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# Environmental Education in Post-green Revolution Punjab

Qing Fan  
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## ENVIRONMENTAL EDUCATION IN POST-GREEN REVOLUTION PUNJAB

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## Abstract

*In India, environmental education (EE) became compulsory for Classes I-XII nationwide in 1991, with curricula designed by central and state governments. Meanwhile, in the interest of food security, the government-promulgated Green Revolution of the 1960s brought about commercial agriculture practices have led to environmental degradation, with negative impacts on farmers' livelihoods. This paper presents a case study in a rural region in the state of Punjab, the heartland of the Green Revolution. Through interviews with students, teachers and community members as well as a review of school curricula, it seeks to understand how EE in schools is impacting the perceptions and aspirations of the community's younger generation with respect to the community's agricultural and environmental linkages, problems and future. It is found that although EE in Punjab touches upon locally relevant concerns, in the context of ingrained societal attitudes and the wider body of school curricula, it does not compel any meaningful initiative or change on the part of the students. While education is commonly seen as an important medium for human, societal and economic development, EE is part of an education system, taking part in a feedback loop with broader societal values which may not be aligned with sustainable development.*

## **Introduction**

### *Modern Agriculture and the Environment*

Mainstream agricultural development in India has emphasized ecologically unsustainable practices that produce short-term returns. In the 1960s, the drive for agricultural self-sufficiency prompted the Government of India to promote the Green Revolution, introducing high-yielding hybrid grain seeds and chemical inputs; it also led to monoculture that disrupted local self-sustaining agricultural-ecological systems, resulting in the loss of ecosystem services that sustain agriculture in the medium- and long-terms (Shiva, 2003).

As a result of the loss of natural fertilizers, pesticides, and seed production, as well as the desire for increased efficiency, this commercial agriculture renders farmers dependent on market inputs. Although the government has provided subsidies for chemical fertilizer since the start of the Green Revolution, the pursuit of neoliberal policies in the 1990s and 2000s led to a steady decrease in fertilizer subsidies from 3.2% of GDP in 1990-1991 to 0.69% of GDP in 2003-2004 as well as decreased lending by formal credit institutions in rural areas, impacting small farmers the most. Marketization has also increased prices of inputs, including water. Meanwhile, prices of agricultural outputs have not increased to make up for the differences. Government-sponsored missions to promote the cultivation of cash crops have instead made farmers further vulnerable to volatile global market prices, while draining the natural resources of areas whose environments are not suitable for those cash crops.

In addition, lack of funds has meant that farmers have resorted to coping with increased input demand and scarcity through low-cost but further unsustainable methods. Thus, even as small farms are still “increasingly moving from a system of farmers’ own-resource-based subsistence farming to purchased-input-based intensive commercial farming”, the combination of interlinked environmental, political and economic pressures makes the new system

unsustainable. The result has been widespread farmer debt: in 2005, almost half of farming households in India were indebted. A study has found that indebtedness, crop failure, input misuse, and the incompatibility of crop cycles with local rainfall patterns were leading causes of farmer suicides, while a survey of households of farmers who had committed suicide “had taken to mono-cropping of input-intensive, non-food, commercial crops... but the crops failed due to inadequate water” (Reddy and Mishra, 2008). Thus, in agricultural livelihoods, environmental, economic and personal well-being are deeply interconnected.

### *The Case of Punjab*

Due to its favorable agricultural conditions, Punjab was chosen to be the state where the Green Revolution would begin in the 1960s. By 1983-85, 95% of land in Punjab under foodgrain cultivation was under high-yield variety (HYV) seeds, compared to 54% in all of India (Jodhka, 2006). From the start of the Green Revolution until the early 1990s, the area of degraded, barren, uncultivable, saline and waterlogged land in Punjab reduced significantly, due to the installation of tubewells as well as the economic incentive that the new, profitable crops provided to “reclaim degraded land” (Chand, 1999). As a result of the gains from the Green Revolution, Punjab became one of the most prosperous states of India.

However, beginning in the 1980s, agricultural yields began to stagnate, while input costs increased (Singh, 2000). In the 1990s, Punjab’s growth rates of both agricultural output and the economy as a whole fell below the national average for the first time since the Green Revolution (Chand, 1999). Decreasing returns and the need for more inputs has put Punjabi farmers in debt: as of 2005, 65% of Punjabi farmer households were in debt, and Punjab had the highest average outstanding debt per farmer household among major states. Furthermore, 52% of this debt was owed to non-institutional sources, which are prone to usury. By the agricultural year 2014-2015,

according to a survey, the proportion of land-owning farming households under debt had increased to 85.9% (Singh, et. al. 2017). Thus, Punjab has also seen its share of farmer suicides (Ghuman, 2008).

One component of modern agriculture in Punjab is the intensive use of chemical fertilizers, or urea, and chemical pesticides. Apart from the chemical inputs' contributions to yields and farmer debt, chemical-intensive agriculture has also been linked to public health in Punjab, especially in the Malwa region of southern Punjab, where this study is located. According to Mittal, et. al. (2013), the Malwa region heavily uses pesticides. At the same time, "the region has been described as India's 'cancer capital' due to abnormally high number of cancer cases, which have increased 3-fold in the last 10 years". Studies show strong correlation between pesticide use and cancer, via contamination of groundwater and above-acceptable levels seeping inside vegetables (Kochhar, et. al., 2007; Thakur, et. al., 2008; Singh, 2008; Mittal, et. al., 2013). Also associated with excessive pesticide use are mental retardation and reproductive disorders, which have also increased in the Malwa region (Mittal, et. al., 2014). Government health care is scarce in rural areas, and the cost of cancer-treatment drugs are often beyond people's means, creating another source of debt (Ghuman, 2008). Although the high incidence of cancer in Punjab has multiple causes, including industrial pollution, pesticide use is one prominent cause over which farmers should have direct control.

Another aspect of agriculture to emerge in Punjab after the Green Revolution is the wheat-paddy monoculture system, in which farmers grow paddy during the kharif season and wheat during rabi season. Punjab traditionally grew a variety of crops, including maize, pearl millet, pulses and oilseeds; however, the Green Revolution introduced high-yielding hybrid seeds for wheat and rice, and in 1966-67, the government began to offer farmers Minimum

Support Prices (MSP) for wheat and rice in the interest of food security. Hence, as wheat and paddy cultivation became both lucrative and low-risk, wheat-paddy monoculture rose as the dominant system. The percentage of land under paddy in Punjab increased from 6.9% in 1970-71 to 33.8% in 2005-06, while the area under traditional crops now stands at 2-3%. Besides implications for biodiversity and ecosystems, for some parts of the state, the new system has led to a rapid decrease in the water table, as paddy cultivation is water-intensive. The government of Punjab enacted a law to restrict paddy sowing times such that cultivation takes greater advantage of monsoon rains and relies less on drawing groundwater. Although the law has decreased the rate of water depletion, less time between paddy and wheat harvests has led to other problems for farmers. Farmers are aware of the water issues and crop diversification programs exist, but according to the agriculture commissioner of Punjab, farmers are now so attuned to the incentive of MSPs that other crops without MSPs are not attractive to them (Sood, 2014).

Another consequence of the wheat-paddy system is stubble burning, which has caught national and international attention in recent years. Since wheat and paddy are harvested by cutting the crop, after harvest, the bottoms of crops remain in the fields. This straw stubble can be sown back into the soil with benefits to the soil, but this requires time and great effort. In order to save resources and have the fields ready in time for sowing the next crop, many farmers burn their fields to eliminate the stubble. This practice, especially when done by Punjabi farmers en masse, causes massive air pollution that affects not only local areas, but as far as Delhi. The heat from the burning also kills beneficial organisms in the soil. Stubble burning has been banned in India since 1981 (Mukerjee, 2016); however, only recently has enforcement been vigilant enough to be potentially compelling to farmers. Although technologies exist to make alternatives to stubble burning possible, such technologies are too expensive for many farmers

(Anand, 2016). The roots of the stubble burning problem lie in the wheat-paddy system. According to one farmer in Punjab interviewed by *The Indian Express*, “Our forefathers never used to burn the stubble.... They sowed bajra, guar, sunflower. So straw management was easy with these crops. But now these crops have no market value and hence we are focusing on wheat-paddy cycle. Hence stubble burning is inevitable unless we are given some compensation to go green” (Jagga, 2017). Thus, again, farmers feel obliged to follow market forces and economic incentives, at the expense of their land and the environment.

In terms of the physical environment, researchers summarize the effects of agriculture in Punjab as: land waterlogged by the rising water table in some parts of the state, declining water table in other parts, “nitrate pollution and excessive chemicalization of soils and rising deficiency of micro-nutrients” which are associated with increase in weeds, pests and diseases, and heavy air pollution from the burning of straw left after harvest. The soil problems can be alleviated only by “increasing organic matter in the soil”, such as animal dung and green manure (Chand, 1999). On the human side, Ghuman (2008) attributes farmers’ decreasing incomes primarily to “a depleting water table, the ever-rising use of fertilisers and pesticides, over-mechanisation, declining fertility of soil, and almost stagnant minimum support prices (in real terms)”.

Hence, practices in the pursuit of agricultural yield in India, and Punjab specifically, have directly resulted in environmental degradation, with consequences for farmer health and livelihood. While education is seen as a crucial means to economic development and community empowerment, governments and development organizations in India and internationally have recognized the need to incorporate sustainability into education. Environmental education is one manifestation of this effort that has taken root in India.

*Environmental Education in India*

In India, the case for environmental consciousness and protection has been made by Gandhi and classical Hindu texts. However, it has mostly been international influences and the discourse of global environmental issues that pushed India to begin emphasizing environmental education (EE). The 1972 UN Conference on the Human Environment in Stockholm, in which EE was a key issue, motivated the adoption in 1976 of the 42<sup>nd</sup> Amendment to the Constitution of India, which made environmental concern a directive principle for the Government as well as an obligation for Indian citizens. Meanwhile, EE gained increasing traction as a possible solution to India's development-related environmental issues (Iyengar and Bajaj, 2011).

EE became a widespread reality in India in the late 1980s. The 1986 National Policy on Education, formulated by the Ministry of Human Resource Development (MHRD), stated that "there is a paramount need to create a consciousness of the environment.... Environmental consciousness should inform teaching in schools and colleges. This aspect will be integrated in the entire educational process." The 1988 National Curriculum for Elementary and Secondary Education recommended that EE was to be implemented in schools through the "infusion" approach, in which environmentally relevant material was incorporated into the curriculum for traditional school subjects instead of creating independent courses. This was based on the rationale that the environment is present in all aspects of society and that studying it requires tools from various disciplines. Accordingly, the National Council of Educational Research and Training (NCERT) developed textbooks for traditional subjects that included EE, which state governments translated and reprinted for use in their schools (Iyengar and Bajaj, 2011).

In 1991, environmentalist M.C. Mehta filed a Public Interest Litigation to make environmental education compulsory in all schools and colleges in India, and the Supreme Court issued a directive to implement this (Iyengar and Bajaj, 2011). In 2005, NCERT published the

latest National Curriculum Framework (NCF), which recommended that “science be placed in the wider context of the learner’s environment, local and global, enabling him/her to appreciate the issues at the interface of science, technology and society, and equipping him/her with the requisite knowledge and skills to enter the world of work”. This NCF gave provisions for EE to touch upon social issues such as poverty, gender, caste and inequality as well.

Although the NCF provides curriculum guidelines for all states, in the case of EE, each state’s board of education has the choice to (1) completely adopt the NCF curriculum, (2) prepare its own syllabus that accounts for the state’s environmental conditions, or (3) allow individual schools to determine the details of their EE curricula. Furthermore, for its students to be eligible for university admissions, secondary schools may follow either the state board syllabi or that of the Central Board of Secondary Education (CBSE) (Iyengar and Bajaj, 2011). Thus, although EE is compulsory and the NCF applies nationally, the curriculum and implementation still varies by state and even by school. In Punjab, the Punjab School Education Board (PSEB) has chosen to deviate from the central EE structure and syllabi. As in the central syllabi, PSEB schools teach Environmental Studies for Classes III-V and infuse environment-related material into science, social studies, language, and other subjects for Classes VI-X. The main difference is that for Classes XI and XII, Environmental Education is a compulsory separate subject for all students, regardless of stream (PSEB, 2017).

Much of the literature on EE in India has found that the infusion method has led to incoherent and unconvincing messages (e.g. Pande, A., 2001; Pande, L., 2002; Siddiqui and Khan, 2015; Sonowal, 2009). Furthermore, it has been found that EE in India is generally oriented towards global and urban environmental issues, despite the environmental concerns in Indian rural areas, forests, and other more remote areas. Examples given by Pande (2002) reflect

three ways in which the standard EE fails to empower students to incorporate environmental issues into their thoughts and actions:

- (1) Contradictory lessons through the infusion approach – “standard textbooks on agriculture emphasize the use of pesticides and how they have increased production. However, elsewhere, the harmful effects of pesticides are enumerated. Such conflicting messages are unlikely to alter behavior.”
- (2) Giving impractical lessons that ignore the roots of the problems – “in science textbooks deforestation is cited as a major problem and students are advised to plant more trees. However, this advice is somewhat simplistic. Where are the saplings to be planted? What species? Where will the seeds and saplings be obtained? How will they be protected from cattle or fire?”
- (3) Emphasis on topics which students are not able to truly comprehend or act on, at the expense of more relevant issues – “To a child who has never left Uttarakhand or his village, where only one or two buses pass each day on the nearest road a few miles away, addressing the issues of vehicular or industrial pollution will only encourage memorization.”

Sonowal (2009), citing environmentalist Ramachandra Guha, offers a possible explanation for these contradictory and abstract EE lessons: “according to [Guha] our environmental perceptions are largely determined by Euro-American perceptions and this is the biggest barrier to effective EE in [India].” This view is consistent with the alignment of the beginnings of India’s EE with international discourse on EE and education for sustainable development. In addition, it suggests that India’s EE curriculum, like the industrialization of agriculture, is rooted in a development paradigm that tries to emulate the industry and economic growth of the developed countries,

which conflicts with local realities and with environmental sustainability itself. The presence of philosophical biases to EE is further suggested by the observation that while the central government has promoted EE since the late 1980s, the contextualization of EE has varied from one administration to the next: while the BJP was in power, the 2000 National Curriculum Framework put EE in the context of ancient Hindu philosophy, whereas under Congress rule, the 2005 National Curriculum Framework emphasized the socioeconomic aspects of the environment and linked EE to sustainability and human rights (Iyengar and Bajaj, 2011).

The findings of Iyengar and Bajaj (2011) highlight the shortcomings of the most recent national EE curriculum in making students aware of the environmental issues in their own contexts. The paper notes that the 2005 National Curriculum Framework “mentions that the content [of EE] should reflect the day-to-day experiences of children and their lived realities. It acknowledges that the child’s community and local environment form the primary context in which learning takes place, and in which knowledge acquires its significance.” In this case, EE in a place like Bhopal, Madhya Pradesh, which continues to suffer from the aftermath of the 1984 gas tragedy, should educate students on the social, economic and environmental dimensions of environmental disasters. However, through analyzing the EE syllabi of Madhya Pradesh, which chose to adopt the NCERT EE curriculum with minimal modifications, Iyengar and Bajaj found that EE in Madhya Pradesh is mostly natural science-oriented and focuses on waste management, with “little to no reference (in required textbooks) to the Bhopal gas tragedy and the role of human-made or natural environmental disasters”. Furthermore, “environmental citizenship, along with values and ethics that tap into the more sociopsychological aspects of EE, were the least referenced theme.”

To the problem of misplaced emphases, Sonowal also offers the direction for a solution: “[Guha] emphasizes that [only] if the environmental educationists begin to listen to the authentic voice of the poor, the displaced and the discriminated against, can we hope to create more effective EE.” In this vein, the environmental education program started in 1987 in Uttarakhand by the Uttarakhand Environmental Education Centre (UEEC), under the auspices of the Uttarakhand Seva Nidhi and the Environmental Orientation to School Education (EOSE) program to “supplement the effort at national and state level by a more intensive locale-specific effort”, illustrates the potential of EE that is thoroughly grounded in the philosophy of EE by and for the grassroots. In Uttarakhand, the replacement of indigenous oak forests with “a monoculture of commercially useful trees” was disrupting local biodiversity, soil, and water systems. For agricultural communities, this meant decreased crop yield, scarcity of water, fuel wood and other forest commodities, migration of men to cities, and increasing burden on women who are left to tend the fields and who must walk increasingly far distances to obtain water, wood, etc. (Pande, L., 2002). Despite the state government’s effort to build schools throughout the state, girls often dropped out to help their mothers (Pande, A., 2001). The UEEC-designed locale-specific EE courses place students directly in the local villages, where women and elders were requested to serve as sources of information. Students go to these “study villages” to gather data, which they then turn into an overview of the village. From there, they create “a plan for restoration and improvement of the productivity of the village ecosystem”, which is then “discussed with the local community.” Curriculum design specifically incorporated “environmental and livelihood issues that had been raised by women’s groups in the area”, and UEEC encourages community members to question students and schools about their work (Pande, L., 2002).

In line with the program's overarching philosophy, the UEEC initially intended for experienced local teachers from the villages to develop course materials. However, the UEEC found that "the mass media and standardized textbooks that deal with urban and industrial problems influenced teachers' perceptions; although important, these issues lack relevance in rural areas like Uttaranchal... Further, many teachers and principals were not conversant about simple ecological concepts" (Pande, A., 2001). Hence, the UEEC abandoned this plan and created its own course materials and teacher training program. Sonowal (2009) reports that the UEEC's five-day training for in-service teachers was highly effective in reorienting the teachers' attitudes towards the environment, EE, and the community's problems. For example, in the area of "problems faced by villages at present", teachers' views changed from "poor roads and transportation, unemployment, health care and lack of educational facility" to "added the dimension of man made environmental degradation leading to deteriorated life support"; in the area of "means for higher yield in cultivation", views changed from "use of chemical fertilizer, irrigation, new crop varieties and use of machineries" to "clear about non-suitability of such means in steep hilly areas and emphasizing on... biofertilizers etc. within the village"; in "means of development of villages/rural areas", views changed from "setting up industries by government, computer training etc." to "community involvement in planned village management of support area and related resources increasing self-sufficiency"; and in "outcome of EE", views changed from "it is unimportant subject, not much help for future career and academic life" to "a larger part of them are highly ambitious about the positive outcome whereas some still think that EE... alone cannot bring changes as the problem has many faces deeply rooted into our present-day political and social environment".

The UEEC's EE courses were met with enthusiasm from students and schools (Pande, L., 2002). The state government decided to extend the course to all 3,700 schools in the state and to make the course an optional subject for Grades 9 and 10 (Pande, A., 2001). Thus, Uttarakhand became the only state in India to have EE as a regular subject up to Grade 8 (Sonowal, 2009).

However, such practical, grassroots-inspired EE programs continue to be the exception rather than the norm. In addition to shortcomings of EE curricula, multiple authors also mentioned two other challenges to effective EE in India: (1) students, teachers, and state governments often place low value on EE due to its relative absence from important examinations, and (2) teachers are often not sufficiently trained to impart EE. In light of the updated EE syllabi approved in 2010 and the continuing commercialization of agriculture, it remains to examine the feedback, at present, between EE and the young generation in affected communities.

### *Research Question*

This one-month project will be a case study of an area in Punjab where unsustainable agriculture (e.g. chemical-intensive, monoculture-based, cash-crop based, genetically modified, not suitable for local conditions) was initially lucrative but, since then, has negatively impacted the local natural environment, with visible consequences for farmers' livelihoods. In such a community where agriculture-driven environmental degradation and state-driven environmental education occur simultaneously, I will seek to understand whether, and in what ways, EE is helping students comprehend the environmental issues in their local context and empowering them to address these issues. How do the youths who attend school, especially children of farmers, perceive the community's problems based on what they are taught at school about environmental sustainability and agriculture? Does EE make students aware of the problems that

have come about due to modern agriculture? To what extent does the “world of work” for which, according to the 2005 NCF, EE should prepare students, include agricultural livelihoods?

Through surveying the national and local EE curricula and through interviews and observation, I will seek to gain a qualitative understanding of these questions.

## Methods

This study mostly focuses on the farming communities surrounding the town of Jaito, Faridkot district, Punjab. In these villages, most farmers primarily grow wheat and rice using chemical fertilizers and pesticides. The area is part of the Malwa region, where cancer rates are high. According to locals, different villages in this area largely have very similar agricultural conditions and concerns, so research sites and participants were not limited to any specific village or school. In addition, two participants come from the Barnala district of Punjab, which is also a largely agricultural part of the Malwa region, with chemical use and cultivation of wheat and paddy being the norm.

In this qualitative study, interviews were the primary method of data collection. Interviews were sought first with local teachers of EE or environment-related subjects, with the aim of finding out (1) how the school implements EE, and how closely it follows the state board's curriculum, (2) if the school has made any deviations from the state board's curriculum, what the reasons for the deviations are and how they were decided upon, (3) what EE-related training, if any, the teachers received, (4) what the interviewees personally believe EE in their school should be like and what impact it should have on students and the community, and (5) what challenges, if any, they perceive in teaching EE.

Then, interviews were conducted with local youths, particularly ones belonging to agricultural households, to seek their perspectives on (1) what they have learned from formal EE in school, (2) what they have learned about the environment, their local ecosystem, and agriculture from their families and community, (3) what they perceive to be their community's challenges and the sources of those challenges, (4) what they think the future of the community will look like and what they want it to look like, (5) what their plans for their own future are, and

(6) what, if any, changes they will try to make to how their families or other agricultural households in the community practice agriculture.

In addition, I sought interviews with older farmers, to find out their perspectives on (1) how agricultural practices have changed during their lives, the causes of these changes, and what their opinions on these changes are (2) how returns to agriculture have changed during their lives, (3) how they see the environment (including soil, water, biodiversity, climate) as impacting agriculture and vice versa, (4) what they would like to see for the future of their community, and (5) what their opinions are on the agricultural competence and economic prospects of the community's younger generation. From these perspectives, I would analyze the ways in which understandings of agriculture, the environment, and livelihoods have changed across time, generations, and educational experiences. Then, I would be able to isolate to some extent the impacts of EE and of the normalization of industrial agriculture.

In seeking out teachers and (former) students to interview, I wished to reach out specifically to children of farmers who might continue to be farmers on their families' land, and their teachers, since their responses would give more meaningful insight as to the knowledge and attitudes of the next generation of farmers, as shaped by school education, and their potential impact on the local environment and communities. To this end, I placed myself in a predominantly agricultural village, namely the village of Chaina near Jaito. I learned that most of the village's children attend the local government school, which offers up to Class X. For Classes XI and XII, students take the bus daily to the government senior secondary schools in Jaito, where students from other nearby villages also attend. I interviewed some of the teachers and principals of these schools. Since neither school had a specialized environment teacher, I

interviewed multiple teachers at each school, among whom at least some were connected to environmental education.

Although I also intended to seek interviews from students at these schools who were 18 or above, I discovered that since it was the beginning of the school year, no students had yet turned 18. Thus, interviews with youths of age 18 or above were sought at a college in Jaito whose students were locals, as well as in Chaina and another nearby village, Dabrikhana. Interviews were conducted with a total of 16 young people, aged 18-24, of whom five are the children of practicing farmers, another five come from families in which their parents recently left agriculture and ties to farming through relatives and home villages still exist, one from a landowning family that earns income through leasing their land to farmers, and five without ties to land or farming.

In addition, five farmers were interviewed: three farmers who practice commercial farming, one who has converted to organic farming, and one who practiced chemical agriculture when he was in charge of the farm, but whose son has since converted the family's land to organic. Besides these formal interviews, permission was obtained to use the contents of informal conversations with two organic farmers in this research.

Each of my interviews were semi-structured, in the sense that I began by asking broad questions and let the interviewee's responses determine my subsequent questions and topics of discussion. In this way, the interviewees could draw attention to what they see as the most notable aspects of EE and of their lived experiences in their own community. In most cases, this also meant interviewees were not prompted with specific ways in which agriculture is unsustainable, so that it is possible to evaluate what issues they really think about. Most interviews were conducted in the presence of a Punjabi-English translator.

Alongside the interviews, I independently assessed the curriculum for EE and related subjects, as published by the school boards. In Punjab and in this region, my focus was on the PSEB state syllabus and on schools following this as opposed to CBSE or international board syllabi. This choice arises from the assumption that, as Iyengar and Bajaj (2011) suggests, schools following CBSE EE curricula will not impart very much locally useful environmental knowledge and skills. I also suppose that students studying at a CBSE school are less likely to stay in their rural community after finishing their studies, so their views towards their community's problems are perhaps less meaningful for understanding the impact of the next generation on the community. Still, a few of the students interviewed did attend CBSE-affiliated schools, as will be discussed in later sections.

PSEB makes syllabi for Classes VI-XII, as well as textbooks for some subjects and classes, available online. I reviewed these syllabi and textbooks, paying special attention to agriculture-related material, and what the curriculum teaches about agricultural productivity, sustainable agriculture, the role of the ecosystem in agriculture, groundwater, irrigation, and soil, the Green Revolution, and the environment in Punjab specifically. Furthermore, I sought to understand the curriculum's philosophies and ultimate goals (e.g. environmental sustainability, science and technology, rural development, prepare students for urban work). By examining the EE curriculum, I attempted to gain an understanding of the ideas and skills cumulatively imparted by EE in the state as well as the process through which the state board intends to shape students' environment-related views and skills over time.

Finally, I synthesized the curriculum review and the perspectives gained through interviews. I compared the perspectives of each group of interviewees to each other and to third-party information on agriculture and the environment in this location.

My interviews and other aspects of this project did not involve any potential physical or psychological harm to participants. Interviewees were restricted to age 18 and above. The research did not involve any form of deception of participants, nor did it raise sensitive topics. Participation was voluntary and it was made clear to each participant that they could refuse to provide any information and could terminate the interview at any time. In this paper, all participants have been given pseudonyms to maintain their anonymity.

Limitations of this study include potential miscommunication due to translation, the lack of rigorous methodology in analyzing syllabi, textbooks, and interviews, time constraints during interviews that were self-imposed to be respectful of the interviewees' work, studies, and rest, and the researcher's lack of expertise in local conditions and in environmental and agricultural topics.

## **Findings**

To critically examine the philosophy, contents, and outcomes of EE, it is necessary to note the pre-existing knowledge, perceptions, and attitudes in students' environment, which inform the way students process and interact with school-derived learning. This section first presents findings on what the community at large knows or believes about agriculture and the environment, as well as its own philosophy towards agriculture, as found through interviews with farmers. A review of EE and related curricula as prescribed by PSEB, as well as the realities of implementation in schools and perspectives of teachers, follow. Finally, students' attitudes, what students learned from their school education, and how they have acted in relation to that knowledge are presented.

### Community Knowledge, Perceptions, and Attitudes

#### *Co-evolution of Agriculture, Lifestyle, and Values*

As the Green Revolution took root in Punjab, the changes in agricultural practices and the associated socioeconomic changes led to shifts in lifestyle, values, and aspirations among farming communities. Manvir, a farmer born in 1956, recounts that the traditional pre-Green Revolution method of farming involved few expenses and was dependent on nature. There was less sickness, so medical expenses were smaller, and people made their own clothes. When the government began to promote the new way of farming, farmers were opposed. Many people said urea was harmful, and that 40 years of using it would destroy one's land. Thus, initially, few farmers followed the government's advice. However, as these first chemical farmers were seen to achieve good yields, gradually, more farmers became receptive to the new ways. Still, farmers initially used very small amounts of urea and only for select crops. The amount used gradually

increased, as people came to expect that urea leads to better yield (personal communication, 29 April 2017). Other farmers mention the influence of agricultural universities and agrochemical corporations, in the increasing chemical use (personal communications, 19 April 2017).

Eventually, chemical inputs, market-derived seeds, tractors, and tubewells became the norm.

As incomes rose due to the new mode of agriculture, people began to put more emphasis on studies (personal communication, 29 April 2017). The story of Amrinder, who was born in 1984 and whose family owns 36 acres of land, illustrates the mindset and lifestyle changes that went along with this shift. Amrinder's father was a farmer, but the family leased out the land and moved to the town for Amrinder's education. After finishing school, he worked as a life insurance agent. He bought a nice car, and for his child's primary schooling, he sent him to an English-medium, British board residential school, where students are taught French but not Punjabi or Hindi. The yearly fees were three lakh rupees. When asked why he sent his son to such a school, Amrinder replies that it was a "status symbol", and in fact, Punjabis in general became interested in status symbols after the Green Revolution gave them wealth (personal communication, 27 April 2017).

### *Conventional and Organic Farmers: Problems, Solutions, and Future*

In recent years, a small number of farmers in Punjab have adopted organic farming as an alternative to the dominant chemical-based wheat-paddy monoculture. Interviews with organic farmers and conventional farmers suggest that, even among contemporary farmers, different modes of farming are associated with different attitudes and values. Conventional farmers linked farmers' welfare to finances and government. According to Jagga, a conventional farmer with eight acres, increased use of technology and agrochemicals have raised yield but also expenditures. Meanwhile, though the MSPs for wheat and rice have remained fixed, inflation has

increased the prices of other commodities. Thus, it is now more difficult to meet one's needs.

Govinder, another young conventional farmer, says he feels deeply connected to agriculture.

However, as earnings have decreased and expenditures increased, farming can make ends meet but cannot provide financial security or any luxury. Thus, he is seeking a job to add to agricultural income.

The conventional farmers interviewed were aware of the harms from their mode of farming. All three of the conventional farmers interviewed mentioned without prompt that agrochemicals cause diseases; in fact, ailments ranging from joint pain to poor eyesight to heart disease to cancer are attributed to the chemicals. Some farmers even call the chemical inputs *zahir*, or poison (personal communication, 19 April 2017). In addition to health effects, Govinder mentions that chemicals are decreasing soil fertility. Jagjeet, the third conventional farmer, says that companies have manufactured new pesticides that can be used in smaller quantities, but are more harmful because they are stronger and remain in the soil for longer time. Farmers use too much water to grow paddy, so groundwater is depleting. He is also aware that stubble burning causes respiratory problems, burns eyes, kills beneficial insects and degrades the soil (personal communication, 24 April 2017).

However, all three conventional farmers expressed helplessness in acting on these issues. Despite knowledge of the organic alternative, they say that organic farming decreases yields and does not make enough money. Although not burning wheat stubble increased the yield of his next crop, Jagjeet says he will continue to burn his paddy stubble for lack of alternatives. Jagjeet emphasizes that despite knowing the problems farmers are causing, they have to continue these practices to earn their livelihood. Thus, when he attends agricultural fairs, he looks for chemical inputs that can help him increase his yields.

Jagga believes that the land and agriculture are both fine, but politics is the root of the problems: there is corruption in infrastructure and agricultural subsidies, people are pressured to vote for the party in power, and government policies lead to inflation, making agriculture very difficult. The other two conventional farmers also placed the blame and imperative to act partly or wholly on the government; suggested solutions included raising the MSPs of wheat and paddy, changing the price structure to give farmers incentives to farm differently, implementing regulations, and providing subsidies. Govinder says he would like to switch to organic, but would only be able to if government policies were favorable.

Due to these financial and political issues, Jagga says that life is hard in Punjab, and he would like his child to go abroad. He has sent his son to private school, where he hopes he will learn everything about society and how to speak good English. Since he does not want his son to be a farmer, he does not teach him about farming. Jagga says organic farming would not allow him to pay his son's private school fees.

In contrast, conversations with organic farmers led to discussions of lifestyle. Amanjot, the organic farmer who was formally interviewed, splits his family's five acres of land with his brother. Ten years ago, he converted his share to organic. When asked about the relationship between farmers and the environment, Amanjot's immediate reply was "agriculture is life". Chemicals affect everything; if people continue to use them, diseases will proliferate. On the other hand, nature has created sustainable systems that perform the functions of the chemicals. Amanjot would like the next generation to keep practicing agriculture, and specifically organic agriculture. Thus, he believes schools should teach farmers' children about agriculture, and teach it as a practical subject. However, he says, schools are simply teaching students how to earn

more money. Amanjot believes that the only solution is organic farming; thinking about money or yield “will not save us” (personal communication, 19 April 2017).

Amrinder, who became an organic farmer five years ago after taking back 26 acres of his family’s land, also places the roots of the problem in farmers’ mindset. Though he agrees that organic farming earns less revenue, the lower expenditures balances out so that he earns the same amount as he would from conventional farming. In his experience, conventional farmers may know this arithmetic, but the dominant mode of farming is so ingrained in them that they are afraid even to try a new crop, let alone switch to organic. For him personally, working on his farm in nature-aligned ways led him to reevaluate his needs. He sold his car, and brought his son back to live at home and attend a local day school. To spur his children’s interest in farming, he takes them to the farm with him during school holidays. His family is building a house on the farm and will shift there from the town once it is complete (personal communication, 27 April 2017).

### PSEB Curricula, Schools, and Attitudes of Teachers

#### *EE and Related Subjects in PSEB System*

In Punjab, government schools and some private schools follow the Punjab School Education Board (PSEB) curriculum. As for CBSE, Classes III-V have a subject called Environmental Studies (EVS), which addresses the social and physical world. In addition to the infusion of EE into other subjects, Environmental Education is a compulsory subject for Classes XI and XII, taken by students of all streams.

In addition to EE, PSEB makes provisions for agriculture-related courses. There are syllabi for Agriculture for Classes VI-XII. For Classes XI and XII, there are syllabi for

Humanities, Commerce, Science, Agriculture, and Technical streams. Students in each stream can choose from certain electives. PSEB lists 33 electives for the Humanities stream, two of which are Rural Development and Environment, and Agriculture, and Agriculture is also a possible elective for the Science stream. The Agriculture stream consists of the Agriculture subject, as well as two choices from Physics, Chemistry, Economics, Rural Development and Environment, and Geography. Students in the Agriculture stream also have the option to take either Math or Computer Application (PSEB, 2017).

### *Syllabi and Textbooks*

*My World*, the textbook series for EVS for Classes III-V, is designed to be “practical and activity-based” and to encourage students to “relate their local knowledge to school knowledge. Activities have been designed to promote the participation of parents as well as teachers”. Through stories of children with Punjabi names, the book explains everyday phenomena. For example, in the Class IV book, Lesson 10: From Field to Home uses stories and pictures to explain harvesting wheat, machines used for wheat, the supply chain of wheat and pulses, farmers buying crops that they do not grow themselves, and the process of oil extraction. In Lesson 18: the Story of Water, causes of water pollution are cited to be garbage dumps near water sources, “poisonous insecticides and chemical fertilizers”, “poisonous waste of factories and industries”, sewage, and people throwing trash into river. Ways to prevent water pollution are listed as banning animals from entering water, banning laundry on riverbanks, not throwing garbage inside the water, not bathing in water sources, and not allowing dirty water from houses to reach water sources. No mention is made, for example, of where the dirty water should go instead, and no further mention is made of the “poisonous insecticides and chemical fertilizers”.

The social environment is also studied: Lesson 1, entitled “A Daughter Brings Joy”, tells a story of celebrations at the birth of a girl.

In Classes VI-X, EE is infused in other subjects. For example, the Class IX Social Studies textbook focuses on world history, government, and Indian nationhood, but the last of 15 chapters is Environmental Values and Ethics. The chapter does not mention agriculture, but advises students to use their purchasing power consciously, reduce trash and packaging, reduce-reuse-recycle, use appliances that run on renewable sources of energy, eat healthy and exercise, ride bicycles instead of cars, and raise awareness about environmental issues (PSEB, 2017).

For a Class XI or XII student, there are two periods of Environmental Education each week, the least of all subjects; for example, English is allotted eight periods per week, Punjabi seven, and science subjects 11. This distribution is determined by PSEB. For this subject, students receive letter grades, which are seen as less important, instead of numerical marks (Government Girls’ Senior Secondary School, Jaito, personal communication, 21 April 2017). The Class XI syllabus includes “environmental problems in urban and rural areas”, “agriculture and industry as major sector of development”, “impact of liberalization and globalization- agriculture and industries, dislocation of manpower and unemployment implications for social harmony”, and “soil pollution – sources and consequences”. In the Class XII syllabus, one of five units is “Sustainable Agriculture”, which discusses the environmental impacts of the Green Revolution, “impact of agrochemicals on environment”, and “elements of sustainable agriculture-mixed farming, mixed cropping, crop rotation, biological and economic consideration, use of biofertilizers and bio pesticides, biological pest control, integrated pest management” (PSEB, 2017). In May 2017, following a directive by the National Green Tribunal that school students in Punjab be made aware of the harms of stubble burning, PSEB is working

on adding chapters about stubble burning to the Class XI and XII Environmental Education subject syllabi (Goyal, 2017).

The textbooks for Agriculture for Classes VI-XII are written by professors from Punjab Agricultural University (PAU), which was instrumental in promulgating the Green Revolution in Punjab and has since been active in research on fertilizers, pesticides, hybrid seeds, technology, etc. The textbooks acknowledge that the Green Revolution and the present mode of agriculture are not environmentally sustainable; however, in terms of both content and attitudes conveyed, much greater emphasis is placed on yield and chemical farming, and messages about the problems associated with these with are not sustained. The books present the Green Revolution as a momentous achievement, and PAU as “a lighthouse of scientific knowledge of agriculture”. The Class VIII book includes one chapter on organic farming, which concludes that adoption of organic methods should take place only when there would be no loss of yield; in Punjab and other irrigated areas, organic farming should not be promoted since the land is well-suited for high-yield conventional farming (PSEB, 2017).

### *Implementation in Schools*

The Chaina government high school, which follows PSEB, takes students from Chaina and two other villages. Students' families are mostly farmers, agricultural laborers, and other laborers. The school has Classes VI-X, for which EE is not a separate subject. When asked about environmental education in the school, the principal and teachers initially said that there was none. When it was mentioned that EE is compulsory in India for all classes, they acknowledged that in science classes, the last one or two lessons out of about twenty each year are environment-related. Still, when asked what he thought of the research question for this project, the science teacher said, “there are no lessons about agriculture or society's problems” in the syllabi; and

there is no focus on fertilizers, chemicals, or these kinds of problems. The science teacher says that although he must strictly follow the PSEB syllabi, he uses examples about water pollution, water depletion, soil pollution, and excessive use of fertilizer and pesticides and relates them to the syllabus. In this way, he seeks to make students aware about these problems. The school does not offer the agriculture subject for any class. Class X students take English, Punjabi, Hindi, Math, Science, Physical Education, Social Science, Computer Science, and Mechanical Drawing (personal communication, 18 April 2017).

The senior secondary schools in Jaito, which offer up to Class XII, teaches Environmental Education as a subject for all students in Classes XI and XII as required by PSEB. However, there is no teacher specifically trained or dedicated for the subject; instead, science teachers and other teachers with related expertise teach the subject in addition to their own subjects. This includes an English teacher who studied science in college. The teachers say that this arrangement works well, and there are no plans to change it. Agriculture is not offered as either a stream or an elective, and Rural Development and Environment is also not offered. The teachers say that very few schools in the state offer these. The school has an eco-club, of which about 60 of the school's 1368 students are members. The club's activities include planting trees and raising awareness of droughts and pesticides (personal communication, 21 April 2017).

### *Teachers' Perspectives*

Teachers at both schools agreed that the PSEB syllabi are satisfactory. The China science teacher, says that most students study science to pass exams, but the curriculum itself is well-designed for allowing students to "have knowledge about the problems around them and what to do in the future" (personal communication, 18 April 2017).

Teachers know that most students come from farming families, and expect students to talk to their families about the environmental issues learned in school. Yet, says the principal in Chaina, decreasing or ending use of chemicals and other unsustainable practices would be a long process, because it requires a change in farmers' and society's mentality. Teachers in Jaito further emphasize that although students learn and understand the issues, there is a large gap between knowledge and practice due to the systems around them. Parents do not listen when students tell them about the environmental consequences of their farming methods. Although students learn about the pollution from stubble burning, they still say that burning fields is the easiest way. Even though there are class demonstrations to show that plastic does not decompose, one can see daily at school that students continue to use plastic bags for their purchase; students will not opt out of widely available conveniences for the sake of the environment. As for problems such as deforestation and industrial pollution, students have no power to stop them. Thus, the teachers say, making students aware is not enough; once students leave school, they follow the ways of their parents and society. Hence, the government needs to take measures like strictly banning chemical use in farming and the production of plastic bags and bottles, and enforce these regulations.

When asked what problems students' families and communities face, the teachers and principal in Chaina – who are themselves from the villages surrounding the school and the nearby town of Jaito – lack of family planning and employment leads to poverty and illiteracy, which are the biggest problems. In the context of agriculture and the environment, the Jaito teachers say that poverty prevents families from doing agriculture differently and leads them to emphasize yield. Teachers in Chaina say that their main wishes for their students are they become good citizens with moral values, who can earn their livelihoods. Teachers in Jaito say

they want students to be eco-friendly and save the environment so that future generations can lead healthy lives; as it is, they say, lifespans and capacity to work are decreasing due to chemicals (personal communication, 21 April 2017).

### Students' Knowledge, Attitudes, and Actions

Of the 16 students interviewed, ten attended PSEB senior secondary schools and six attended CBSE senior secondary schools. Differences between the PSEB group and the CBSE group were not distinct enough, especially given the small number of CBSE students, and could not be isolated from the effects of belonging to a farming family vs. a job-holding family, living in a village vs. in the town, different school quality, etc. Therefore, the views and experiences of PSEB students and of CBSE students will be presented together, except where noted otherwise.

### *Agricultural and Environmental Issues of Concern*

Like the farmers, the students also tended to emphasize diseases due to agrochemicals as a problem stemming from agricultural practices; this issue arose in interviews with nine out of 16 students. Many of them also mentioned soil or water pollution in association. Most of these students are sympathetic towards farmers, however. Two students Karina and Sukhvir, whose families are from towns, say that pesticide use is due not to farmers' greed but to necessity, as population increase necessitates higher yields, and another three say that in present circumstances, farmers need to use pesticides to earn their livelihoods (personal communication, 22 April 2017). Another student, Gurjeet, whose nuclear family moved to the town but who feels connected to her extended family's farm, says that doctors conduct tests and tell patients which chemicals are causing their ailments. She says using agrochemicals is "playing with our lives, playing with our health", but when asked if her relatives use them, she says, "obviously! Every family wants harvest to be good" (personal communication, 22 April 2017).

Six students mentioned the health and pollution effects of stubble burning. Among them, two who come from farming families each only mentioned burning straw as a harmful agricultural practice. One, Rajinder, says one can see and experience the environmental effects of stubble burning in daily life, in the form of breathing problems and eyes burning. The other, Amarpreet, says his school taught not to burn straw to decrease pollution.

Two students mention that use of chemical fertilizers is decreasing soil fertility. Gurjeet is one of them, and she predicts that in 20 years, the soil will be so infertile that chemical fertilizers will not be able to help. Two other students, Pratak and Rahul, mention in a joint interview that using urea strains water resources; although there used to be water 30 or 40 feet below ground, now people must dig increasingly deeper and use submersible pumps. Pratak and Rahul are also the only ones to explicitly mention the Green Revolution, saying that although the Green Revolution introduced chemical fertilizer to achieve food self-sufficiency, there is much better food security now, and surplus grain is wasting in godowns.

#### *Perceptions of Appropriate Solutions and Initiatives Taken*

When asked what the solution these agricultural-environmental problems should be, twelve students said that farmers should partially or wholly adopt organic practices. Another student did not use the word organic, but said that farmers should adopt the “old ways” of farming. One of these students, Balpreet, is the son of a conventional farmer. He has finished his degree in biotechnology and recently began working for major company that develops and sells bio-fertilizers and bio-pesticides, whose clientele includes both organic and non-organic farmers. Although Balpreet was not originally interested in natural farming, he received from training on organic farming from the company. He has shared his new knowledge with his father, he says, and has convinced his father to convert to organic and use the bio-inputs from the company

(personal communication, 29 April 2017). Mandeep, another son of a farmer, says that the environment is “totally polluted” from agrochemicals and straw burning, but his family follows these practices to increase yield, as organic farming takes too much time and the government does not provide good prices for organic crops. However, he has taken the initiative to do Internet research on how to grow wheat organically. He says he has tried to convince his father to switch to organic, but his father replied that organic farming takes too much time. Mandeep is optimistic, though: the government has just banned straw burning, and he has learned from the news that other countries are pressuring India to be eco-friendly. Thus, he predicts that the Indian government will begin to promote organic farming. He says the government should hold seminars in every village to raise awareness of organic farming and should provide organic seeds and manures. Furthermore, when the government bans these practices, his parents will be forced to stop (personal communication, 24 April 2017).

Karina and Sukhvir say that using natural farming methods such as vermicomposting actually increases yield. Three other students who come from towns say that although organic farming is less profitable right now, if consumers create demand for organic food, then it will become profitable; thus, farmers should grow organically and people should buy organic food. However, these students say that they do not buy organic food since it is more expensive. Two other students Inderjeet and Rupinder, who live in a village but whose fathers have left farming for financial reasons, say that farmers have to use chemicals to increase yield. Still, they say that organic farming is the solution to the problem of diseases. They have talked to people about adopting organic, but are always told that organic farming decreases yield.

Four students, all of whom are either children of farmers or maintain close ties to farming, say that the government should take the initiative to create a market for paddy straw,

provide diesel subsidies to make clearing straw easier, provide crop insurance, increase MSPs, and/or impose regulations. One of these students is Amarpreet, who says he asked his parents not to burn straw, but they did not listen. Since the government has now banned stubble burning, they have stopped burning the wheat straw, but continue to burn paddy straw for lack of alternatives. Therefore, he says, the government should increase crop prices and lower price of fuel so that farmers can afford alternatives to paddy straw burning (personal communication, 24 April 2017).

### *EE and Other Sources of Knowledge*

Most students who mention chemical-caused diseases say that their schools taught them about this. Multiple students also mention that their schools teach about pollution, stubble burning, organic farming methods like vermicompost, and the importance of planting trees. Most students cite a mixture of school and community, media, and the Internet as sources of their knowledge on agricultural-environmental problems. For example, in one interview, the students said that although they know about the pesticides and stubble burning problems from daily life, from the effects on their own bodies, school books increase their knowledge.

Some students are skeptical about the effectiveness of EE, while a few others do not remember undergoing any form of EE. Mandeep, who is the son of a farmer but will leave agriculture, says that the new generation is learning about the problems in school; however, educating the young is not enough, as they will not do farming later. It is up to their parents to create change, so the government should provide seminars on organic farming to farmers in villages. Gurjeet laments that “in India, we are studying our books”, and even though the books talk about pollution and other environmental issues, in practices, students learn the ways of their parents and continue to create pollution, waste water, etc. She concludes that the government

needs to take on more environment-directed initiatives. Of the six students who attended CBSE senior secondary schools, two said that their schools did not teach anything about the environment or agriculture. Of the ten students who attended PBSE senior secondary schools, only one, Rajinder, said that his school did not teach students to be environmentally conscious and mainly emphasized English. Another, Amarpreet, says that his school did teach about pollution reduction and not burning straw, but did not give importance to the Environmental Education subject in Classes XI and XII, and students also did not take the subject seriously since they were awarded letter grades for it instead of marks. Govinder, the 26-year-old conventional farmer, says that he did not learn anything useful to agriculture when he was in school, although the EE curriculum has most likely changed since then.

#### *Attitudes toward School*

Gurjeet, whose nuclear family moved from the village to the town so she could attend a good private school, believes that school education is extremely important. When asked whether information learned at school is relevant to local students, Gurjeet says yes and praises her school's English education, which includes the practice of fining students for speaking Punjabi instead of English at school. She believes that quality education is especially important for children of poor farmers, although from working as a tutor for them, she knows they have no choice but to attend government schools, where teachers are unmotivated and students "do not know their ABCs".

The experiences of Balpreet, who attended a private CBSE school and now works to sell bio-fertilizers and bio-pesticides, illustrate another take on the emphasis on education. Although Balpreet's father is a farmer, he has spent little time on the family's farm and has always wanted to do a job instead of farming. He says the land in his area is not fertile and the family's cotton

crop has failed for several years; when asked whether the crop failure is due to the vulnerabilities of using genetically-modified BT cotton seeds, he says that lands closer to rivers are irrigated and grow wheat and paddy. Balpreet says that since his family has no business, he had to pursue higher education to be successful in life. However, as the first in his family to attend college, he was unsure what the options were and what he should do, and ended up studying biotechnology. After graduation, he took on his current job because it makes use of his studies. He says Social Studies and Punjabi were the most helpful subjects to him in school, because the exams were easy and helped his marks. Furthermore, a couple of students from non-farming families mentioned that agriculture was a compulsory subject for them when they were in school, and since the course was in Punjabi, it was an easy way to increase their marks.

#### *Personal Connection with Agriculture, and Aspirations*

Four of the students hope to work at a government job, mostly citing comfort or money as reasons. Four plan to go abroad to study and/or work, including one who would like to be a truck driver abroad ((personal communication, 24 April 2017). Five of the current college students would like to become professors in the fields of their interest. One would like to join the police because that is her interest. One would like to work in banking. Balpreet, who currently works in biotechnology, says he would like to have “a better life – luxury life” (personal communication, 29 April 2017). Besides Balpreet, whose works to promote natural farming methods due to where his studies and job search happened to lead him, none of the other students are planning to do farming or work related to agriculture, public health, or the environment in the future.

Rajinder’s family grows wheat and paddy on 6 acres of land, and he goes to the fields to help after finishing his schoolwork. However, he says that agriculture is no longer profitable for

smaller farmers, as the government is not providing good prices for the crops. Rajinder is hoping to go abroad for studies and work because he feels that he cannot earn a good income in Punjab, but he would like his village to become “modern” and to have good non-agricultural jobs so that people do not feel compelled to go abroad. He says that farming will always be an available option, but only offers seasonal work and income, whereas a job is a permanent source of income.

Students who are children of farmers say that when their parents retire, they will lease out the family land. Two students from a village mention that in some farming families in which children are trying to go abroad, the parents will go so far as to sell their land to finance that dream.

## Discussion

Based on the PSEB syllabi and textbooks and what students remember learning in school, EE in PSEB schools addresses some of the environmental issues stemming from agriculture that students encounter in their daily lives, including the consequences of chemical inputs and stubble burning, as well as the alternative of using more organic farming methods. However, although students are mostly aware of surface-level issues that immediately affect them (diseases from chemicals and pollution from stubble burning), they are less conscious of other problems whose consequences are longer-term (e.g. soil fertility decrease, water depletion, biodiversity loss), and they mostly do not think about these problems in relation to each other, as results of a larger unsustainable agricultural system that is unaligned with the surrounding ecosystem. Even regarding problems that they seem very conscious of, students do not personally make efforts to mitigate them. Thus, it seems that EE sometimes fails to impart the understanding of the problems due to commercial agriculture beyond the level of what is in the here and now, and fails to motivate meaningful action. Data gathered in this study suggest that these failures are due to a combination of EE, the broader school system, and the attitudes of students and their communities.

### Evaluation of EE in PSEB Schools

#### *EE Content, Attitudes, and Structure*

The Environmental Studies (EVS) curriculum for Classes III-V is very locale-specific and inclusive of rural environments, even providing opportunities for students to directly learn from their families and communities. However, while presenting the agricultural practices of students' families and communities, the course texts mostly do not mention the roots of these practices or their effects on people and the larger environment, but tend to present them simply

as the way things work. For example, while the Class IV book explains the supply chain of wheat, no mention is made of how wheat came to be a dominant crop, or the environmental problems associated with monoculture. The only mention found in the book of negative environmental effects from agricultural practices is when “poisonous insecticides and chemical fertilizers” are cited as a source of water pollution; even then, decreased use of these chemicals is not in the list that follows of ways to address water pollution. Thus, while the curriculum seems to be trying to inculcate certain attitudes in students, such as gender equality, the value of sustainability in agriculture is not among them.

In Classes VI-X, EE is imparted through the infusion method. Although EE is meant to be infused in other subjects in a natural way, interviews and review of PSEB textbooks show that in many courses, including sciences and social science, EE content is usually the last one or two chapters of each book, while preceding chapters do not touch on the environment. As in the case of the Class IX Social Studies book, the environment chapters do not necessarily seem to have any relation to the rest of the course content. This suggests that these chapters were included only out of obligation to fulfill the national EE mandate, and that PSEB did not place enough importance on EE to carry this out in more than a token manner. Furthermore, the content of EE in these subjects, as exemplified by the Class IX Social Studies text, confirms the critiques of existing literature that the lessons of EE are impractical, locally irrelevant, Western-inspired, and unconvincing. For example, what appliances do students in rural Punjab even use, and where should they obtain appliances that run on renewable energy? Why is there no mention of agriculture? The advice given in this chapter is clearly directed to a city-dweller; in addition to being somewhat irrelevant to village students, it perhaps reinforces the notion of urban life as the norm and the more desirable way of life.

For Classes XI and XII, the existence of Environmental Education as a separate subject in PSEB shows more investment in EE than is required by the EE mandate and practiced by CBSE. Although the small number of student interviewees prevents generalizations, the fact that a third of the CBSE students do not remember learning anything about the environment from school, while only one PSEB student said so, suggests that this key difference between PSEB and CBSE EE perhaps makes a notable impact on what students remember after finishing school. The course does problematize agricultural practices, contextualizes them in the Green Revolution, and presents natural farming methods as an alternative; interviews with students show that most students do retain at least some of this information, especially about the organic farming alternative. However, interviews with teachers and students suggest that since Environmental Education is given the least class time of all subjects, schools do not have specialized teachers for the subject, and the course awards grades instead of marks, both schools and students are led to not take the subject seriously.

#### *EE in Context*

Due to lack of access to PSEB employees or official documents, it could not be determined how the EE curriculum was set or how PSEB intends for EE to impact students. However, the recent initiative to add chapters on stubble burning to the Class XI and XII curricula is suggestive of some of the motivating forces behind the current EE curriculum. Although the ban on stubble burning has been in place and violated since 1981, this syllabus addition comes only after stubble burning receives widespread attention due to its effects on Delhi. The fact that the change is coming at this time, due to directions from a national institution, suggest that it is rooted not in PSEB's own desire for rural Punjab's students to create change for a more sustainable local environment, but in the interest of the immediate

environmental well-being of distant, high-profile urban centers. Thus, it remains to be seen whether the new chapters will offer a message compelling enough to overcome the typical rebuttals of time and cost on the part of local farmers and their children, and whether the lessons will connect the tangible problem of stubble burning to its roots in the unsustainable wheat-paddy system.

In addition to the intentions and content of EE itself, since EE is only a small part of all the courses that students go through during 12 years of school, the intentions and context of the rest of the school system are also essential to understanding the effects of EE. In relation to agricultural-environmental issues, it is of interest that PSEB also makes provisions for an agriculture subject and stream that, presumably, are targeted at future farmers. Although few schools in Punjab actually offer these courses, a look at the content and attitudes conveyed by the textbooks still shows that the PSEB school system as a whole may negate and overpower the messages of EE. Where agriculture is offered, students would spend two periods per week in Environmental Education learning that farmers should adopt organic farming, and then would spend much more time learning which chemicals to apply to each crop, which government agencies farmers should take advice from, and to avoid organic farming in the interest of yield. In this case, they would quite likely not be compelled to switch to organic at the cost of their immediate earnings and convenience, even if they can recite the environmental impacts of conventional farming. The same inconsistency in philosophy and explicit lessons may apply to economics, political science, and other more commonly offered subjects.

Thus, although PSEB does better than CBSE in teaching locale-specific material and covers agriculture-derived environmental issues at least on a surface level, it still receives few resources, low priority, and lack of consistency from the rest of the curriculum. The cumulative

effect of such an education system would be to make students aware of the environmental consequences of some aspects of unsustainable agriculture without cultivating any deep appreciation for environmental sustainability or motivation to act meaningfully to create change, which is consistent with the knowledge and attitudes of the students interviewed.

### Societal Influences and Students' Aspirations

Since students are not blank slates, the successes and failings of EE must be further contextualized within students' social surroundings.

#### *Attitudes and Norms since the Green Revolution*

According to Manvir's narrative, the Green Revolution took root gradually, along with a shift in attitudes. For example, people's views of chemical inputs shifted from "this will destroy the land in the long-run, so we should not start using it" to "this increases yield, so we should use it now, and use more". Students' responses suggest that from the influence of their communities, views of the latter type are deeply ingrained in them, despite their knowledge of the issues with these practices. Multiple students who say that farmers should switch to organic and that they have talked to their families or neighbors about switching to organic or not burning stubble; however, at other times during the interviews, they state as fact the same rebuttals that their parents and neighbors gave them – organic farming decreases yield, there are no alternatives to stubble burning, etc. For example, Karina and Sukhvir first said it is necessary that farmers use pesticides because of the growing population requires more food yield, but when asked about the solution to the problems caused by pesticides, they said that farmers should adopt some organic methods like vermicomposting, which would actually increase yield in addition to being eco-friendly. Thus, the environmental ideals and knowledge that students gain from school or other sources are at odds with reality, or with their perceptions of reality, as told to them by their

communities. Except when led to discuss their ideals and theoretical knowledge, it seems, the mainstream, community-derived objections dominate their attitudes. This poses a challenge to initiating change.

Another attitudinal shift that went along with the Green Revolution, according to Manvir, was the increasing emphasis on education. Other interviews substantiate this and further suggest that the shift is due to the value of schooling as an exit from agriculture. The families of Amrinder and Gurjeet left farming so that they could attend good schools in town, and both did or will continue to non-farming jobs. Amrinder then invested a large sum into his own son's education at a British board school that does not even teach Punjabi, so presumably does not value local agriculture and environment; he did so as a "status symbol", suggesting that foreign language proficiency and a diploma from an elite, non-native school confer social capital which is more important than connection to the local area and culture. Gurjeet's stream of thoughts suggests her belief that local students, especially children of poor farmers, need quality education so that they can learn English (and other such subjects) well, which would presumably lead them to job opportunities to escape the poverty they face in agriculture. Similarly, since Jagga wants his son to go abroad, he does not teach him about agriculture and sends him to private school to learn English and how to navigate society. Balpreet's belief that higher education is necessary for students without inherited family businesses to be successful in life implies that success means not agriculture. Since, for him, the purpose of education is to obtain the diplomas needed to exit agriculture, without discrimination for where to end up instead, Balpreet studied for marks and chose his path based on opportunities perceived to be available, rather than interests. For each of these interviewees, education is a source of social capital and a route to something more prestigious and comfortable than agriculture. Thus, even if students understand the

environmental problems generated by agriculture, they are seeking to physically and financially escape them rather than solve them.

Along with the emphasis on yield and the desire to exit agriculture went the commodification of land. For students and families who do not wish to continue farming, and who would lease or sell their land and physically move away from it to make exit from farming possible, the land is perhaps viewed as a short-term source of income that will allow them to leave it, rather than the primary long-term source of livelihood for themselves and future generations. In that case, it is no wonder that for these families, yield and income continue to take priority over sustainability in the face of health and environmental issues. Furthermore, the prevalence of the desire to go abroad perhaps creates a disconnect between people and the future of the whole region, regardless of whether one is in farming or not. Jagga, the conventional farmer, is a case in point: in order that the family farm will not be his son's source of livelihood and that Punjab will not continue to be his son's home, he feels compelled to continue chemical use on his land so that his son can get the education needed to leave. For farmers and students who think like Jagga, who seem to be most people, there is little incentive to care for the long-term environment on and around their land.

Interviews further suggest that as the connection with the land is lost, people take less responsibility for the condition of their land and crops, instead placing the responsibility on factors outside their control such as the government. Farmers and students who would like the government to raise MSPs on wheat and paddy or provide subsidies for alternatives to stubble burning are still engrained in the monoculture, chemical input mindset, despite knowing the harms of that system of farming. Some interviewees, like Mandeep, put the initiative on the government to raise awareness of organic farming, facilitate the transition, enact and enforce

regulations; however, they and their families are not practicing organic or following the stubble burning ban despite already being aware. In other words, on the lands of people who view agriculture as a short-term income source either by choice or by necessity, sustainability can be achieved only when external forces make it the most practically attractive option.

Although modern organic farming in Punjab yet uses different methods and crops than traditional pre-Green Revolution farming (personal communication, 19 April 2017), a comparison of the attitudes and opinions of conventional farmers today and those of organic farmers today reveals the deep connection between mode of agriculture and outlook, controlling for other societal influences. Although organic farmers receive virtually no support from the government (personal communication, 14 April 2017), the ones interviewed do not seek any and still would like their children to continue organic farming, regardless of whether they have two or three acres of land (Amanjot) or 36 acres (Amrinder). For them, organic agriculture is not simply an income generator, but a way of life and philosophy of life, as exemplified by Amanjot's refrain "agriculture is life". Amrinder's adoption of organic farming and the personal changes that followed, including his physical move back to his farm, may be taken to represent a reversal of the attitude and lifestyle shifts that went with the Green Revolution. Their narratives suggest that though the political problems and economic incentives related to agriculture are real causes of concern, they are not necessarily the insurmountable barriers to sustainability that conventional farmers and mainstream opinion make them out to be; rather, the biggest barriers are people's deeply ingrained attitudes in favor of the status quo and the desire to (further) obtain material comfort and ascend the socioeconomic ladder beyond where agriculture can take them.

For students raised in the dominant post-Green Revolution mindsets, then, the current state of EE in Punjab is far from enough to inspire the changes of attitude and aspirations that

would be required to put theoretical knowledge into action. If the goal of EE is to give students a comprehensive understanding of the physical environment and its linkages, and to both enable and inspire them to create change in spite of the dominant inertia and attitudes, then lessons could perhaps be drawn from the Uttarakhand Seva Nidhi's EE program. In particular, PSEB can give schools the freedom to make local fields, villages and/or towns the space of learning starting in primary school, depending on the backgrounds of the students, and the "local ecosystem" the focus of study. Unlike in Uttarakhand, however, the views of locals is part of the perpetuation of environmental problems in Punjab, so the curriculum would need to include voices of organic farmers, elders, public health experts, etc. in order to meaningfully influence students' mindset. The program should then cast the students themselves as actors responsible for finding a solution.

Political and economic factors influencing the viability for farmers of alternative farming methods were outside the scope of this study. Despite the influence of dominant mindsets, corruption, farmer debt, etc. are very real and prevalent issues. Furthermore, since PSEB is a government organization, it is likely that government values and goals that are not aligned with environmental sustainability find their way into curricula and school policies. Thus, in addition to changes in curriculum and philosophy that PSEB should make, the actions that the rest of the Punjab state government should take in tandem deserves an entire other research paper.

## **Conclusion**

This study found that environmental education in PSEB schools does cover the agricultural-environmental problems that have emerged in Punjab's rural communities since the Green Revolution, giving students from these communities some degree of knowledge about these issues. However, EE remains a small and underemphasized part of the coursework that students go through; the rest of PSEB coursework does not reinforce notions of agricultural sustainability and may even contradict the messages of EE. Furthermore, attitudes and values have co-evolved along with the Green Revolution such that commercial agriculture has become a deeply engrained norm, and agriculture is seen as an inferior income-generating activity rather than as a way of life. Although EE theoretically has sustainable development as its motivation, in addition to fixing its own imperfections, EE must find a way to operate within the feedback loop between the larger school system and societal values and norms. At present, this feedback loop perpetuates values counter to environmental sustainability as well as the desire to escape agriculture rather than solve its problems. Thus, students are not motivated or empowered to take meaningful action – for example, changing practices on their families' farms, buying organic food, entering environment- or agriculture-related work – even if they have the knowledge of these ways to help. In order to make an impact, EE must be transformed from a fringe part of the curriculum designed to satisfy a mandate into a consistent, comprehensive program that, beginning in primary school, inculcates an understanding and deep appreciation of the interdependence between agriculture, livelihoods, and the entirety of the surrounding ecosystem.

## **Recommendations for Future Study**

In this study, all student interviewees who are children of farmers or have ties to farming through relatives wished to leave farming. However, no children of marginal farmers or agricultural laborers who lack the financial and human capital to leave farming were interviewed, nor were children of large farmers (e.g. owning 100+ acres of land) who might not so strongly desire to seek better lives outside agriculture. Thus, this study inadvertently left out the perspectives of young people who, voluntarily or not, expect to become the next generation of agriculturalists. To gain insight into the future of agriculture, the environment, and farmers' livelihoods in Punjab, it remains to collect and analyze their views. Such a study may also consider the views of students at agricultural universities or other institutions, who are likely to enter agriculture or agriculture-related research and policymaking in the future. Such information on future actors in agriculture could be extremely beneficial to policymaking in education, agriculture, and the environment.

To better understand how government-determined school curricula are influenced by, and seek to influence, societal conditions and dominant attitudes, it may be helpful to study the evolution of school structure and curricula over time. In the context of Punjab and the Green Revolution, potentially insightful questions include: Before the Green Revolution, what did education or the accumulation of human capital entail for children? How has that changed over time, and what led to the changes? Since PSEB was established in 1969 (PSEB, 2017), how has the curriculum changed, and what spurred the changes? In particular, what has influenced the EE curriculum? As the move to add a chapter on stubble burning suggests, the content of EE may sometimes be influenced by external pressures, rather than arising from Punjabis' own environmental concerns. Examining EE through the lens of PSEB and across time may give insights on the philosophy and intent of EE that a community-based study cannot.

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## Appendix

### Interview Guide

The following interview questions were used as a guide, or list of suggested questions, for the semi-structured interviews. In practice, every interview was different, and no interview involved a different subset of these questions as well as other questions not written here.

#### *Teachers*

- (Explain research question) do you have any thoughts on this?
- What subjects and classes do you teach?
  - o (If not explicitly environmental studies or agriculture) Can you tell me about how environment- or agriculture-related content is incorporated in your classes?
  - o How strictly do you follow the government curriculum? Do you, or the school, have any control over what you teach? If so, do you incorporate anything specific to this community?
- What would you say are the problems that your students' community faces? What are the causes of these problems?
- What would you say should be the role of environmental education? What do you think students at this school should learn related to the environment?
- What challenges do you face when trying to teach about the environment or about agriculture?
- What made you become a teacher?
  - o What do you want your students to become? (in terms of occupation, values, behavior, or anything else)
- How did you become a teacher? What training did you receive?
- Are you from this area? How much do you interact with the students' home communities?

#### *Students*

- How would you describe farming in your village?
  - o What do people grow? What does your family grow?
  - o (initially, be vague, so can see how the student conceptualizes the method of farming. Don't bring up "chemical", "yield", etc. until after they answer the general question.)
- How connected do you feel to agriculture or the land? How often do you visit your family's farm? What, if any, is your involvement in farming?
- What do you think your village will be like in 20 years? Why will it be like that?
  - o Are people in your village currently facing any challenges?

- What do you want it to be like in 20 years?
- Can you tell me about what school (I-XII) teaches about the environment, whether in environmental studies classes specifically or as part of other classes?
  - About the link between agriculture and the environment?
  - What do you think about this?
  - Is this information true? Is it/will it be helpful to you? Does it connect to what you see here in your village and in Punjab? Why or why not?
- What do your family and other people in your village say about how the environment works and the link between agriculture and the environment?
  - What do you think about that?
- (If perceives village to have environment-related health or livelihood challenges) What do you think your village needs to do to resolve these problems? How should people do that?
- What are your plans for your own future?
  - Why do want to do X instead of farming? Did you ever want to do farming? Does your family and/or school encourage you to leave farming?

### *Community Members*

- How old are you? (If a farmer) How long have you been farming? Were your parents (or in-laws) farmers too? How long has your family been in this village? How did you learn to farm?
- How has what people grow and how they do agriculture in this village changed in your lifetime/while you've been here? What do you think caused these changes? What do you think about these changes?
  - Do you think farmers in this village have become better off or worse off over the years? What led to that?
  - What do you think farming should be like in this village?
- Do you know what farming was like in this village before you were born/came here?
- How would you say the environment in this area impacts farming and farmers' lives, and vice versa?
  - (including soil, water, biodiversity, climate, health)
- What do you think this village will be like in 20 years? What do you want it to be like?
- What do you want for the children in your family and in this community? What do you want them to gain from school?
- Do you think the young people in this village know enough about farming, the environment, the land, etc.? If so, how did they learn? If not, what are they missing?