's website can be found a 'Universal Declaration of the Rights of Mother Earth'. It defines "Mother Earth" as an "indivisible, self-regulating community of interrelated beings" and emphasizes that 'Mother Earth' and "[its] children" – that is, all living organisms on earth - have rights Navdanya pledges to protect (<https://www.navdanya.org/earth-university/universal-declaration-of-the-rights-of-mother-earth>). This emphasis and personification of biodiversity is also understood in Shiva's statement "everything I need to know I learnt in the forest," as well as parallels between the protection of biodiversity and cultural diversity that both seem to be entrenched in the idea of biodiversity as a model, a teacher, in some ways similar to religious stories reflecting the image of a desired society to aim for (Shiva 2019; <https://www.navdanya.org/>). This also links to 'Earth democracy' and 'Earth Family as overarching values of Navdanya's epistemes (Marathe 2023). Amongst these values also is the desire to recenter attention around economies or people that are often sidelined: namely, the economy and productive power of biodiversity and of women's (reproductive) labor (<https://www.navdanya.org/eco-feminism>). Beyond a response to climate change and institutionalized sexism, this materialist ecofeminism re-appropriates and builds marginalized knowledge, economies, and activities into a desirable alternative.

Beyond Common Property Rights seems to appear the idea that seeds and products grown from the earth belong to the Earth, or to themselves, much more than they belong to humans. Linked to this is the belief that "life cannot be commodified," or at least should not be

(Shiva 2023b). This ideological premise also points out a specific relation between humans and agriculture wherein the wellbeing of all living beings is taken into consideration along with humans'. This discourse is notably framed in Navdanya's activism against GM crops and what they refer to as 'patents on life' (<https://www.navdanya.org/earth-university/ahimsa-shat-yantra>). A manifestation of this can notably be seen in the Common Property Rights Navdanya has set up for the seed banks and in the fight for free exchanges of seeds between farmers.

In terms of economic beliefs, this means that Navdanya considers reproductive labor and mechanisms as equally important to any classically productive process. This inclusive understanding is in tension with the realities of economic distribution and financial value given to the 'care economy,' or 'nature's economy'. Indeed, while fighting for a recognition of women's reproductive labor and ecosystems' inherent productivity, Navdanya does not reflect this value in monetary terms. This can appear as a discrepancy between moral value and economic values. This also raises the question of how value is given within the system Navdanya presents, if not through money? However, this refusal to give value through economic means appears to be rooted in a choice to function outside of monetary terms and economy (Shiva 2023b). This leads to identifying the underlying premise that setting a price, or internalizing reproductive labor within the capitalist economy leads to its exploitation, overproduction, and ultimately the destruction of its environment and autonomous sustainable productive power. Navdanya argues that economic growth as it is currently measured focuses on increasing very little of Earth's production by using and destroying a high and increasing amount of it, as such it is mainly associated with greed, not progress (<https://www.navdanya.org/earth-university/mother-earth>).

Beyond dislike, or even despise for capitalist economic systems and private property rights, this points towards a relative yet omnipresent fear of the capitalist economy and what it leads to. This fear is also linked to Navdanya's discourse against globalization, at least in the way it has been developed. One can notably notice how Navdanya seems to apprehend MNCs such as Bayer as neocolonial forms of power that perpetrate global inequalities and power imbalances. This position is also rooted in Navdanya's inscription within decolonial traditions and the framing of Navdanya in the tradition of Gandhi's satyagraha movement into "Jaivik Kranti – the Satyagraha for Life" (<https://www.navdanya.org/earth-university/mother-earth>). Navdanya's emphasis on autonomy and sovereignty reclaim Mahatma Gandhi's *swaraj* (self-rule) into food, seed, or water *swaraj* (<https://www.navdanya.org/earth-university/ahimsa-shat-yantra>).

Nevertheless, an important discrepancy can be found in Navdanya's anti-capitalist position as Navdanya functions from within the capitalist system, notably when selling products. Criticism of GM companies also points to another discrepancy: Navdanya demands accountability and transparency from GM companies such as Bayer, yet presents little accountability of its own activities and financial system. Navdanya claims that agroecology methods "double" farmers' incomes compared to agricultural methods using pesticides and hybrid/GM crops (Navdanya 2022). However, while studies and reports from Navdanya present the logic and modelling that leads them to such conclusion (Navdanya 2022), there is no publicly available and easily accessible report of Navdanya's agricultural, social or financial and economic activities or of its impact, and different studies tend to be contradictory. This lack of available data and accounting on the economic operations, CO2 emissions, and general impact of Navdanya's actions demonstrates a certain extent of double standard to which Navdanya differently holds itself and companies such as Bayer. This also points to a certain amount of discrepancy between discourse and accountability.

5.3 Comparison of Bayer and Navdanya.

The commonalities between Bayer and Navdanya appear so primary as to seldom be mentioned, yet they are fundamental: primarily the will to end hunger, research to improve climate resilience of agricultural products and of farmers, and desire to enhance quality of life in India. Bayer and Navdanya both identify a same myriad of societal challenges (women economic empowerment, agrarian crisis, hunger, etc) as well as environmental risks and disasters. They also both claim that adaptation (notably genetic) and innovation of crops, environment, and farming practices are necessary.

The divergence between Bayer and Navdanya mainly stems from the adequate response to food insecurity and environmental challenges: Bayer takes the way of laboratory research and produced seeds while Navdanya preserves and diversifies traditional seeds. This is rooted in a main epistemic difference between Bayer and Navdanya: the focus on man, specifically scientific man in one episteme, and biodiversity, Earth Family, in the other. While Bayer is set in an episteme where beliefs in the capacity of scientific man to save the world are infinite, Navdanya is set in an episteme where beliefs in biodiversity and 'Mother Earth's' ability to protect and sustain humans is unyielding.

These beliefs are also linked to the dependence Bayer and Navdanya respectively developed on scientific progress and biodiversity. Indeed, it appears Navdanya needs

biodiversity to sustain the existence of both the collective and the farmers who form that collective in a similar way that Bayer needs its shareholders. This parallel seems important to highlight that in the same way Navdanya sees biodiversity as sacred, Bayer's stakeholders and shareholders are necessary and thus to some extent sacred to the company's existence, although vocabulary of worship is seldom used.

Furthermore, both from within their epistemes, Bayer and Navdanya are quite oblivious of other methods' and systems' existence. That is for instance noticeable in Bayer's utter absence of mention of polycultures, or Navdanya's complete despise for industrial agricultural products and methods. This division is set in a lack of consensus on the productivity and efficiency brought about by chemical or biological pesticides, and hybrid, rDNA, or agroecological methods. As was seen above, proponents of both sides measure their efficiency differently, which in both cases frames the method they propose to be the most efficient one.

This division is also rooted in fear. Navdanya hates and fears chemical practices because they attack biodiversity which they see at an almost-sacred rank. Bayer fears and hates the way Navdanya is attacking the ground they are standing on by attacking its relationship to its customers. These lead to polarizing attitudes between the two epistemes Bayer and Navdanya stand in. These polarizing attitudes are a possible explanation for the lack of attention given to the similarities between the two epistemes. Such epistemic polarization is also creating a potential barrier on movement between the two epistemes, whether in the form of transition from one episteme to the other or development of a middle ground, notably in terms of agricultural practices where this can have a tendency to hinder mixed use of industrial tools and agroecology practices, but also innovative research on climate adaptation and mitigation inspired by both sides of the debate.

6. Discussion

6.1 The embedded epistemes from which Bayer and Navdanya's agricultural practices and beliefs stem from.

Bayer and Navdanya's epistemic confrontation can be understood in the debate of modernity and counter modernity. Modernity has been defined within ideas of "the world as open to transformation, by human intervention, [a] complex of economic institutions, especially industrial production and a market economy, [and] political institutions, including the nation-

state and mass democracy” (Giddens and Pierson 1998, 94). Bayer’s focus on progress, scientific innovation and GDP is indeed well explained by what Foucault has analyzed as the Modern episteme (Foucault 1994). Bayer’s anthropocentrism is characteristic of this modern episteme (Birkin and Polesie 2011, 245, 249). Bayer’s understanding of nature, or ecology as a whole is derived from Descartes’ ‘cogito, ergo sum’ in its division of the subject and the object that “[denies] intersubjectivity and social totality as the production site of knowledge” and where the ‘other’ can only be present in an “‘objectivized’ mode” (Quijano 2007, 172-173). This can be further understood via Quijano’s conceptualization of totality wherein Bayer is the center that produces all agrochemical products while farmers or biodiversity are the objectified ‘others,’ more or less so depending on their distance from the center (marginality) (Quijano 2007, 175-176).

Bayer’s claim to be “Driving the Fight against the Climate Crisis” (Bayer AG 2023b, 3) is set in the comparison with other MNCs similarly standing in the modern episteme. Bayer’s attempts to invest research and resources towards more corporate sustainability can also be understood as a step towards a ‘second modernity’. Such second modernity would gear towards research and progress increasingly focused on the challenges of climate change, and include flexibility and resilience in its modus operandi (Grunwald 2021, 3-4). This attempt to direct existing capitalist structures in the direction of long-term viability and climate resilience is entirely entrenched in the ideology of sustainable development. Nevertheless, while Bayer’s attention to climate change and its challenges is increasing, initiatives characterizable as part of a second modernity appear to this day to be marginal to the company’s processes.

Meanwhile, Navdanya’s refusal of what Quijano refers to as the colonization of imaginaries is set in a rejection of the modern episteme (Quijano 2007, 169). Further, Navdanya aims to create an alternative paradigm to what they identify as a modern neocolonial capitalist episteme that cannot sustain ecological transitions (<https://www.navdanya.org/2017-03-29-08-02-10/what-is-agroecology>). One of the ways in which Navdanya resists this colonization of knowledge is by refocusing attention to marginalized communities, in this case women.

Navdanya’s epistemic, economic and ecological commitment to creating an alternative is set in a counter modernist movement that criticizes the epistemic foundations of modernity for its instrumentalization of knowledge and capitalism to enhance exploitation of whole populations, and in particular biodiversity and women’s knowledge, diversity, and creation. Navdanya’s focus on a criticism of GDP and economic growth as measures of wealth place it amongst degrowth initiatives. Navdanya’s episteme is indeed characterized by its goal to exist

outside of a growth paradigm defined in terms of private property. Navdanya proposes an alternative economic system, and whether or not the new system leads to economic growth should not be a concern: whether or not it works in a sustainable way is.

Navdanya's postdevelopment socio-economic system can also be understood through lenses of Radical Ecological Democracy (*eco-swaraj*) (Kothari 2014, 37). Kothari outlines a framework for movements towards sustainable postcolonial societies in India. He insists on four pillars in *eco-swaraj*: a grassroots democracy molded in Gandhian inheritance; worker-owned corporations where workers have the power and the access to technology, knowledge and science; initiatives led by marginalized communities (notably women) to enhance social justice; and ecologically changing conservation paradigms, politics and epistemes (away from anthropocentrism) (Kothari 2014, 37).

Bayer and Navdanya's polarizing opposition is rooted in wider commitment to modern and counter modern epistemes, in direct relationship with the position they have in societal challenges in India such as hunger, the crisis of farmers' suicides, or climate change. The development goals of Bayer and Navdanya are often understood as in intrinsic opposition. The polarization of knowledge between Bayer and Navdanya's epistemes is reinforcing existing legislative and economic barriers to change in both directions. The position they defend vis-a-vis each other is reinforced by both organizations' needs to protect the interest of the epistemes they each stand in.

6.2 Informing ecological transitions in India

This research has found that commonalities and differences between Bayer and Navdanya are anchored in broader epistemic foundations. The question of climate change and ecological transitions remains to be answered, but first one must emphasize the limitations of this thesis, first and foremost regarding wider applicability. This research is based on case studies and the outline of epistemic premises on which they stand can only be valid in their regard. Nevertheless, because of the broader context in which the organizations at hand operate, the following section aims to unearth potential usefulness of this thesis' findings to transition studies in India, although further research is necessary to validate their accuracy.

Firstly, certain conclusions can be drawn regarding each case study internally. While remaining in the Modern episteme, Bayer's efforts to gear operations towards sustainable development can be intensified, and need to be if the company aims to face the climate crisis

head on. Nevertheless, one must keep in mind that Bayer is dependent on its need to satisfy all stakeholders, and that conflict of interests with company partners and shareholders might obstruct adequate action. In this light, it is interesting to note that – as far as this thesis can be aware – Bayer respects the Indian legal requirement to divest 2% of its profit to CSR. This could point towards legal pathways, subsidies, or other forms of support to facilitate and encourage timely transition to sustainable development within Bayer CropScience Ltd. (India).

Secondly, regarding the study of Navdanya, one can note how strongly concrete ecological initiatives are linked to the set of beliefs carried out by Navdanya. From perspectives of degrowth scholars and activists, the extreme prominence of Navdanya's consideration of biodiversity as alive, withholding rights of its own, and its sacred features suggest that enhancing relational and intrinsic value of nature⁴ can play a major role in transitions to similar post-development initiatives.

Lastly, although this thesis highlights a polarizing trend between the two epistemes at hand, one cannot be oblivious of the characteristics that Bayer and Navdanya share. Initiatives aiming to reconcile sustainable development and post-growth perspectives can build upon the common desire to end hunger, advance research, increase food security and farmers' gains. Taking together the strength, means, and advance of Bayer's scientific research and economic power with Navdanya's limited objectification of biodiversity and its consciousness of climate justice could enable new paths for food security and sovereignty in India as well as climate adaptation, mitigation, resilience, and justice.

7. Concluding remarks

This thesis has found that Bayer's episteme is characterized by its definition of progress as growth, and its co-dependence in equilibrium between shareholders and consumers that are more widely set in the Modern episteme's anthropocentrism and objectification of the 'other'. Navdanya's episteme is characterized by a sacred understanding of biodiversity and an attempt to recenter economies towards women and nature in the idea that their creations is merely unpaid work upon which the growth paradigm relies. The two organizations are set in a

⁴ Several scholars have outlined that the value of biodiversity can be divided in three strands: the intrinsic value refers to nature's value in itself and for itself; relational value refers to the importance given to biodiversity as a cultural conveyor in its relationship with humans and local communities; and the instrumental value is the worth of nature as a resource (Stålhammar and Thorén 2019).

polarizing tension rooted in the core beliefs of both paradigms. This thesis has outlined the strong differences in assumptions of Bayer and Navdanya, to conclude that the core values, as well as the entire hierarchic economic systems they rely upon, significantly diverge into two epistemes: one rooted in a wider understanding of Modernity and the other in post-development. This study can provide insights into the *modi operandi* of these two systems and the way they are facing the climate crisis in the Indian agricultural sector. These materials can be looked at both individually or in comparison with each other.

This thesis is highly limited by time, space, and resources: field studies were not possible, furthermore, the humanities perspective of this research makes it blind to nuanced financial and scientific information. Furthermore, the recommendations stemming from this research are based on case studies, and while this thesis hopes to add a stone to the research, further research on MNCs and post-development initiatives in India must be conducted to contend the results of this research for wider applicability. Avenues for future research also include ways to build from the epistemic commonalities outlined here into potential pathways from one episteme to the other. Research on the effectiveness and environmental sustainability of both Bayer and Navdanya's practices could also enhance understanding of the societal, economic and agricultural changes necessary to build a more prosperous sustainable society in India.

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