



Losing touch with mother seed: Insights from action research with small-scale farmers in Tamil Nadu, India

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Abstract

The article showcases the nature of climate colonialism by examining the transitions in heirloom seed conservation practices in the context of climate change. Insights for this article are drawn from an action research project implemented among heirloom seed keepers and small-scale farmers in Tamil Nadu, India. Local knowledge systems and indigenous seed conservation practices play a crucial role in strengthening the resilience of small-scale farmers to climate variability and extreme weather events. Throughout India, traditional seed keepers have voluntarily taken up the responsibility of collecting and conserving native and heirloom seeds for future generations. These practices also ensure that sustainable farming practices are adopted. However, the modernization and commercialization of agriculture since the colonial and post-independence periods have displaced several such practices, paving the way for the mass consumption of hybrid seed varieties and chemical fertilizers and pesticides. With the advent of climate change as both global discourse and locally experienced phenomena, yet another layer of dispossession and the cheapening of nature has occurred. The key argument of this article is that climate change adaptation has become a new commodity frontier, dispossessing and alienating small-scale producers.

Keywords

climate change, adaptation, commodity frontier, agriculture, livelihood, action research

1. Introduction

The modernization of agriculture, driven by the expansion and deepening of commodity frontiers, treats nature as a thing or resource to be extracted and exploited for profit. Further, as is evident with the rise in industrial production and the Green Revolution, these processes rely heavily on Western science and the transfer of technology model (Pimbert, 2022). Such a capitalist world system relies on violent technologies of rapid and total extraction of all entangled beings, both human and nonhuman (Dunlap & Jakobsen, 2020). In the context of agriculture, these forces have fueled the mass production and consumption of hybrid seed

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varieties, chemical fertilizers, and chemical pesticides and led to the alienation and dispossession of small and marginal farmers (Shiva, 1994, 2017). Shah *et al.* (2018, p. 16) argue that such a model of capitalist penetration in the rural economy has resulted in 'conjugated oppression,' showcasing how multiple oppressions based on class, caste, ethnicity, gender, and region shape the everyday livelihood practices of poor and marginalized groups in India.

With the modernization and commodification of agriculture, seeds have become 'things'—a commodity. Moreover, in these processes of translating seeds from animate beings into items of commercial value, the very existences of both seeds and farmers are cheapened, displaced, and dispossessed. Very few people care whether seeds, farmers, and their symbiotic relationship will continue. With the advent of climate change as both global discourse and locally experienced phenomena, yet another layer of dispossession and cheapening of nature is happening.

The construct of the nature–society binary is characteristic of modernization, and viewing humans as something external to nature is a fundamental condition of capital accumulation (Moore, 2015). Instead of valuing relationships in world-making, such a worldview imposes an ontological status upon beings as objects. This further enforces the idea of purposive control of humans over nature. Such an epistemological dualism is the root cause of today's environmental crisis. Furthermore, any responses to these complex environmental problems are founded on these dualisms. This includes adaptation to climate change as well. The accompanying politics of knowledge and market-based economic drivers further transform all living organisms from a state of 'being' to things of commercial value (Havice & Zalik, 2019).

This article argues that adaptation to climate change has become a new commodity frontier rooted in colonial epistemological dualism. Moore argues that capitalism is not simply an economic system that uses, abuses, or exploits so-called nature; capitalism is a way of organizing nature (2015, p. 2). It is an ecological regime operating through commodity frontiers—it works through nature. The notion of a commodity frontier refers to those previously uncommodified spaces into which capital must expand and commodify to perpetuate itself (Nolan *et al.*, 2022). The frontier is not only a space for resource extraction. Frontiers are also zones where diverse actors with different values, interests, knowledge, and power interface to reshape specific socioecological worlds (Fawcett *et al.*, 2022). Commodity frontiers develop from one place to another, transforming socioecological relations as they go, and producing more and more goods and services that circulate through an expanding series of exchanges (Beckert *et al.*, 2021). Still, commodity production is simplified, rationalized, and reorganized to secure cheap labor, food, energy, care, life, and materials (Patel & Moore, 2017). According to Patel and Moore (p. 24), the human separation from nature demonstrates a kind of massive exclusion. It is not only that society separates from nature, but also that women, indigenous peoples, enslaved people, and colonized people everywhere were not seen as fully human and thus not full members of society. Instead, they were part of nature, treated as social outcasts – they were 'cheapened.'

One could trace the origin of agricultural commoditization in India to colonial scientific practices that promoted a specific form of agriculture. Aga (2021) notes that the colonial rulers in the late 19th century aimed at 'agricultural improvement' of crops critical to the political economy, such as cotton, jute, and cereals like paddy and wheat. However, the scientific tradition that persisted post-independence within the country was still influenced by a holistic understanding of farming that recognized mixed and intercropping practices, nurturing soil health, and conserving and sharing native seeds through farmer-to-farmer exchanges. There was also no organized seed industry until the 1960s. However, such practices changed with the Green Revolution, and the need for organized production of high-yielding hybrid seeds became a responsibility of the state. As the demand for these seeds increased, the private sector found a way into seed multiplication and distribution by the 1980s. After liberalization in the 1990s, Indian seed companies (owned by privileged caste groups that had access to capital) began to partner with global seed corporations involved in the large-scale production of hybrid and transgenic seeds (Aga, 2012). This resulted in the influx of transnational capital into Indian agriculture, activating a corporate food regime (Brown, 2018; Patel, 2013).

Brown (2018) has examined the vulnerabilities of small and marginal farmers in India in the post-Green Revolution and post-liberalization context. Brown narrates the complex systemic issues through which farmers remain perpetually indebted and resort to extreme measures, including ending their lives. Ramamurthy (2011)

argues that multinational and Indian corporations rely on hybridization to protect their intellectual property rights to branded seeds. Further, outsourcing the production of hybrid seeds to smallholders is profitable due to cheap labor. The mass promotion of hybrid varieties of crops, monocropping, and chemicalization of farming was endorsed by both the state and the private sectors. Though this agricultural modernization did boost rice and wheat production in specific regions, it also intensified resource extraction with a heavy reliance on synthetic chemicals, groundwater, and twisting traditional nature–culture entanglements. The consequences were the propagation of capitalist farming in those regions where sustenance farming was practiced, inducing biodiversity loss and widening inequalities among diverse agriculture-dependent groups (Aga, 2021). Vasavi (1999) has painstakingly described the transitions in a drought-impacted agrarian community, analyzing closely the entanglements of 'naturecultures' and how a series of external interventions disrupt them. Further, introducing genetically modified (GM) and transgenic crops threatens natural and indigenous farming practices that once addressed the food security needs of diverse population groups (Aga, 2021).

Given these historical and contemporary contexts for the perpetuation of capitalism, farmers and their solidarity networks in the Global South have been mobilizing to develop and strengthen alternative pathways for a just, equitable, and resilient eco-social world. Guided by the core values of care, justice, and solidarity, a key strategy has been emphasizing local knowledge and sustainable agriculture to deal with complex problems rather than solely being driven by scientific expertise and policies (Brown, 2018). Within the larger context of climate change and agriculture, this article explores the transitions happening in the eco-social worlds of small-scale farmers in a village near Erode in Tamil Nadu. The key argument of this article is that climate change adaptation has become a new commodity frontier, where nature (seeds) is cheapened (including the knowledge and labor of small-scale farmers consisting of women and men from different castes, classes, and communities). Furthermore, these people are dispossessed and alienated from nature to satisfy the goal of capital accumulation. These strategies are shaped by the binary knowledge systems separating nature from society, which have also imposed Eurocentric ways of knowing and doing on the Global South.

2. The contexts of practice

Insights for this article are drawn from a participatory action research project implemented in a small village in Tamil Nadu, India (Figure 1). The Centre for Livelihoods and Social Innovation (CLSI) partnered with a social enterprise, Hooga Seed Keepers Collective (HSKC), in facilitating research to revive natural farming through traditional seed-keeping practices. HSKC has been mobilizing heirloom seed keepers, primarily small and marginal farmers, who have voluntarily taken up the responsibility of collecting and conserving native and heirloom seeds.

For the action research, we (two faculty and four students from CLSI) began to work with 20 seed keepers in the village. These seed keepers, both men and women, belonged to different caste categories. There were 14 men and 6 women seed keepers. While 15 members were from the Kongu Vellalar Gounder and Padayaachi communities, 5 were of a less privileged Scheduled Caste (SC) group, namely the Arundhadhiyin community. The men from the upper-caste communities owned up to three acres (1.2 ha) of agricultural land (with access to irrigated water), while the men from the SC community owned less than one acre (0.4 ha) each with limited access to irrigation. It has to be noted here that caste and gender hierarchies were very rooted in this village, and they acted as barriers for both women and SC men to actively participate in the research process. As our action research progressed, other actors volunteered with us, including schoolteachers and children, students with backgrounds in agricultural science, government officials, retired educators, and seed keepers from the neighboring districts. By the time we ended our action research, HSKC had more than 50 members in the seed keeper's collective.

As per the contextual requirement of the action research project, we adopted diverse methods at different points of our work with the seed keepers and the rest of the farming community. These included household visits, transect walks, convergent interviews, photovoice, movie screenings, dialogue conferences, seed festivals, and seed *yatras* (journeys). We began our discussions with farmers about traditional seed production and conservation practices. Conversational interviews at the household level were crucial in understanding the transitions happening in traditional farming practices. These conversations also helped us understand the

discourses surrounding climate change among the farmers. Some of our initial learning from the field is narrated below.

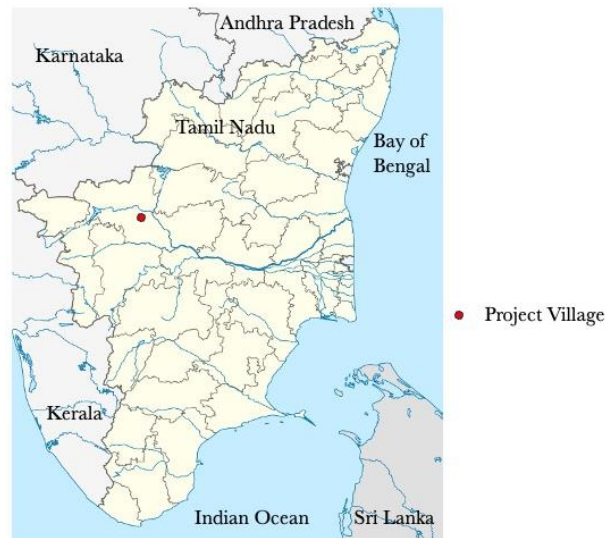


Figure 1: Map of Project Site. Source: Dörrbecker⁹

A farmer who had lost his hybrid groundnut crop to delayed rainfall shared his experience: "Just like humans require adequate food till our 20s and 30s to become strong, plants need water at a specific time to retain strength and grow. If the rains had started 10 to 15 days earlier, my crop would have survived." However, the following year, he was surprised that the rains continued to pour over more than their regular spell. He shared his frustration with us: "This is not good. The wet weather decayed all the sprouts and the seeds underneath. The change in the wind direction has also resulted in the emergence of new varieties of pests."

Farming depends on one's ability to predict seasonal changes. Today, the unpredictability of emerging changes in the weather and seasons has become a concern. Climate change and associated uncertainties have also rendered present livelihood practices and forms of knowledge unreliable. Women farm laborers mentioned that in recent years, many of them could not work in the field during the summer months due to the risk of heatstroke. They were concerned about how they could allow their children to work on a farm if the situation was like this.

Farmers who had switched to corn/maize cultivation to reap more profit were disappointed and distressed by the spread of a new pest, which they locally called American puzhu (American worm). These farmers were unsure whether the seeds purchased from the market or climate change resulted in the perpetuation of the pest. Such situations create new knowledge uncertainties and increase farmers' dependency on the market for more seeds, pesticides, and fertilizers.

During our interactions with farmers, a vital discourse emerged: that climate change and its impact are embedded in sociocultural, historical, technological, and larger political ecology contexts and, therefore, cannot be understood in isolation. A young farmer cum agro-entrepreneur commented:

⁹ By Maximilian Dörrbecker (Chumwa)—own work, using this file by Planemad, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=9946168> (text added by the author).

Our people today do not have a holistic and systemic understanding of how climate change impacts their everyday lives. They see the impact only in terms of direct, immediate change visible to them, then and there. Instead, the whole social-ecological system needs to be looked at. For example, a red insect eats the flower of avarai (Indian broad beans). Earlier, a particular bird used to come to eat this insect. Moreover, this bird used to stay in a specific tree. However, we have cut down those trees to expand our monocrops, and these birds are not here anymore. This has resulted in a rise in the population of insects. Further, hybrid seeds and monocrops are more prone to pest attacks.

Heirloom seed keepers claim that the production of hybrid crops has resulted in the disappearance of several native varieties of seeds. Further, the everyday struggle for a good yield and high profit has forced farmers to depend on hybrid seed varieties supplied by state and private players. Many farmers also shared their constraints in accessing native seeds. It was also found that the state departments and agricultural universities are keen to promote hybrid seeds or the latest lab-developed varieties they found to be high-yielding.

Farmers are dispossessed in diverse ways. For instance, we interacted with a farmer who had to diversify to coconut cultivation due to frequent crop failures and an inability to procure farm inputs from the market at a higher price each time. Within a year, he had suffered a considerable loss of 25,000 rupees (approximately US\$300) from groundnut farming. He could not benefit from government schemes such as the Uzhavar Santhai (Farmers' Market), as there was little opportunity to sell groundnuts in these places. However, with prolonged drought and pest infestation, his strategy to diversify to coconut also came with the cost of mortgaging a part of his land as crop security.

Today, traditional knowledge systems and livelihood practices are being drastically eroded. Farming has become an activity of individual households, which was not the case in the past. Collective farming arrangements disappeared entirely, including the sharing of land, seeds, and crop yields. Further, with the rising cost of farm inputs and lack guaranteed sustained profits, several stretches of cultivable land are being converted for real estate development. A decade ago, women in farming households practiced kitchen gardening, where they sowed native seeds. However, with the concretization of courtyards, such practices are also disappearing in many homes.

As the market values particular crops as 'commodities,' farmers resort to monocropping maize, sugarcane, and paddy rice. Subsequently, farm biodiversity is affected. Farmers also highlighted challenges when they bargain and sell their produce for prices that do not justify the effort. A farmer shared his pain: "It takes 50 days to grow *sorakkai* [bottle gourd], but it gets sold in the market for a mere 15 rupees [approximately US\$0.18]." A group of farmers who had reverted to native seeds shared their experience as follows:

Our groundnut seeds did not germinate last time. We bought hybrid seeds last year. However, none of them germinated. We lost the money, the sowing time, and the crop. We can no longer trust hybrid seeds. However, we are unaware of the good native variety in groundnuts. We cannot trust hybrid seeds anymore but have also lost our knowledge of the good native varieties. We have long abandoned our practices of farming several varieties of native crops. Our adaptation choices are, therefore, minimal. Furthermore, all decisions depend on our water availability for irrigation.

These experiences are similar to those observed by Gidwani and Ramamurthy (2018): most small and marginal farmers involved in land-based activities such as agriculture, animal husbandry, horticulture, and wage work find these combinations of adaptation strategies insufficient to ensure a secure livelihood. During a group discussion, a woman farmer shared her view:

Though hybrid seeds may seem attractive in size, shape, and color appearance, they do not taste as good as the heirloom seeds. The heirloom seeds are also beautiful and tastier. Take, for example, the *Togo* tomato seeds. You invest around 270 rupees and are guaranteed an entire crop for almost three months (15 kilogram yield per plant). Further, they take care of their own. Caring for a hybrid seed is like caring for a baby until the baby grows into an adult. In contrast, heirloom seeds do not require constant attention.

Other farmers who were listening to her agreed. They also mentioned that hybrid seeds are costly: "Hybrid seeds are very costly, too. While a kilogram of heirloom seeds of Okra costs 1,500 rupees (US\$18), the cost of hybrid seeds will be around 4,000 rupees. (US\$48)" A woman seed keeper shared her view:

Though hybrid seeds are more prone to pest attacks, they are marketed in the name of high yields. Further, cooking vegetables from hybrid seeds guarantees easy work for people involved, such as the much easier peeling of their skin. Hybrid seeds affect the agency and fecundity of the soil, and thus, soil quality declines over time. In contrast, native seeds have the strength to counter pests by nurturing soil fertility.

Some among the elderly seed keepers also made the rest of the participants aware that these seed modification and commodification practices originated in colonial epistemologies. Similar to studies elsewhere (Siiskonen, 2015; Singh, 2006-2007), they argued that practices that even continue today are intended to maximize economic interests, ignoring the everyday struggles of small-scale producers in the Global South. Culturing traditional and staple food crops was ignored and discouraged at the cost of cultivating cash crops like cotton and tobacco, which served raw material needs for British industries and European exports (Singh 2006-2007). An elderly farmer raised his concern:

Seed corporations have taken control of the whole seed trade and market. Historically, this has happened to our indigenous breed of cattle, whereby the promotion of hybrid varieties has displaced and dispossessed indigenous species. The same thing happens to native heirloom seeds.

Seed keepers argue that the push by scientists and corporations to prevent mixing seeds is to pursue monocropping, favoring hybrid seed markets. Seed keepers also believe that steps such as certification and licensing are strategies to restrict the conservation, sharing, and reproduction of indigenous seed management practices. Further, the seed corporations act as if they are not accountable for the environmental deterioration, biodiversity loss, and food insecurity that emerges in their race towards profit. New seeds, crops, regulations, and knowledge practices are being introduced with such intent. All these practices characterize the continuation of the colonial mindset, widening and deepening new commodity frontiers.

Farmers cannot cope with the profit maximization motive that has seeped into farming. Many farmers, therefore, believe that farming is not a profitable business. They also mention various uncertainties and risk factors impacting farming these days. These include the extreme dependence on the market and intermediaries for seeds, chemical fertilizers and pesticides, and the sale of farm produce. Yet another critical factor is climate change. There is intense propaganda by state and private players in the marketing of 'climate-smart seeds' capable of giving 'high yields.' Seed conservation and management is considered a critical component of climate-smart agriculture (CSA), with other vital dimensions being water-smart, nutrient-smart, energy-smart, carbon-smart, and knowledge-smart (Bhattacharya *et al.*, 2020). The thrust of CSA has been to enhance the capacities of farmers to move from a sustenance-based economy to commercial farming (Pal *et al.*, 2019; Chandra *et al.*, 2017). The non-availability of local inputs, including seeds and high-yielding planting material, is projected as one of the problems that CSA could address (Isaac *et al.*, 2020). However, such a claim is being made without considering the region's sociohistorical and material farming contexts.

We argue that the discursive practices of CSA involve the articulation of a series of instrumental rationalities leading one to another. For instance, the promotion of flood-resistant or drought-resistant seeds is advocated as a critical climate-mitigation strategy, and subsequently, CSA technologies and crop insurance mechanisms are mooted as future pathways, which will become accessible to only those farmers who have diversified from their traditional cropping patterns. There were also instances reported where officials in the agriculture department advocated the shift from paddy cultivation to fisheries or lotus seed cultivation in regions where flooding is a risk. The pursuit of diversification through technological innovations and market mechanisms is also a capitalist strategy to move from one commodity frontier to another. Crop insurance is conceived as a mechanism to reduce risks of weather-impacted loss only for farmers capable of investing in improved seeds and fertilizers. In addition, the prevailing CSA rationalities are guided by 'control' rather than nurturing nature. Seeds must be improved or modified to deal with drought, floods, or pests (Hardwar, 2020; Praveen & Ramachandran, 2020).

In the name of drought resistance or flood resilience and to shorten the cropping cycle, new varieties of seeds are being introduced to the market. In the case of groundnut, the Krishi Vigyan Kendras (KVKs) promote the use of hybrid varieties such as K-6 (drought-resistant), K-9 (drought-resistant and high oil content), and *dharani* (resistant to drought and leaf spot disease). The KVKs also promote climate-smart seed management techniques, such as seed treatment with *Pseudomonas firmis* for crops like groundnuts and pulses, which are believed to have the capacity to withstand drought for up to 15 days and resist root grub infestations (Vincent & Balasubramani, 2021). However, the stakeholders, including Non-governmental organizations (NGOs) and civil society groups, do not have access to this technology. Only those KVKs who have received funding for producing and promoting *P. firmis* can carry it forward. Not all farmers have access to such seed inoculation technologies (Vincent & Balasubramani, 2021). Big farmers may be quicker than small ones to adopt newer technologies of this type.

Direct seeding (seeds planted directly in the soil, rather than nursery grown seedlings) is promoted as a critical intervention in CSA (Datta *et al.*, 2022). However, direct seed practices could also eliminate the large-scale labor involved in traditional transplantation work, usually carried out by women. The aim is to increase the productivity and profit of the land-owning farmer while other, dependent stakeholders are excluded from its benefits. Further, the promotion of direct seeding practices comes with the pitch for new technologies such as zero-till machines and Turbo Happy seeders (a no-till planting device). There is pressure to use only good-quality, high-yielding varieties of seeds while using these technologies. An underlying presumption is to deepen these practices and to scale up monocultures. A senior professor at the Tamil Nadu Agricultural University commented that such technological diffusion can be disruptive due to the small landholdings of farmers in the region, and many marginal farmers, vulnerable to climate change, depend on dryland farming techniques. In this context, Altieri and Toledo (2011) note that monoculture could result in the collapse of local livelihoods and the economy, impacted by climate change and high energy consumption. Further, the private players in seed distribution do not guarantee the quality of the seeds sold. Farmers complained to us that most of the time, in recent years, they have been getting poor quality seeds from these dealers.

Farmers and seed keepers believe that such attempts towards climate resilience, labeled and marketed as 'climate smart', only cater to the market's needs. Such fears are aggravated when states, in collusion with seed, fertilizer, and pesticide corporations, frame legislation that could undermine the very practice of native and heirloom seed conservation.¹⁰ These contestations are characteristic of climate coloniality and make any form of counter-mobilization difficult amid pressures to commodify and adapt.

¹⁰ For example, The Asia Foundation (2022: 33) report states that "while India has made significant strides in climate change mitigation, the International Finance Corporation (IFC) believes that demonstrating the business side of emerging climate-smart practices and technologies will allow the private sector to scale up adaptation and build resilience faster... The examples of DCM Shriram Ltd., Golchha Organisation, Hindustan Coca-Cola Beverage Pvt. Ltd., Jain Irrigation Systems Ltd., JK Paper Ltd., Mountain Hazlenut Venture India Pvt. Ltd., Bigbasket.com, Olam International Ltd., and Supreme Seed Company Ltd., could be considered examples of CSA technology models. Many others like ITC Ltd., PepsiCo, Solvay, L'Oréal, Cargil Pvt. Ltd., Pioneer Seeds, Mars India, and Kelloggs actively promote CSA through the farmers associated with them for sourcing produce."

3. Resisting climate coloniality

In 2014, a civil society delegation facilitated by organizations such as the Tamil Nadu Organic Farmers' Federation at the national level, with global organizations such as ActionAid International, submitted an open letter to the newly formed Global Alliance for Climate Smart Agriculture. Critiquing that the global alliance did not guarantee any social safeguards, they argued:

Companies with dire social impacts on farmers and communities, such as those promoting Genetically Modified (GM) seeds or driving land grabbing, already claim that they are practicing 'Climate Smart Agriculture.' GM seeds contaminate and erode seed diversity, and criminalise the seed saving practices that farmers need to adapt to climate change. Without social safeguards in place, we are concerned that the Alliance may be used to promote approaches that increase the dependence of farmers on external inputs that trap them in cycles of debt and poverty, and that leave them even more vulnerable to climate change. (Climate Smart Agriculture Concerns, 2014)

Our action research showcased the need for strengthening grassroots-level agri-food systems and the autonomy of small-scale producers. There was a growing need not only to revive farming through native and heirloom seed conservation practices but also to strengthen seed keepers' solidarity networks, reducing dependence on the global market. We also realized that these needs can be addressed only through the agency and actions of farmers and local communities entangled in specific eco-social worlds (Pimbert, 2022; Shiva, 2017). We organized a dialogue conference in the village to strengthen the seed keepers' collective. Dialogue conferencing is an action research method that allows all participant actors to create a common ground for further collaborative activities (Shotter, 2014). The underlying principle is an equal right to speak, where the local actors decide on the themes they will engage with and accordingly frame the context they will attend to (Shotter, 2014). Local seed keepers and farmers decided the agenda for the dialogue conference. They had two themes: to discuss the impacts of climate change and commodification in their everyday lives and how to revive heirloom seed conservation practices. Other participants included schoolteachers, faculty and students from an agricultural university, government officials from the agricultural department, seed keepers, and agro-entrepreneurs from the neighboring districts.

During the dialogue conference, a seed keeper reinforced the popular sentiment that if we must deal with climate change, the way we conceive farming and agriculture should not be focused on 'yield.' In his own words:

Present-day risks and uncertainties are due to our actions aimed at profit maximization. Farming is a way of work that does not strive towards profit maximization. For example, let us take the case of coconut cultivation. The whole region had undertaken coconut cultivation to export the produce. Instead, we need to plant what is local. Most importantly, the future of climate and nutrition needs must be emphasized more than profit here.

Listening to this, a woman farmer shared her experience in adapting to climate change as follows:

I lost more than 200 coconut trees in the recent drought. Then, we noticed that other local trees, such as teak, survived the drought. Following this observation, we began to plant these trees in the inner boundaries of our fields. We did not revert to planting coconut. Trees, like a teak native to the region, will be alive during the drought and regenerate during the rains. They also cool the nearby environment, as well as provide new saplings. They also help in organic mulching, which further reduces water needs.

The seed keepers shared their story of reverting to cultivating heirloom crops. These farmers believe that heirloom seeds give them a sense of freedom, autonomy, and ownership, which hybrid seeds, markets, and seed companies dispossess them of. Given the concerns of climate change–induced complexities, they do not have to worry about seeds in case the first or second round of sowing fails. Unlike most hybrid seeds, the heirloom seeds could reproduce, and seed sharing among farmers is also possible. A farmer shared that he distributed 5 kilograms of heirloom paddy seeds to other farming households in his network. Post-harvest, they returned 10 kilograms of seeds to him. Thus, sharing seeds and regenerating them is possible through heirloom seeds.

Participants in the dialogue conference had the following suggestions: promote a culture of sharing seeds and mutual exchange by reviving cultural practices and seed festivals; create spaces to share and sell native seeds and produce; develop and strengthen local value chains for native and heirloom crops; actively promote homestead farming, where women would have control over heirloom seeds; strengthen 'farm to household'–based direct delivery models without the presence of intermediaries; shift from pest control practices to pest management by considering the entanglements in social–ecological systems; develop strategies to bring about changes in consumer awareness and behavior; and promote traditional agricultural knowledge, which would provide diverse exposure to children, teachers, and mothers to overcome the knowledge binaries that separate humans from the rest of nature.

The graduate students in agriculture who were present during the dialogue conference were skeptical of such resistance strategies. "Can we resist commoditization?" they asked. According to them, the perpetuation of the cash economy has made the situation difficult, and any counter-mobilization vulnerable. Today, the market and the climate are two forces that dominate farmers' decision-making strategies, including what to cultivate and how to go about it. Farmers in the study region largely depended on agriculture and cattle rearing for their livelihoods. However, as agriculture became less profitable and uncertain due to climate change, small and marginal farmers found it difficult to hold on to farming. Due to the lack of water for cultivation, men migrate to other places for livelihoods, and women seek wage labor in nearby factories. As agriculture has become riskier and more uncertain, people from poor and vulnerable households have shifted to other industrial frontiers, such as the textile industry, in search of livelihoods. The youth are also diversifying to the expanding opportunities in the information technology sector. These diversifications have also led to the erosion of traditional ecological knowledge and livelihood practices closely entangled with their eco-social worlds. A young person shared his concern:

Our elders are running panicked behind money and the pursuit of more and more profit. No one is concerned about the health of soil, water, and humans. Though my parents are farmers, if I go into farming, they will label me insane. Today, our parents consider blue-collar and white-collar jobs as a profession, not agriculture. This must change. What will we do if society does not recognize farming? We will not get a bride if we do agriculture!

Some others shared that the curriculum needs to engage more with heirloom farming. Currently, the emphasis is skewed towards the hybridization and commercialization of farming. The concerns of these youth reflected what Heller (2016) terms cognitive capitalism, which seeks new forms of knowledge that can be rapidly commodified. Such trends also engage with only a single form of knowledge or a one-world ontology (Law, 2015), signifying a sense of 'epistemicide' (Tsing *et al.*, 2019, p. S192).

The increasing use of hybrid seeds, the concreting of house compounds, dependency on the market for seeds, and ignoring traditional ecological knowledge affect the conservation of native and heirloom seeds. Today, while seed activists claim that native seeds are climate-resilient and will aid climate adaptation, farmers themselves counter such claims. According to farmers, the present toxicity in the soil due to chemical farming will 'burn' the native seeds to death. Mixing hybrid seeds with native seeds has added further uncertainty to their understanding of which seeds are better suited for climate adaptation. Several farmers have abandoned the practice of seed saving in their homes, as they depend heavily on the market for their supply. The

commodity deepening through the promotion of high-yielding varieties has further shaped farming into a profit-maximization practice. A farmer remarked:

We have started believing hybrid seeds are high-yielding. These seeds are indeed high-yielding and can be harvested quickly. In contrast, native seeds take time to fruit. However, we are also aware that the native seeds taste better and are healthier and nutritional.

It also surprised us when we realized the linkages between changing family structures and people's preference for hybrid seeds. With the emergence of nuclear families, some households prefer to buy vegetables that are smaller in size. Hybrid crops usually yield small-sized vegetables, and therefore, people prefer them. Further, it is easy for people to peel and clean them. In contrast, the native/heirloom varieties of crops yield larger ones, which are also tricky to peel and clean due to their rough-and-tough texture. These discussions remind us of the observation that Vasavi (1994) made several decades ago on how farmers in another village in Bijapur referred to the present as 'hybrid times' and to themselves as 'hybrid people' who are now 'weak, delicate, dependent, and susceptible to diseases.' The conditions of farmers depicted the 'unfreedom' farmers were facing, compounded by the erosion of their local knowledge systems, agrarian values, and identity (Vasavi, 1994).

4. Discussion

The nature of vulnerabilities shaping the everyday livelihood practices of small and marginal farmers is very complex. Various factors, such as dependency on the market for specific varieties of hybrid seeds, CSA interventions without proper information dissemination, lack of solidarity among farmers, indebtedness, and aspirations to achieve maximum profit within a shorter time, constrain farmers' agency in adaptation. Further, the notions of being 'smart' imply the development or maneuvering of new technology and market mechanisms often situated outside these farmers' access boundaries. The sociocultural and spatial practices that ensured the communal pooling of risk in farming villages (such as seed-sharing practices associated with temple rituals) have weakened. While collectives and cooperatives are being fragmented or becoming defunct, the burden of facing wicked problems such as climate change has entirely transitioned into intense personal experiences of risk exposure (Vasavi, 1994, 2012).

The stakes in CSA and other technological options, such as GM crops, have taken a further moral twist in these contexts, drawing on the positive feeling of abundance and the end of misery (Aga, 2021). Nevertheless, the commodification of seeds and related farm management practices result in the alienation and dispossession of farmers. Farmers are caught between markets and seed manufacturers. Farmers have lost the practice of conserving native seeds. Further, as observed by Ramamurthy (2011), as a spin-off to commodification, small-holder capitalists in rural areas have forayed into the retailing of hybrid seeds and other inputs, thus acting as a favorable medium for corporates to transfer new and emergent technological practices to farmers.

The action research also provoked us to ponder strategies for strengthening actions to reclaim farmers' freedom in producing and conserving seeds. However, we realized this may not be possible through the efforts of a few seed keepers alone. Instead, it must evolve as a broader collective effort. An elderly farmer shared: "Collective resistance is more potent than an individual seed keeper could achieve. Resistance is not easy when we have limited options, especially for people like us with small land holdings."

We are also aware of the intersectional challenges that such collective action processes would face. During our action research, we realized how diverse intersectional factors, especially caste and gender-based hierarchies, could hinder the seed keepers' movement. We could see very few farmers, specifically women, who were persistently involved in on-farm breeding and conservation of heirloom varieties. The policies and practices promoting hybrid seeds have led to the loss of naturally available native seed varieties. Further, these processes of dispossession are layered within intersectional and socio-structural inequalities at the local level. Women farmers and marginal farmers from less privileged and oppressed caste groups are the primary victims

of these transitions. Ramamurthy (2010) refers to hybridization (the cross-pollination of two genetic varieties to produce a hybrid seed) as 'floral sex work,' emphasizing the gendering of techno-cultural processes with nature. Ramamurthy argues that through the promotion of irrigation and hybridization at different phases of the Green Revolution, gender binaries have not only been reinforced in everyday practice but also resulted in the feminization of agriculture, showcasing the dynamic relationship between labor and capital (Ramamurthy, 1991, 2010). These are also ways cheap labor is extracted through a gendered process (Ramamurthy 2010). Ramamurthy (2000) argues that these processes are a continuation of British colonial policies that played with the agrarian relations and prevailing patriarchal norms affecting the everyday livelihood practices of women. The outcomes of such extractivism have become more unpredictable due to climate variability, poor soil fertility, pest invasions, knowledge uncertainties, and lack of access to good-quality seeds. Tractors, threshers, Happy Seeders, and herbicides have reduced employment opportunities for elderly women from less privileged caste groups. On several occasions, we could connect with Ramamurthy's (2011, p. 1036) observations that these women continue to "experience the inherent contradictions of capitalism through a 'structure of feeling' marked by perplexity."

Resisting coloniality implies that we must have the agency to counter models of total extractivism by critically examining the everyday normalization of hierarchies and oppression in sustaining a techno-capitalist trajectory (Dunlop & Jakobsen, 2020, p. 119). However, working through a web of hegemonic power relations is a consistent challenge, making us wonder whether grassroots movements will succeed in uprooting the status quo (Brown, 2018). History shows that most sustainable agriculture organizations reinforce the prevailing power relations (Brown). The Dalit community on the project site were custodians of indigenous knowledge and involved in conserving diverse varieties of native seeds. However, these people and seeds were not part of the larger collective's prominent discursive practices of farming and seed conservation. Though they are rich custodians of knowledge and possess rare native seeds, they remain the most vulnerable and exploited, primarily as cheap laborers, systematically oppressed by capitalist class and caste relations (Shah *et al.*, 2018).

5. Conclusion

The capitalist "worldeater" continues colonizing the planet as it appropriates, expropriates, and extinguishes all vital human and nonhuman matter while accumulating profit (Dunlap & Jakobsen, 2020, p. 7). Aided by smart technologies serving financial-cum-political interests, extractivism continuing from colonial times to the present is characterized by the creation of monopolies over resources, where diverse capital groups deepen inequalities and destroy eco-social worlds (Aga, 2021; Ye *et al.*, 2020). Agrobiodiversity and traditional knowledge systems are threatened today due to diverse factors, such as the rapid expansion of industrial and commercial agriculture, the Green Revolution, and the globalization of food production and consumption (Gonzalez, 2011; Vasavi, 1994). We will not find a solution if we resort to one-size-fits-all technologies, which have already impacted the environment, farmer autonomy, price instability, and rural livelihoods (Brown, 2018).

Our experiences through the action research demonstrate that the climate crisis and its response are shaped by knowledge dualisms that separate society from nature, alienate seeds from farmers, and transform moral economies for capital/profit accumulation. We agree with Dunlap and Jakobsen's (2020, p. 8) argument that the discursive practices of climate change are mainly "technocratic framings that situate agency in the hands of few experts and powerful actors but, at the same time, seem powerless to face the all-devouring world-eating capitalist machine." Shaped by Western worldviews of modernization and development, nature and related eco-social worlds are cheapened and translated as commodities in pursuing profit and power. Responding ethically to the problems of climate change and seed conservation requires us to break away from the paradigms that locate nature and society as binaries and commodities. Climate justice can be achieved only if strategies aimed at adaptation, conservation, and well-being are dialogical and inclusive and recognize human–nonhuman entanglements (seed–farmer entanglements).

We must question our faith in the contemporary growth model that focuses only on increasing productivity and profit maximization while small and marginal farmers, including women and less privileged caste groups, continue to be oppressed, silenced, and disadvantaged. In such contexts, we desire

transformations in our everyday practices, seeking autonomy, an ethics of care, and shared reciprocities (Pimbert, 2022; Weber, 2020). Such an approach requires alternative ontologies of being that direct our attention to diverse modes of knowing and living (Tsing *et al.*, 2019, p. S192). Counter-hegemonic practices by seed keepers' networks that seek agroecological transformations based on justice, care, and solidarity give us hope for a dignified and sustainable future. There is a need to explore, relearn, and promote diverse agricultural practices that are more holistic, inclusive, and ecologically sustainable. This would imply that we strive for alternative pathways to agricultural education and practice embedded within political praxis. Our hope lies in a statement made by a seed keeper that:

The resistance to commodification lies within seeds... An immediate change is not possible but hopes for a gradual and sound change by spreading the impact from one farmer to another, seeing one's farm and getting inspired to use more and more native seeds.

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