

Farmer Supported Biodiversity Conservation in Uttarakhand, India

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Abstract: In Uttarakhand, India, an estimated 80 percent of the farming is “organic by default” in rainfed areas, and in the hills, 90 percent of the agricultural land is rainfed. Rich biodiversity both in wild plants and agricultural crops is preserved in ancient as well as new seed banks. New technologies, particularly introduction of hybrid seed, have negatively impacted traditional diversity in crops, and some farmers have experienced nutrient depletion with use of mineral fertilizers, especially when rain was less than expected. Farmers here cultivate a number of traditional crops famous for taste and quality, often sold in Delhi and Mumbai, but there is a need to improve marketing. Many certified organic producers receive market premiums only in urban areas. Local farmers’ organizations train and support farmers converting from conventional to organic practices and also help those farmers using traditional, natural methods to improve their production. Organizations that assist farmers in this transition are crucial because they teach new methods and give practical and moral support when farmers feel uncertain making a large change in how they earn their living. During the conversion period, farmers in traditional low-input production systems often see immediate increase in the yields when they start to make use of multiple on-farm fertility sources including vermi compost, crop residue, and animal manure. Multi-cropping is also used to increase production on small plots and to reduce the risk of loss due to drought or other difficult climatic conditions. Farmers reported that local food security is improved through biodiversity conservation and control over their own seed and other inputs.

Fieldwork for this research was conducted between February 2007 and October 2008 in Punjab, Uttarakhand, Tamil Nadu, and West Bengal, and includes interviews with 250 farmers and staff from farmers’ organizations. This paper focuses on the findings from Uttarakhand.

Keywords: Biodiversity conservation, mountain agriculture, agroforestry, sustainable farming

Introduction: Mountain Agriculture and Agroforestry

Uttarakhand in northern India is primarily composed of relatively homogeneous small family farms located in a still largely inaccessible mountain region. The farmers here embrace traditional agroforestry systems developed over centuries to cope with challenges and build on opportunities presented by the local environment. Topography is a barrier to mechanization in hilly areas of the state, but some modern farming methods have recently been adopted. Local farmers maintain a rich biodiversity, both in crops and other plants grown or collected from the wild, many with medicinal and herbal properties. There is little use of agrochemicals, and consequently fewer negative environmental and health effects compared to other parts of India. Local farmers do face large challenges, such as how to support a growing population and how to counter the effects of climate change.

Uttarakhand (north country), located in the Western Himalayas, is 90 percent mountainous with forests covering 60–65 percent, and only 14.5 percent of the land is cultivated (Mittal, et al. 2008; Sati 2005; Singh 2009). Climate and vegetation vary greatly, from snow covered mountains, glaciers, and bare rock at the highest elevations (7,816 meters), to moist forests in the plains around 300 meters above sea level. Distinct agroecological zones include the highlands from 2,400–

3,600 meters, where barley, potato, wheat, and other crops are grown in the summer season only. From 1,200–2,400 meters, finger millet and rice are cultivated in addition to the three crops above. At lower elevations farmers plant finger millet, maize, rice, and wheat, while the plains have largely been cleared for wheat, rice and sugarcane. Together with maize and finger millet, these lowland crops are produced in 80 percent of the cultivated area (Guha 2000a). On most farms in the hills farmers grow three to five varieties of cereal (wheat, rice or millets), two to three pulse crops, and supplement their diets and income with vegetables, fruit, and animal husbandry. While agriculture with mixed farming systems of crops and animals is the main livelihood for more than three quarters of the population, it contributes only 22 percent to the state's domestic product. Most farmers own their land, largely farmed with family labor. Irrigation is difficult in steep hillsides, where slopes have been converted into field terraces located high above the rivers, and merely 10 percent of the agricultural plots in the hills are irrigated. The national average of irrigated net sown area is 40 percent (Indiastat 2011; Mittal, et al. 2008; Singh 2009). Average landholding size is only 2.3 acres, compared to the national average of 3.5 acres, and almost 70 percent of the holdings are marginal (less than 2.5 acres). Seventy-eight percent of the population of about 10 million live in rural areas (Mittal, et al. 2008; Indiastat 2011).

Historically, production for the market has been limited due to lack of transportation and other infrastructure. This situation persists today, with over four thousand villages still not connected by road (Guha 2000a; Singh 2009). Eighty percent of rural households earn over one third of their income from livestock, mainly from sale of meat and milk. Animals are mainly fed leaves and crop residues in addition to cultivated green fodder and grasses from permanent pastures. Geographic inaccessibility, environmental diversity, and ecological fragility have contributed to this historic agroecological production system, mainly sustained with inputs from the forest. Even though agriculture in the hill areas is less mechanized than in the plains, some farmers own a tractor, or several farmers share one tractor. Bullocks are easier to maneuver in undulating terrain, and horses and mules are the core of the rural transport system in hill districts. On the whole, hill areas are less developed than the plains, also in terms of education and health services (Mittal, et al. 2008, Singh 2009).

To build on the traditions of using natural farming methods, for economic and ecological reasons, the state government identified organic farming as a focus for agricultural development and declared Uttarakhand as the first *organic state* in India. This does not mean that chemical pesticides or mineral fertilizers are forbidden, but their use has been reduced since 2003 (Singh 2009), and the government encourages and supports farmers who want to use organic methods. The government established the Uttarakhand Organic Commodity Board in 2003 to coordinate and promote organic farming throughout the state, and emphasized the importance of the forest for rural mountain agriculture. Forests and associated grasslands provide fodder for livestock and regulate hydrological and nutrient cycling for sustainability of fragile hill agro-ecosystems. Millions of tons of leaf litter are available every year after ecological needs of the forest are fulfilled, and leaf litter collection plus traditional manure systems can maintain the nutrients in the soil. Uttarakhand has an exceptionally rich plant biodiversity. Farmers may grow up to 40 different species in a year, and at least 175 species of aromatic and medicinal plants are known to grow there (Mahajan 2009; Mittal, et al. 2008).

Several social movements and farmers' organizations have opposed the farming trends driven by agribusiness by promoting sustainable, organic agriculture, and the re-validation of indigenous knowledge. One of the organizations is Navdanya (translates into 'nine crops', representing India's collective source of food security), a social movement led by Dr. Vandana Shiva, a physicist, environmentalist, and agricultural activist from India. Navdanya was founded in 1987 "to provide direction and support to environmental activism" and undertake "independent research to

address the most significant ecological and social issues, in close partnership with local communities and social movements” (Navdanya 2009b).

Research Questions

This research looks at the work social movements like Navdanya have done in facilitating conversion to organic agriculture in India, and more importantly how the local farmers perceive, and adopt or reject this “traditional,” now called “alternative,” farming philosophy and strategy. Key questions were: Are farmers actively and consciously resisting industrialized agriculture through the Navdanya model? How do they view their role in an increasingly globalized agricultural economy? How do they view their futures? The focus of this brief paper is Navdanya’s work with farmers in Uttarakhand, one of the four states for field research, and farmers’ experiences with conversion, biodiversity conservation and seed saving, and lastly sale of organic produce.

Methods

Fieldwork for this research was conducted between February 2007 and October 2008. In Uttarakhand, emphasis was on hill and mountain agriculture, and interviews with 62 farmers and staff from Navdanya were conducted. In addition to field sites in villages in the hills, in Uttarkashi, the northernmost district of the state, several weeks were spent at Navdanya’s research farm and training center, BijaVidyapeeth, near Dehradun, because organic farming training for farmers and coordinators and other meetings takes place there.

Navdanya in Uttarakhand

According to Shiva (2003), Navdanya started to work with local farmers, educating them about organic agriculture, creating local seed banks, fighting against the establishment of intellectual property rights (IPRs) on traditional knowledge, and defending their food rights and food sovereignty. At BijaVidyapeeth, their eight-acre farm, several courses are taught to people from within India and from abroad. There are large meetings and training sessions for their coordinators and participating farmers, and celebrations such as Biodiversity Day, where politicians and other leaders are invited to participate. At the farm they also produce and preserve diverse varieties of millets, pulses, oilseed, vegetables and medicinal plants, in addition to 30 varieties of wheat and over 250 varieties of rice. The Navdanya coordinators are farmers, some with higher education and involved in agricultural research, independently, or in cooperation with Navdanya. Most worked part time for Navdanya, got a symbolic compensation, and received training at their research farm, BijaVidyapeeth.

One of the first to join Shiva was Darban Singh Negi, a farmer from Garhwal who had been working in another NGO. Negi now divides his time between BijaVidyapeeth, his own small farm in Garhwal, and coordinating the training of farmers in organic agriculture. Negi recalled earlier days when they started the work: “Many people used to tell me that Vandana and I were wasting time and money, and that we needed more food fast. Now, many NGOs are working on organic farming and seed saving and we are working in 16 states in India.” He noticed today people everywhere are talking about organic farming and seed saving. “For me, this is the success of Navdanya. That we withstood that critique and have inspired so many to do similar work,” he mentioned proudly. “In some regions we are working alone, like in these hill areas where we can reach the farmers easily, while in other states we cooperate with local organizations and share information.”

The director of Navdanya, Dr. Vinod Kumar Bhatt, came to the organization in 1997 after teaching botany. He has conducted research on productivity potential of traditional crops, comparing local with commercial varieties. He also looked at the overall production of a mixed cropping system, and found that even in the worst drought conditions some of the crops did very well, although one or two failed. The farmers were successful because the resilience of the mixture performed very well, while had it been a monoculture the farmers could have experienced 100 per-

cent loss. Also, valuable genetic resources are conserved in the cultivation of multiple crops and local varieties (Rais, et al. 2009). Some traditional varieties of rice produce around 23 percent higher yields compared to the conventional hybrids in Uttarakhand (Panneerselvam, et al. 2010). In a comparative study, higher grain yield was found in rice plots fertilized with cow manure, which contributed to greater nutrient availability, less pest infestation and improved soil quality, compared to conventional plots treated with mineral fertilizers (Saha, et al. 2010). When farmers in the irrigated areas of the Green Revolution convert to organic agriculture, their yields reach about the same, or sometimes a little less than crops from conventional systems, after the initial conversion period (Kler, et al. 2002; Rajendran, et al. 2000). In traditional rainfed agriculture with few external inputs, organic agriculture has shown potential to increase yields (Ramesh, et al. 2008; 2010).

Farmers' Experiences

Many farmers in the hill areas of Uttarakhand have practiced what is called “organic agriculture by default”, living in remote areas and far from transport facilities. Surbeer is a farmer who lives in Sour, a village in the northernmost district of Uttarkashi, with a spectacular view of the Himalayas. Neatly terraced plots and fruit trees surrounding the village make it an idyllic sight. Surbeer told me, “Our farming in the past was natural; we applied cow, sheep, and goat dung in the fields... The road was built in the mid 1970s and transportation to the village became possible... A few people started to use chemical fertilizers to grow potatoes from the 1980s” when a state cooperative was opened. The Department of Agriculture provided the cooperative with mineral fertilizers and hybrid seed, and the cooperative gave farmers inputs on credit. The farmers paid for the inputs when they sold their produce. “By using chemical fertilizers the production increased,” Surbeer said, “and the local people started to make more money.” After planting one sack of potatoes they could harvest 10–12 sacks, but after four to five years the yield started to decrease and they had to move to a new field. “We realized that the whole farming got ruined, and the soil on the top became like ash, as if the soil had burned and the crop completely stopped,” he said. “When Navdanya came to the village and talked to us in 2002, we told the coordinator, Raghubir Singh Rawat, that our farming is dying.”

In a fertilizer study in four hill districts of Uttarakhand (Singh and Singh 2004a), 46 percent of farmers said they were reducing use of mineral fertilizers, and climatic conditions such as insufficient rainfall are cited as one cause. A third of farmers who used mineral fertilizers deemed that chemicals caused loss of soil fertility and change in soil structure, such as creating a hard upper crust which requires a heavy plough for tilling, and declined porosity and water holding capacity (Singh and Singh 2004b). Farmers also said economic returns were poor, and that the price of agrochemicals increased input costs excessively (Singh and Singh 2004a). This development model has not increased self-reliance or livelihood security in hill communities. From being self-sufficient with few external inputs, with agricultural traditions intertwined with social practices, rituals and festivals, agriculture is now increasingly a commercial activity where farmers make an investment and hope for profits. Previously farmers regarded the soil as a living medium, that they would feed, and in turn the soil would feed the plants. Biomass from forests and residues from crops went back to cropland as manure. Negative effects from mineral fertilizers and chemical pesticides impact this sensitive agroecological system.

Training of Farmers

Vinod Chamoli, a farmer from Rudraprayag who has been working with Navdanya since 1999 as a coordinator, is involved in organizing farmers' meetings, training programs, and work on the People's Biodiversity Registers (PBR). The latter is a program initiated by the Foundation for Revitalisation of Local Health Traditions in several Indian states to record folk knowledge about the status and use of biological resources. Since 1995 several NGOs, among them Navdanya, and

members of the academic community have been involved in setting up registers where local information is recorded with full acknowledgement of the sources, so that any benefits that may come from future economic use of the registers can be shared. While in some areas the focus is on recording folk knowledge of medicinal uses of plants, Navdanya and other farmers' organizations are also recording the occurrence and management practices of land races of cultivated crops to support their on-farm conservation, and to promote farmers' rights (Gadgil, et al. 2000). Since 1999, around five thousands farmers have joined Navdanya in Rudraprayag district.

Negi argued, as have others, that the water resources are shrinking with the declining snow cover in the mountains. "We need management of water, and we are losing a lot of forest. There is replanting, but normally only of one type of tree, but we need to bring back the variety of trees for both timber and medicinal use, and for the animals to have something to eat." He explained how he starts by talking to the farmers about water and forest issues. "If you don't have any moisture in your land how can you grow anything? The forest gives moisture, as does organic farming. While Negi does not see any real obstacles preventing the small farmers from converting to organic agriculture, he argued, "We need to give them alternatives." He said it is important to explain that if they would use these alternatives they would save on their inputs. He believed that with practical demonstrations in the village, the farmers learn very quickly. In his home district, Garhwal, Negi works with farmers in more than 100 villages together with three local Navdanya coordinators, and over 50 of these villages are now completely converted to organic methods. "I started to talk to people in 1993, and the following year we started to sow organic. More converted in the last part of the 90s, so they have been growing organic for more than ten years. Most of the farmers were using only a little amount of chemicals earlier," Negi said, and gave an example of an incident that made many farmers convert. A few years ago the farmers lost almost the whole crop of onions and had to import from Pakistan. Onions, a basic ingredient in Indian cooking, which normally sell at a rate of Rs. 4 per kilogram increased to Rs. 40, and even for a while to Rs. 60 per kilogram. The conventional farmers had sold the few onions they had for the regular rate, because they could not keep the produce for long before it went bad. The organic farmers had onions for three months and could benefit from the price increase. The farmers became interested in how the organic onions lasted so much longer, and several stopped using mineral fertilizers, Negi said. "If you don't use chemicals, the vegetables keep better. Onions can be stored for six months. With mineral fertilizers they stay fresh for only one and a half months." Several comparative tests in various countries have reported that the quality of organic produce after storage is better than that of conventional produce (Benge, et al. 2000; Raupp 1997; Reganold, et al. 2001).

Biodiversity Conservation

Seed saving is one of the practices familiar to all the farmers in Uttarakhand. In Uttarkashi district there were many old seed banks, some smaller ones on individual farms and other larger ones maintained by whole villages; some were embellished with decorative woodcarvings. Most were constructed with thick wood walls and stood on a base of stones. Kala, a female farmer in Jakul village, said that her community has had seed banks for a long time. "We never used to buy seed from the market. We did not learn to save seed from Navdanya; we have been saving seed historically." She pointed to the seed bank in her village, and as a leader of the biodiversity group, she kept the key, a large black iron key, in her home. They store their grain and other food items in the same unit. "We had a loss from our seed, so we exchanged with another village. Now we are self-dependent in terms of seed again." She continued, "sometimes we sell seed, but not between us." If the villagers have no seed left Kala will give them some. "We give the seed only on good relation and on friendly values." Community seed banks not only make farmers independent, they also recognize women's knowledge as valuable, because women are often in charge of the seed bank. This gives women greater influence in village affairs and the opportunity to participate in the broader seed conservation movement.

In Sour village, Surbeer explained they also exchange seed and borrow from each other, and when the crop is harvested return the seed to the farmer that provided them. “At some places the seed banks are old, at other places Navdanya has started new seed banks,” he said. He emphasized they are concerned about having variety, and keep the seed of all the crops that grow in their area. “We think saving seed and biodiversity is good for us and for the whole country.” He noted that their seed are adjusted to the local environment. “This is what we have been doing from our ancestor’s time in the whole area. These are all our seed from many generations back; we do not even recall when we started to use these seed.” Surbeer said they never bring seed from outside. Some seed, which were becoming scarce, are now exchanged through Navdanya. Vinod, the coordinator in Rudraprayag explained, “we approach the farmers who have more seed than their need and encourage them to save these extra seed, and share with those who have no seed.”

The choice the farmers have is clear, between the safeguarding or rebuilding of their self-sufficient local food systems and their biodiversity, or reliance on monoculture and a food system controlled by industry. Navdanya and other farmers’ organizations see as the only alternative solution that farmers keep and grow their own seed.

From Farm to Market

One challenge for the farmers is to get a higher price for their organic produce, and to get it to the market. Surbeer said, “We sell our produce here in the village mostly; sometimes Navdanya buys kidney beans, paddy, wheat, and organic vegetable seed from us.” Surbeer added they now sow beans and get good prices, and that they have reduced growing potatoes. When the wheat is harvested, they sow beans in the same field. “That way we get two crops in a year. We also grow vegetables like peas, tomatoes, potatoes, chilies and beans that we sell to Navdanya,” Surbeer explains.

Navdanya has a network for distribution, and buys directly from the farmers. That is convenient for Surbeer, because the closest market for Sour is in Dehradun, which is ten hours away with the local bus. Vijay Bhatt, who has worked for Navdanya since 2003 said, “I joined Navdanya as a volunteer in 1999 when they made a JaiV Panchayat, a biodiversity focused village festival, in Rudraprayag, because I liked their work; it is good for the state and good for our farmers.” Navdanya buys from a variety of farmers; it may collect 50 quintals from one farmer and 100 quintals from another, but Vijay admitted he prefers to go to the farmers where he will buy one or two quintals (1 quintal = 100 kilogram). “It takes longer time, and we often buy only 20–25 quintals in one day because we buy a few quintals in each farm, but I like to buy from small farmers because I want them to receive a good price. I want to support them so they can live from agriculture. The big farmers can sell in the market, and they have contacts,” he added. “I talk to the farmers, check the quality of the produce, and decide the rates. Navdanya pays about ten percent more than others”, he explained. “The price of the end product is excessive because of the transport and package, but people are interested in buying organic in the cities, mainly Delhi and Mumbai.” Navdanya is not an official certifying agency, but they have their own certification. Vijay said, “We collect soil samples and check the location of the field. Next year we are taking various farmers in certification. I think it is going to grow every year.” Some Navdanya members also undergo the organic certification by the Uttarakhand State Organic Certification Agency or other national or international agencies.

Dr. Bhatt says, “I think the only solution is if the farmers do biodiversity-based organic farming. That is the only way for their sustainability and it is also better for the environment, and biodiversity.” He thought small farmers who live in the countryside should continue living there instead of moving. “They should continue with what they were doing earlier, and of course they should continue doing innovations.”

Rawat, the coordinator from Rudraprayag is working with organic farmers who cultivate medicinal plants. “We help farmers to grow by giving them seed and then we buy back their produce,” he explained. The state of Uttarakhand is developing several medicinal and aromatic plants (MAPs) projects for increasing this cultivation. Organic cultivation of MAPs is a fast growing activity that can increase the income for marginal farmers in a sustainable way. The variety the small farmers in the hill areas grow, like rice, pulses, vegetables, spices, herbs, and fruits, makes it easier for them to be self-sufficient in food than for the farmers in the plains that are more prone to grow just wheat and rice. There is not much room for other livelihoods in these hills, but mountain agroforestry is one that has been working for centuries, and can be further improved with education of the farmers in agricultural technologies and by improving infrastructure and access to a market.

Conclusions

This research indicates that it is possible for farmers to convert from an intensive conventional system to organic farming, or to make a living on a smallholding in difficult terrain. Both alternatives can provide a good livelihood with sustainable methods. The combination of being economically independent, if still poor, and having control over the inputs and production methods on your farm, is really empowering.

Uttarakhand is a relatively new state, with a long history of cultivation of certain crops and combinations of these, developed by farmers and adjusted over centuries to the varying micro-ecological niches in these deep valleys (Singh 1998). Navdanya has been working with farmers in Uttarakhand, as well as in several other states in India, for almost three decades, with the aim to teach the farmers to be self-sufficient through organic agriculture and biodiversity conservation, in order to maintain sustainable livelihoods and preserve the ecological resources. The state has suffered some negative effects of mineral fertilizer use on soil fertility. Climate change is an increasing problem for farmers in Uttarakhand, especially decreasing rainfall and erratic patterns of the monsoon, which make rainfed farming difficult to control. Navdanya and other organizations working on sustainable farming methods see that multi-cropping, use of locally adapted seed—which require less water—and natural fertilizers in the form of dung and forest litter to replenish the soil, are the best way to adapt to these changes. Navdanya staff carries out research on organic farming methods, natural pest-controlling mechanisms, and economic and environmental effects of converting to sustainable farming and water conservation in their villages. Moreover farmers are involved in political aspects of sustainable farming, and take part in courses, meetings, and activism related to issues such as international trade, patents, and GM crops. They learn about the real costs of using hybrid seed, and are encouraged to use local varieties and keeping seed banks. Marketing organic produce and securing a good price for the farmers is a challenge here as in other states. A growing demand for organic produce, and a potential for expanded sale, enable many farmers to support their families through sustainable farming and livestock. This help them sustain their livelihoods, and at the same time preserving crop and natural biodiversity as well as culture and quality of life.

A more extensive version of these findings is published in Nicolaysen, A. M. (2013). *The Dark Shadow of the Green Revolution: Empowering Small Farmers in India through Organic Agriculture and Biodiversity Conservation*. Saarbrücken: LAP Lambert Academic Publishing.

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