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### **Indian Smallholder Farming: Back to the Roots**

I live in a mid-size suburban house in the greater Triangle region of Cary, North Carolina. I live with my sister, mom, dad, and dog: 4 humans and 1 dog. We have a pomegranate bush that is currently putting out more fruit than we know what to do with, blueberries that the deer always get to before we do, two or three pepper plants that my dad planted on the deck, and a rosemary shrub in a pot.

My neighbors all live in a very similar way, plus or minus one or two kids (and maybe they have a cat instead of a dog). We live deep in a little “American Dream” neighborhood at the end of a cul-de-sac. Six houses surround the circular section of the cul-de-sac and together those six houses make up about 2 hectares: the same amount of land that a typical smallholder in third world India has to eat, sleep, make money, and raise a family.

Smallholders make up 78% of all of India’s farmers. But they only own 33% of the cultivated land in India. Smallholders experience much suffering in the form of debts, malnutrition and related health issues, educational deficiencies, and bad weather, and yet they produce 41% of the country’s food.

A large majority of these smallholders use conventional farming methods. Conventional farming, instigated by the Green Revolution of the 1960’s, provided a method of farming for smallholders in India that put food on their plates when the entire country was on the brink of famine due to poor agronomic policy and management, degraded soil and bad weather. However, poor soil and bad weather did not disappear with the introduction of conventional farming. Conventional farming - using genetically enhanced seeds, chemical fertilizers and pesticides – simply covered up these problems.

Conventional farming was like putting duct tape on the car rear-view mirror when it falls off. It holds everything together, but when inspection comes it will have to be replaced. It seems, however, that there were limited inspectors of the Green Revolution because, as the duct tape began to wear out and the mirror started to slump, no one told them how to put everything back together in a sustainable, reliable way.

Of course, there were efforts. Organic and biodynamic farming were created as grassroots movements, and the emerging environmental movements of the 1970s and sustainability movements more recently all have had positive impacts. Methods of farming without or with reduced chemicals and better understanding of soil, pest and plant ecologies can lead to more sustainable practices. Organic farming uses regular seeds and organic fertilizers and pesticides – organic meaning non-laboratory (non-synthetic) created. Organic farming can be very effective and give a high yield. Chemical fertilizers, pesticides, and the most advanced seeds are expensive to buy and use. Often the smallholders don’t even know how or when to properly use them, so they end up having to pay the cost and not reaping the benefits. It’s like as though a person who’s only ever ridden a bicycle is suddenly given a red sports car. They love it, but they don’t know what to do with it. And, besides, a sports car is too expensive for some families. A smallholder needs something steady, reliable, and cost effective: like a Volkswagen.

Biodynamic farming is the exact opposite of conventional farming. It focuses mainly on the soil – farming from the bottom to the top. This is opposite of the Green Revolution which caused farmers to rely on top-down farming, where everything was added from above the soil – such as seed and chemicals. Biodynamic farming says that you cannot grow a large amount of good food in a small amount of bad

soil. Therefore, it is ideal to have a considerable amount of good soil and the rest will come. It increases the quality and biodiversity of the soil. In India, for example, it pulls from the large cow population, using their composted cow manure to improve soil. Biodynamic farming relies on nature to take care of the crops. If there's a worm problem, the biodynamic farmer would look around and say that the birds should take care of the pesky worms in a couple days, instead of looking at the problem and saying that it needs a pesticide. It is a method that uses many approaches that are now understood to be central to Integrated Pest Management. However, biodynamic farming, no matter how cheap, can have a relatively low yield when compared with conventional and organic farming. The yield is not high enough to provide food and income for a smallholder in India, or to feed the world. It fits on the landscape and amongst farmers in certain circumstances, and has much to teach other kinds of farming systems about integrated soil and crop management, and how to reduce costs and debt.

The problems for smallholders in India today are: poor soil, low and highly variable yields, and high debts from the practice of buying advanced seeds, as well as the fertilizer and pesticides required to try and make the seed grow as it should in their environment. But poor soils, and the many other challenges smallholders face, often result in seed potential being unrealized, but the expense and debt is real no matter what. In addition, smallholders tend to grow food to feed themselves, and then maybe some specialty food, which they can take to markets and sell for more money not to other smallholders but to restaurant owners and city folk. They also struggle to share resources with their neighbors because the chemicals they need to use are expensive, and as each farmer copes with debt and crop production uncertainty, it becomes harder and harder to cooperate with each other as was traditional and often necessary in smallholder systems.

In order to improve the environment and keep in mind the needs of smallholders, we must create a *mélange* of farming techniques, taking the best of all three worlds to make a beautiful harmony. This means growing food from the ground, up. We need to take the duct tape off by focusing on improving soil, getting a higher yield, better maximizing the potential of whatever seed farmers do plant, designing systems that help farmers pay off debts, and creating collaborative communities in order to improve conditions for smallholders in India, and elsewhere.

To start this process we need to start with soil. The soil in India has, to say the least, deteriorated as smallholders inadvertently misuse, overuse, and over-rely on the chemicals and methods of the Green Revolution. Plowing, poor physical management and unneeded use of chemicals have drained the soil of vital fertility, nutrients and water-holding capacity. These practices have caused the soil to compact and become barren. Because of this, it's very difficult to grow food in the soil and get the crop production returns appropriate to farming investments. These investments should keep a smallholder and their family fed and out of debt. When soil is degraded, lacking the ability to hold water and nutrients and soft space for roots to grow, farmers suffer. Earthworms and other soil organisms may no longer find the land hospitable, and a host of other changes can occur that result in poor fertility even when fertilizers are added, and an increase in the susceptibility of crops to pests. Parts of the ecosystem like birds, which might help to get rid of any unwanted bug, may also leave because of undesirable conditions.

A simple way to reverse this is to call upon the compost philosophy of biodynamic farming, and apply it more broadly. India, home to 1/5 of the world's cattle population, has no shortage on compostable material – a.k.a. manure. Eight-hundred million tons of manure is produced by 200 million zebu, or cows, every year in India. Indian farmers need to pull upon these resources to make compost, a natural improver of soil. Using compost increases the biodiversity of the soil exponentially and will draw birds, worms, roly-polys and so on – all helping to restore and improve fertility and then crop production – without adding debt.

Improved soil means improved conditions for farming, which means more money to the smallholders. However, in order to maintain high-quality soil, farmers must – in addition to continuing to use compost – switch to the fertilizers and pesticides used frequently in organic farming. Organic farming uses non-synthetic, non-laboratory made chemicals, and considers how each interacts with the entire farming ecosystem. An organic pesticide, for example, could be materials from chrysanthemums. Chrysanthemums contain natural insecticides. Organic fertilizers are better for the environment and they cost less than the average chemical fertilizer. In fact, a study showed that the leading organic fertilizer costs 66% less than the leading chemical fertilizer.

The next question is this: what kinds of crops will farmers actually use these organic pesticides and fertilizers on? Indian smallholders should take advantage of the potential in genetically enhanced seeds, but in a system that allows them to actually get the benefit of those seeds, without falling into debt when production is not enough to cover costs. Genetically enhanced seeds tend to produce much higher amounts of foodstuffs and tend to be more resistant to local insects and diseases. The down side is the cost. Although smallholders will be saving money from organic fertilizers and pesticides, and will be growing more food because they will have better soils with the use of compost, many smallholders are already in huge debt - because of the cost of buying and growing genetically enhanced seeds. When farmers buy genetically enhanced seeds they sign a contract that says that they will not replant any of the seeds even if they are fertile. This keeps customers coming back. However, if the farmer gets hit by a monsoon just after planting, or a drought while the plants are flowering, then the farmers have no way to pay back the huge debts that they incur. In fact they may then try to add even more fertilizer to grow enough to feed themselves, and that can add more debt with limited yield improvements under those poor growing conditions.

Seed selling companies should allow farmers to replant their seeds, and they should also fund research for making more genetically enhanced seeds that have the ability to reproduce. However, if these companies just let farmers replant at no cost, then the companies lose income. So, the companies should create a contract that states that the farmers can replant, but every harvest year the company receives a certain amount of the farmer's income from that particular seed. Say the farmer buys a wheat seed at the current price; they replant the seeds after their first harvest and get 50 tons of wheat in the second year. The farmer should then give, say 10%, of the money they make from selling those 50 tons of wheat to the company from which they bought the original seed. And, because the seeds would lose some of their genetic efficacies over time, the percentage given to the company over time should decrease. Maybe in the third year the farmer only has to give the company 5%, and in the fourth year maybe they don't have to give anything. This will keep the farmers loyal to the company - a good thing for the company - and yet allow them to better manage their expenses and focus more on maximizing the underlying aspects of farming found in soil biodiversity over the years, rather than focusing only on the current year.

At this point, the farmers have everything they need to be successful – good land, good fertilizers, good pesticides, and good seeds. The other thing that should change is the kind of plants that the Indian smallholder grows. Now, the smallholder might grow special varieties of vegetables and wheat, for example, in hopes of going to a city and selling them to the rich for higher prices. With the larger income made from these more expensive plants, the smallholders aspire to buy enough food for their families. Smallholders should grow plants that *they* eat. They should sell them at local markets and to local people. This would create local economies that do not depend on the rich of cities like New Delhi and Mumbai to function. All of these factors combined will serve to empower and enhance local farming areas and communities. This will put their agricultural economy back in-sync with what smallholders need and can sustainably afford and accomplish over many years, and not just the year-to-year panic that many such farmers have now.

Doing all of these things, paves the way for more collaborative communities to develop, or redevelop. A community is a group of people who live in the same relative area. They often share interests and ideas. In a community, people share resources. People share food. People share because it helps all of them over the long term. In a lifestyle where no one is ever fully self-dependent or very able to predict and manage the future (like smallholder farming), it helps to have others to call on, to seek advice or help from. That is why communities are important. If one person is short on composted manure, someone else can lend them some with the knowledge that someday that person will lend them some. Communities allow for people to celebrate life and culture, even in the midst of hard times.

It is in this way that smallholders in India can begin to better their lives. They'll be able to grow enough food for themselves, grow enough for market so that they can afford things like health care and education, better manage their smallholding, and reduce their troublesome debt. They need to work small and get big – farming from the ground-up, working together with their community and the public sector and private companies to find balance. A community of smallholders can only be achieved through local economies. Local economies can only be realized if farmers can reliably, sustainably and affordably grow, consume and sell their food to their neighbors. Farmers can only sell food to their neighbors if they produce more than they themselves need, and can reliably afford good seed from seed companies. They can only afford seeds and stay out of debt if they can grow their own seeds, at least for several years between seed purchases, and they can only grow seeds if they have good soil.

So what do we do? Our role, as outsiders looking in, is to offer a helping hand. We need to teach the farmers not only how to farm sustainably, but also *why* to farm sustainably. The United Nations, for example, and international research agencies have to consider the human part of farming when creating new laws, new farming technologies, and new contracts. In the past, it has always been the *new science* that we as a world have asked farmers to adopt, without necessarily taking heed to the human and economic factors that drive farming systems and the underlying facts about soil and water fertility that ultimately makes for sustainable systems. We all strive for new ways to do things, more efficient ways, and more high-tech ways. But now it's time that we take a good look at the power of technology and weigh it against the power of roots – from the ground-up!

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