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DEVELOPMENT REPORT N° 15

**A BITTER HARVEST:
Farmer suicide and the unforeseen social,
environmental and economic impacts of the
Green Revolution in Punjab, India**

by Bryan Newman

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Executive Summary

The "Green Revolution" refers to the dissemination of industrial agriculture across the developing world during the 1960s and 70s, primarily through the introduction of "high yielding variety" (HYV) seeds, intensive irrigation, and chemical fertilizers and pesticides. This report adds to the debate surrounding the long-term effects of the Green Revolution on India, specifically on its epicenter, the Punjab state. Proponents of Punjab's Green Revolution have consistently pointed to the great upsurge in yields of rice and wheat that industrial agriculture brought about, proclaiming it an unqualified success.

This report takes issue with these declarations by exploring the Revolution's darker side. In so doing, one [quickly](#) encounters an increasing, unmistakable and brutal pattern of farmer suicide across the state. The links between the Green Revolution and this suicide epidemic are found in a web of interconnected crises that have enveloped rural Punjab over the last several decades; crises born of the same processes that so greatly increased rice and wheat yields to begin with. This report examines three such critical issues: increasing rates of rural inequality, ecological collapse both in soil and water systems, and skyrocketing levels of debt among Punjabi farmers. In describing [how](#) these issues [link](#) with farmer suicide, this report challenges the claim that Punjab's Green Revolution can be considered a "success."

This report does not make concrete policy suggestions regarding Punjabi agriculture. Rather, this report should serve as an anthropological, geographical and historical analysis of the current situation in rural Punjab, to be considered by those who would decide such policy now or in the future, and by those interested in the issues facing Indian agriculture in the 21st century.

I. INTRODUCTION

“A farmer allegedly committed suicide after failing to sell off his paddy crop in the Nadala Mandi premises in Kapurthala district on Sunday night.”^{xi}

“Heavily indebted, Kuljit Singh killed his wife and teenage son with a machete and then committed suicide by consuming a poisonous fumigant, recalls Baldev Singh, the Sarpanch (mayor) of Sakraudi Village. According to press reports Kuljit Singh was at one time in charge of a large joint family and had sixty-five acres of land. But when the joint family split up circumstances led him to the Hindu Bania (artiya or money lender). As the indebtedness increased - 4% per month (48% annually) compounded half yearly is the going rate - Kuljit could not take the humiliation, tension and the pressure of the money lender and found escape only in suicide.”^{xi}

“In Mandikhurd three farmers have so far committed suicide for fear of loss of reputation and humiliation caused by financial straits, debt, attachment and tension. Attempts have been made to foist these suicides as deaths caused by the ill effects of pesticides. All three had about 8-10 acres of land of which they had been forced to sell off 4 acres each. They committed suicide because even after selling their land they could not secure much relief from their debt-burden; their debt in fact continued to grow.”^{xiii}

Alongside India’s tremendous middle class growth and the much-celebrated boom of its IT sector, a quiet emergency of debt-driven suicide has taken hold in the countryside. Between 1993 and 2003, as many as 100,000 indebted Indian farmers took their own lives.^{iv} Many of these farmers died consuming the very same pesticides they had bought to use on their fields.

Even as the governments of other Indian states have been slow to officially acknowledge this sub-continental pandemic, the government of Punjab—where the suicides described above took place—concedes that 2116 indebted Punjabi farmers committed suicide between 1988 and 2004.^v Many farmers’ rights activists claim this figure to be a severe *underestimation*. In March 2001 the Punjab government introduced a program designed to “rehabilitate” families of farmers who took their lives, offering 2.5 *lakh* rupees—over \$50,000—as compensation to each. It is the first such program put in place anywhere in India.^{vi}

That Punjab would be the first state in the nation to enact laws on farmer suicide should come as a shock to anyone familiar with Punjabi lore and history. The image of Punjab’s proud, strong Sikh people and its rich, fertile plains, irrigated by vigorous Himalaya streams seems completely inconsistent with the dark despair of the state’s agrarian crisis. The discrepancy is all the more shocking in light of Punjab’s celebrated place in agricultural history: as India teetered on the brink of famine and rural chaos in the late 1960s, Punjab was singled out as ground zero for the largest agricultural experiment in the country’s history. This experiment, designed to radically increase food production for the newly independent nation, came to be known as the “Green Revolution.” As the story goes, by the end of this Green Revolution, Punjab had not only filled India’s empty granaries, but had achieved a level of modernity and economic prosperity far exceeding its rural counterparts elsewhere in the nation.

In reality, the relative success or failure of the Green Revolution is today a fiercely debated point in Punjab, a debate involving a wide variety of actors: from peasant tillers to large farmers, activists and economists, state planners and environmentalists. These actors see radically different patterns of “progress” and “crisis,” “success” and “failure” (and sometimes both at the same time) depending largely on what criteria they take into account and include in their analysis of the Green Revolution. The debate over the Green Revolution is not an academic discourse over a bygone historical moment. Rather, it is a desperate argument over an ongoing process. Although it has changed over the years, the industrialized framework of the Green Revolution still represents the primary agricultural paradigm of the Punjab. The outcome of this debate will yet decide the future course of Punjabi agriculture, and perhaps that of India as a whole.

In the most general terms, those who speak of the Green Revolution’s success look largely to the huge yield increases of two crops—rice and wheat—that accompanied the introduction of new “high yielding variety” seeds into the Punjab in the 1960s and 70s. In similarly general terms, the Green Revolution’s critics do not dispute that rice and wheat yields have increased through its implementation; what they *do* dispute is the extreme fixation on these two crops, to the detriment of a more all-encompassing analysis of the Revolution.

The argument these critics make is that the methodology and ideology of the Green Revolution’s architects were inherently incapable of dealing with issues *other* than yields of wheat and rice. This limitation allowed the planners to ignore, issues as wide-reaching as land distribution, ecological sustainability and the long-term economic costs of an input-intensive agriculture. “Alternative” methods of increasing yields were not considered. Thus, as the argument goes, the introduction of Green Revolution technologies into Punjab, while succeeding in its original mission of growing significantly more food for the rest of India, has brought about economic, environmental and social disasters in Punjab that were unforeseen or overlooked by the Green Revolution’s original architects. Many observers, both beyond Punjab and within, claim the present rash of suicides committed by deeply indebted farmers across the state is the result of two decades of recurring socioeconomic and environmental disaster.

Punjab’s agrarian crisis can be roughly divided into three separate, but intimately interconnected, areas: 1) rampant and widespread debt among farmers due to shrinking markets, stagnating state-set support prices and crop yields, and increasing production costs; 2) social inequalities exacerbated by the exclusionary policies of the Green Revolution and its continuing aftermath; 3) ecological breakdown in both soil and water systems.

These three critical areas have not manifested uniformly across Punjab. Different regions and peoples within the state have often faced distinct sub-crises within the greater Punjabi crisis. For example, some communities have been hit hardest by failing, pest-infested hybrid cotton crops, while other rice and wheat growing communities have suffered most from dying soils and dropping water tables. Financial indebtedness and farmer suicide have become critical issues amongst both groups of people. Small and marginal Punjabi farmers, the rural majority, are the most indebted, unable to stay afloat amid liberalizing economic reforms geared toward their larger counterparts and toward transnational agribusiness. Yet even the largest farmers in Punjab have not been completely immune to the environmental, and therefore economic, damage caused by forty years of industrial agriculture either. Punjabi agriculture as a whole appears to be crashing.

In analyzing this apparent crash, many argue that the Indian Green Revolution, in its totality, was a failure. This report will not attempt to repeat this work. Instead, we will explore the

discrepancy between the Green Revolution's *own* declaration of success, and the nightmare in which the Punjab now finds itself.

II. A BRIEF “HISTORY” OF INDIAN / PUNJABI AGRICULTURE

Two opposing narratives inform today's understanding of what both call “traditional Indian agriculture.” In the first, India's traditional agriculture was an incredibly low-yielding, inefficient and backwards affair, one that routinely led to food shortages and famines across the subcontinent. Because of its technological emphasis and popularity with large-scale agribusiness, one might call this narrative the “industrial view.” Such a view holds that India was incapable of feeding itself until the advent of the Green Revolution in the 1960s, the critical juncture when modern science entered into Indian agriculture and brought about a food grain surplus. For the industrialist, rising populations were not met with sufficiently increased food production, leading to the Malthusian conclusion that starvation was a symptom of the technological underdevelopment of agriculture. The industrial view has dominated the discourses of development, state planning, agronomy and economics both within India and abroad for half a century.

The second narrative, when give an equally crude title, could be called the “traditionalist view.” With very few exceptions, this view has never represented more than a dissenting minority to the mainstream paradigm. From this minority perspective, there was nothing fundamentally wrong with the indigenous Indian agriculture so loathed by the industrialists that in some ways, was even superior to the agriculture of today. Citing crop diversity, sustainable use of water, extremely low input costs, a constant recycling of soil nutrients, a focus on farmer self-sufficiency and mutual co-operation, the traditionalists argue that indigenous cultivation methods in the sub-continent were well suited for the unique cultural and environmental niche that India occupies (this will be explored later on in this report). Further, the traditionalists argue that although imperfect, whatever major “failures” this system then experienced through the ages were the result of social and political injustices, such as unequal distribution of resources or oppressive British colonial land-use policies, as we shall also see.

Despite paying lip service to the land-use and equitable distribution issues that have long existed in India, for the industrialist, the source of India's hunger problems, and the poverty that went hand in hand with it, began with *underproduction*: the traditional cultivation techniques of Indian farmers were simply unfit for the task of feeding the nation's millions. Not surprisingly, Norman Borlaug, Nobel laureate and the premier scientist behind the Green Revolution, had a bleak outlook not only on traditional Indian agriculture, but also on the traditional agriculture of “The Third World” in general, as revealed in the following words, excerpted from his 1970 Nobel lecture: “The land is tired, worn out, depleted of plant nutrients, and often eroded; crop yields have been low, near starvation level, and stagnant for centuries. Hunger prevails, and survival depends largely upon the annual success or failure of the cereal crops.”^{vii}

A similarly dreary description of Indian agriculture rings through an early 1960s article on the Ford Foundation's *Involvement in Intensive Agricultural Development in India*: “India is richly endowed with sunshine, vast land areas...a long growing season. Yet the solar energy, soil resources, crop growing days and water for irrigation are seriously underused or misused. India's soils and climate are among the most underused in the world.”^{viii} Soon after this article was published, the Foundation established itself as one of the major funders of the Green Revolution.

Yet not all agronomists saw failure and backwardness in India's traditional cultivation techniques. Some saw time-tested success and sustainability. Most notable in this regard was Dr. John Augustus Voeckler, who in 1889 was directed by the Secretary of State to India to advise the colonial government on what could be done by Britain to improve Indian agriculture. His findings must have no doubt come as a shock to his superiors. In his official report to the Royal Agricultural Society of England, Voelcker famously wrote:

I explain that I do not share the opinions which have been expressed as to Indian Agriculture being, as a whole, primitive and backward, *but I believe that in many parts there is little or nothing that can be improved.* Whilst where agriculture is manifestly inferior, it is more generally the result of the absence of facilities which exist in the better districts than from inherent bad systems of cultivation....To take the ordinary acts of husbandry, no where would one find better instances of keeping the land scrupulously clean from weeds, of ingenuity in device of water raising appliances, of knowledge of soils and their capabilities as well as of the exact time to sow and to reap as one would in Indian agriculture, and this not at its best only but at its ordinary level.^{ix} [emphasis mine]

Half a century after Dr. Voeckler published his findings, the colonial agronomist Sir John Russell completed a similar study, in which he made special mention of traditional Indian agriculture's *economic* benefits:

The system [of Indian agriculture] has two great advantages, permanence, for apart from actual removal of soil by flood or other agency, there is no reason why the system should ever fail, and economy. Some eleven persons are sustained per ten acres of land while on the modern Western standards and systems more than double this area is needed.^x

Despite India's post-colonial shift towards industrial agriculture, such support for traditional methods has continued unabated among a number of the country's prominent researchers, scientists and intellectuals. In the early 1990s, one such scientist, a well-known bio-physicist named A.V. Balasubramanian, founded the Center for Indian Knowledge Systems as a way of integrating traditional Indian agricultural wisdom into mainstream agronomical and regional planning. In a recent speech focusing on the interrelation between sustainable farming practices and ancient cultural practices, Balasubramanian notes that:

The various castes living within a small geographical region show in various localities adjustments in their utilization of natural resources so that each caste specialized in the use of some narrow range of resources and overlapped little with other castes of the same region. The consequence was that a given resource of a given locality sustained one relatively small homogenous endogamous and self governing group over a long time span. These conditions must have facilitated the cultural evolution of restraints on over exploitation of living resources.^{xi}

While Balasubramanian has dedicated most of his professional career to the promotion of his country's traditional agriculture, some of his more skeptical contemporaries have found themselves unexpectedly "converted," as it were, to a new found respect for its practices. In the late 1970s, the former director of India's highly respected Central Rice Research Institute, Dr. R.H. Richharia, began studying the farming practices of remote communities in the Chhatisgarh

region of Madhya Pradesh state. As a “professionally” trained agronomist, Dr. Richharia was amazed to find:

[h]igh level of skills of the farmers of remote tribal villages still untouched by the official development programmes. This scientist's travels in Bastar district, one of the most remote areas in Central India, where tribal communities still lead a life of their own, brought him into contact with farmers who were taking *comparable and even larger yields* from indigenous rice varieties, compared to the HYVs [“high yielding varieties”] being spread officially in other parts of the state. Another revelation was the very large number of rice varieties being grown by the farmers, who possessed detailed knowledge of each of their properties. Some of those varieties were remarkable for their high yields, some for their supreme cooking qualities, some for their aroma, and some for other cherished qualities.^{xiii} [emphasis mine]

Richharia and Balasubramanian’s work, and that of Voeckler and Russell before them, is compelling, perhaps enough to bring pause to even the most ardent pro-industrial agronomist. Nevertheless, in reading these authors one should not come away with the false notion that traditional Indian agriculture is, or ever was, in Russell’s words, “timeless and unchanging,”^{xiii} for recent scholarship proves otherwise. In fact, history contradicts not only the oftentimes purist vision of the traditionalist, but that of the industrialist as well, who would argue that Indian agriculture was unchanging until the 1960s. The truth is that even before India’s independence in 1948, a large percentage of India’s rice paddies had been replaced by new varieties of seed developed in colonial agricultural departments in Punjab and Madras. It has even been said that Punjab’s *first* “Green Revolution” occurred in the late nineteenth century, when farmers responded to a newly built colonial canal system by planting three “new varieties” of sugar cane within a single generation.^{xiv} Agricultural change and adaptation, although most often localized, has taken place throughout Indian history.

Perhaps nothing has been more critical to people’s assumptions about India’s agriculture than the many famines that have racked the sub-continent throughout history. Ingrained images of starving Indian masses were no doubt powerful catalysts for those who would advocate industrializing Indian agriculture in the 1950s and 1960s. From the 11th to 17th century, fourteen known famines struck India, yet almost all of them were extremely localized in size and scope.^{xv}

Agricultural historian B.M. Bhatia, in his seminal 1967 work *Famines in India*, has argued that famine in the way we understand it today—as a widespread, general shortage of food and food grains across vast areas—began in India only after 1860, with the advent of British rule. Thereafter, in the latter half of the nineteenth century alone, India suffered approximately twenty-five major famines. These “late Victorian holocausts,” as geographer-historian Mike Davis describes the famines, claimed the lives of an almost inconceivable thirty to forty million people.^{xvi}

The fact that millions starved to death would naturally lead one to believe that during the late nineteenth century, India was experiencing a critical shortage of available food. History again shows otherwise. In 1880, at the height of the India’s multiple famine-crises, the colonial government’s ominously titled Famine Commission made the striking observation that, not only did *every single province* under the viceroy hold a surplus of food grains, with the total reaching over five million tons, but India was an exporter of food in the amount of one million tons annually. As the Indian born Harvard economist Amartya Sen points out, “starvation is the

characteristic of some people not *having* enough food to eat. It is not the characteristic of there *being* not enough food to eat.”^{xvii}

With British rule came the emergence of market speculation in grains—unheard of in India before 1850—and the shifting of agricultural production from domestic to export, primarily to Europe. Thus, instead of the new Indian railway system of the 1860s serving as a panacea to rural hunger, as they were purported to do, just the opposite was true. The railways both allowed for and were emblematic of the new focus of Indian agriculture: the export of cash crops at the expense of food grain production for local consumption. By opening the vast Indian interior to export production, the railroads undermined local consumption, effectively siphoning food *out* of the countryside.

Taking into account such *economic* factors, Sen, Bhatia and other scholars have argued that food availability has never been the primary historical cause of Indian famines. In *Poverty and Famines*—for which he won a Nobel prize—Sen relates several examples to prove this point. In his discussion of the Great Bengal famine of 1943, Sen highlights that, “[W]hile the [Bengal] famine killed millions, with agricultural labourers forming by far the largest group of those killed, Bengal was producing the largest rice crop in history.”^{xviii}

Relating a first hand account of the 1861 famine in what was then known as the Northwestern Provinces of India, Bhatia notes, “[f]everish speculative activity in grain trade...[led to] the strange phenomenon that ‘prices had risen, on account of active export trade to the famine levels even in districts having most bountiful crops.’”^{xix} Or as another, similar account of the 1861 famine explains: “where there is canal irrigation in Purganah Muzaffarnagar the crops are thriving but the people are starving on high prices.”^{xx}

The peasants described above were starving not because there was a shortage of food, but because they could not afford the crops that were being harvested all around them. Nevertheless the belief that market forces “naturally” overcome issues of distribution and procurement of food grains was widely accepted in 1861, and was a fundamental conviction guiding the domestic Indian policies of the colonial British government. However, as Sen notes, even “firm believers [within the colonial administration] were often disappointed by the failure of the market to deliver much.”^{xxi} All the same, such ideology was often so all-encompassing that as early as 1812, during a developing famine in Gujarat, “the Governor of Bombay turned down a proposal for moving food into affected areas by asserting the advisability of leaving such matters to the market mechanism, quoting the ‘celebrated author of the *Wealth of Nations* [Adam Smith].”^{xxii}

Perhaps one cannot judge the success or failure of an agricultural system by famine alone. Nonetheless, one could argue that because food shortage was *not* the historical cause of Indian famines, India *was* evidently capable of feeding itself—judging from the total yields—before the introduction of industrial agriculture. By the end of British rule however, few in the West—and perhaps in India either—would have said as much. As has been argued elsewhere, “the basic premise of the Green Revolution programme was that the stagnation of Indian agriculture in the colonial period left behind a terrifying shortage of basic foods.”^{xxiii}

III. EARLY INDEPENDENCE AND THE GREEN REVOLUTION

Although the Green Revolution was eventually adopted by the Indian government as the primary means of increasing food grain production in India, there were other earlier and competing strategies designed for just the same purpose. Many of these competing strategies were born out

of Jawaharlal Nehru's populist, post independence government, which made the resurrection of the country's agriculture a top national priority. Nehru set about implementing a series of ambitious agricultural reforms, centered primarily on land re-distribution and the creation of village-level co-operatives. Seeing strength in India's vast rural populace, Nehru believed that high-intensity cultivation on small plots of land would bring about food self-sufficiency, a policy seen as simultaneously dealing with India's massive problems of inequality and poverty.

In mid-January 1959, under Nehru's watch, the Indian National Congress passed a watershed resolution on the future of Indian agricultural development:

All permanent residents of the village, whether owning land or not, should be eligible for membership of the village cooperative which should promote the welfare of its members by introducing progressive farming methods and improved techniques of cultivation, developing animal husbandry and fishery and encouraging cottage industries. In addition to providing credit and other servicing functions, it will arrange for pooling and marketing the agricultural produce of the farmers and for storage and godown facilities for them. Both the panchayat [village government] and the cooperative should be the spearheads of all developmental activities in the village and, more especially, should encourage intensive farming with a view to raising the per acre yield of agricultural produce.^{xxiv}

Despite claims to the contrary, with his call for "progressive" farming and "improved techniques," Nehru was obviously concerned with increasing yields, and he was evidently—and not surprisingly—not opposed to the adoption of modern cultivation techniques. However, Nehru's proposed land reforms moved slowly, and his ability to implement them was severely limited by the protests of wealthy and influential industrialists within his own Congress Party, such as outspoken Parliamentary representative M.R. Masani, a man deeply disturbed by the "Sino-Soviet" overtones of Nehru's co-operative model.^{xxv} Finally, with Nehru's death in 1964, re-distributive Indian land reform was all but abandoned. It would not take long for India to embark upon an altogether new and distinct path of agricultural development.

In 1966, droughts across India crippled its farmlands, and the young nation became heavily dependent on subsidized wheat imports from the United States as a result. But the American wheat, distributed by then-president Lyndon Johnson under the guise of humanitarian aid, was no free lunch for India. The program known as PL-480—or "Food for Peace," as it would later be called—had been developed fourteen years earlier, in 1952, under the Eisenhower administration.

It was in that year, 1952, during the convention of the American Farm Bureau, the lobbying arm of the large and medium sized grain producers, that decisions had to be made regarding the overwhelming surpluses that were accumulating in U.S. storehouses. These surpluses were the end result of a decade of dramatic increases in American wheat production during the 1940s coupled with continuous, strong price supports for large farmers from the American government. As Francis Moore Lappé notes, for the U.S. farm lobby, "these surpluses represented a terrible dilemma."^{xxvi} Unwilling to dump the surplus wheat on the domestic or world grain markets for fear of crashing them, the farm lobby proposed a novel third option: the creation of a "secondary" foreign market in which food-deficit countries could purchase surplus American grains in their *own* national currencies, thus opening up the entire third world to U.S. wheat.^{xxvii} Not surprisingly, PL-480 was quickly adopted as a national policy of the United States government, but the more noble intentions of protecting its nation's farmers and providing sustenance to the

world's hungry mask other, perhaps less admirable ones. As one of PL-480's greatest early proponents, Senator Hubert Humphrey unhesitatingly proclaimed in 1957:

I have heard that...people may become dependent on us for food. I know that was not supposed to be good news. To me that was good news, because before people can do anything they have got to eat. And if you are looking for a way to get people to lean on you and to be dependent on you, in terms of their cooperation with you, it seems to me that food dependence would be terrific . . .^{xxviii}

The questionable motivations obvious in these words were carried deep into the Green Revolution era, which we will come to shortly. Under Johnson, the PL-480 program was further expanded, especially in relation to India. American food exports to India were tied by the Johnson administration to the imposition of reforms in several sectors of the Indian government and economy. Adding to this pressure exerted by the White House, the World Bank and USAID had also spent much of the 1960s lobbying hard for similar adjustments, including the (successful) devaluation of the rupee by 37.5%, import liberalization and the opening of markets for foreign investment in Indian fertilizers. The combined force of these policies then set the stage for the ultimate "short tether" to which Johnson would tie Indian food aid in 1966. Johnson refused to commit food aid for longer than a month at a time until the American Green Revolution package was accepted by India, who did so with only minimal delay.^{xxix}

But why was the United States so desperate for India to adopt industrial agriculture when the dumping of surplus PL-480 grains was such a boon for American agribusiness? To answer this question, both the PL-480 "Food for Peace" program as well as the Green Revolution must be seen within the world climate out of which they arose, that of the post-WWII Cold War era. This was an era that saw the ascension of the People's Liberation Army to power in China in 1949 and with it, the rising threat of a pan-Asian communist revolution: agrarian unrest across the continent was acute, and India was no exception. Beginning with the Telengana peasant rebellion in 1946,^{xxx} populist radicalism moved swiftly across India. "Indian peasants expected that now, with the British Raj gone, their long-standing demand for land to the tiller would be implemented, and that pressure continued everywhere in India even after the withdrawal of the Telengana struggle."^{xxxi}

Thus, well into the 1960s, the United States was concerned, and not without warrant, that a communist revolution could succeed in India as it had in China, for India's massive peasant population was, by-and-large, hungry, disillusioned and angry, much like the peasantry of its neighbor to the north had been before the rise of Mao Zedong. Terrified over the prospect of a "Red India," Washington did not remain neutral on the issue for long, and soon adopted the Green Revolution strategy of increasing Indian food-grain yields, by whatever means, as a way of pacifying the fiery countryside of the subcontinent. One of the United States' largest philanthropic institutions, the Ford Foundation, soon became the American government's proxy agent for ushering in this counter-revolutionary food grain revolution.

In reality, the Ford Foundation had been involved in India long before the advent of the 1966 Green Revolution. As early as 1951, the Foundation was actively pursuing agricultural development in more than 100 Indian villages, although largely in the form of small scale, non-intensive projects.^{xxxii} Nehru, although himself a populist, realized that a widespread insurgency—such as that foreshadowed by the Telengana revolt—would destroy the young Indian republic, and thus hailed this early Ford work, "as a model for meeting the revolutionary threats from left-wing and communist peasant movements demanding basic social reforms in

agriculture," and calling it a means toward "peaceful revolution."^{xxxiii} In fact, much of the Ford Foundation's early involvement in India went hand in hand with Nehru's own socially minded plans for increasing grain yields through rural development.

Nevertheless, Ford's early "social" approach would last less than a decade. In 1959, a delegation of thirteen American agronomists to India recommended that the Ford Foundation immediately shift toward something fundamentally different from the village-based model of development. As ecologist Vandana Shiva describes it, "[The U.S. agronomists] recommendations for a selective and intensive approach among farmers and among districts led to the winding down of the community development program and the launching of the Intensive Agricultural Development Program (IADP) in 1960-61."^{xxxiv}

The birth of the IADP essentially put an end to the Nehruvian model of agricultural development; it was an abandonment of previous "reformist," populist approaches in favor of "selective," industrial ones. While this shift was no doubt influenced by the American Cold War policies discussed earlier, post-colonial anthropologist Akhil Gupta argues that it was also the result of an undeniable streak of Malthusian ideology permeating development discourse of the era.^{xxxv} In this Malthusian view of things, population and production are seen to be "racing" each other toward some yet undetermined end. In the 1960s, rapidly expanding population, especially in the third world, was thus seen to be in direct opposition to perceived limits on food production, making new agricultural technologies essential if production was to "beat" population in the final leg of their epic race. Technology, above all else, would save the "Third World" from starvation.

The epicenter of this emerging agro-technological Green Revolution was not in the United States, but halfway across the world, in the third-world islands of the Philippines. There, scientists at the Ford and Rockefeller Foundation-funded International Rice Research Institute (IRRI) were developing a package of new synthetic fertilizers and what they would call "high yielding variety" seeds of rice and wheat, seeds that responded with increased yields to intensive irrigation and these new fertilizers. Shiva explains that, "it was not that native crop varieties were low yielding inherently. The problem with indigenous seeds was that they could not be used to consume high doses of chemicals. The Green Revolution seeds were designed to overcome the limits placed on chemically intensive agriculture by the indigenous seeds."^{xxxvi}

The seeds of the Green Revolution had an intensely symbiotic relationship with the new fertilizers; independently each was largely impotent, but when used together—along with increased irrigation—the results were certainly impressive. Yet to actually achieve these results in rural India, the "selective" approach to development "among farmers and among districts" proposed by the 1959 American delegation was solidified by their successors into the model of "building on the strong," or "building on the best."^{xxxvii} In this case, the "best" meant that the largest farmers—in terms of acreage—in the most well endowed agricultural regions would be the ones trained and supported in the Green Revolution package. Punjab, despite being a relatively dry state overall, had an already developed colonial-era network of irrigation canals and enough larger-scale farmers to be chosen as a ground zero for the forthcoming experiment.

It did not take long for the new technologies to catch on in Punjab. As early as 1969, nearly 70 percent of Punjab's wheat and 20 percent of its rice were from HYV seeds. Only three years later, over 75 percent of rice, and almost 80 percent of wheat grown in Punjab were of the new varieties.^{xxxviii} Between 1960 and 1979, total statewide yields in wheat increased by 124 percent, while rice yields shot up by 175 percent.^{xxxix} Quite suddenly, India's food banks began to fill up with Punjabi food grains.

Overwhelmed with Green Revolution successes such as those taking place in the Punjab, Bourlag triumphantly announced in his 1970 Nobel Prize speech that, “never before in the history of agriculture has a transplantation of high-yielding varieties coupled with an entirely new technology and strategy been achieved on such a massive scale, in so short a period of time, and with such great success.”^{xli}

And in filling up the national granaries, many Punjabi farmers benefited as well. In the central Ludhiana district, Punjab’s “showcase” zone of Green Revolution successes, new HYV farmers almost immediately saw higher incomes from the new seeds, earning about 1240 rupees/acre compared to the roughly 750 rupees/acre they were earning previously with traditional varieties, an increase that stood even after taking into account the much higher input costs of the new varieties.^{xli}

However, total statewide yield does little to indicate the yields of the *majority* of Punjab’s farmers. For those with marginal, small and medium sized land holdings, the costly new inputs—fertilizers, pesticides, tubewell irrigation, etc.—priced the Green Revolution far beyond their means. A survey conducted in 1967 revealed that 65 percent of Punjabi farmers owned fifteen acres or less, yet their holdings accounted for only 34 percent of the total farmed land in the state. The minority large farmers, those holding twenty acres or more, owned the rest. And while the majority of Punjab’s farmers worked only *ten* acres or less, the economics of the Green Revolution were such that only those farmers owning at least *twenty* acres were in a position to purchase the new inputs.^{xlii}

In her widely cited 1973 text, *Politics of the Green Revolution: Shifting Peasant Participation in India and Pakistan*, Francine Frankel notes that while farmers with “very substantial holdings”—fifty acres or more—“experienced a qualitative change in their standard of life” as a result of adopting Green Revolution technologies, often finding themselves as wealthy as the urban middle class, “farmers with less than ten acres (again, the majority) were in the most unfavorable position.” Frankel ultimately argues that, “it appears likely that [the position of small Punjabi farmers] actually suffered an absolute decline as a result of the Green Revolution.”^{xliii} In other words, not only were the majority of Indian farmers excluded from the new development paradigm, even at the geographic center of the Green Revolution, the majority of Punjabi farmers were as well.

Although inherent in the strategy of “building on the best” was the result of leaving the rest behind, such criteria were simply no longer taken into account in determining agricultural policy after the collapse of Nehruvian social planning. The Rockefeller Foundation, another institutional backer of the Green Revolution, said as much in its 1968 “Strategy for the Conquest of Hunger,” in which Foundation economist David Hopper clearly stated that, “national governments must clearly separate the goal of growth from the goal of social development and political participation... These goals are not necessarily incompatible, but their joint pursuit in unitary action programs is incompatible with development of an effective strategy for abundance [i.e. high yields].”^{xliv}

As the Green Revolution evolved and morphed over the years, crops other than rice and wheat—primarily cotton—were incorporated into its overall industrial design, as were new developments in biotechnology and larger trends in global agro-business. Nevertheless, the overall development paradigm laid out by Hopper—top-down, technologically focused—has remained. It was in such a model that yield became the primary, even exclusive method of judging the Green Revolution’s

success, but was built into its very framework as an all but exclusive point of reference for the state planners and scientists promoting it. “Yield” could be increased cleanly and simply, without addressing social or environmental spheres of action at all. Furthermore, it was precisely because “yield” on its own does *not* address these spheres, that from its outset, the Green Revolution was unable to see its own shadow, its dark side. Ultimately, an agricultural system that is unable to take into account anything but yield is in conflict with economic reality as well.

IV. INDIA TODAY

Today, the question that must be asked is whether or not feeding India is even an issue of yield and increasing production. At this moment, India sits on a 38 million ton foodgrain surplus.^{xlv} These vast reserves remain in place even as India stands, along with China, as one of the world’s two largest markets for biotechnologies aimed at *increasing* production. This paradox is perhaps most striking when one looks at the infamous events of 2001. In that year starvation deaths were reported in more than a dozen Indian states, a tragedy unheard of since the 1960s^{xlvi} and yet one that occurred at the same time that the government proposed dumping its mammoth surplus into the sea to make room for that of the next year.^{xlvii}

Simple arithmetic shows that despite an overwhelming 320 million malnourished or hungry citizens, with a 38 million ton surplus of grain, India currently has within her grasp the resources to feed *all* of her billion plus people. Nevertheless, as the events of 2001 show, a surplus, no matter the size, is of little use without the infrastructure and political will to distribute it. For all its faults, early Nehruvian State Socialism emphasized the development of both:

Public distribution of foodgrains was retained as a deliberate social policy by India, when it embarked on the path of a planned economic development in 1951. It was, in fact, an important component of the policy of *growth with justice*. In the first five year plan, the system, which was essentially urban based till then was extended to all such rural areas which suffered from chronic food shortages.^{xlviii}
[emphasis added]

The Public Distribution System (PDS) was born in the early 1960s out of such a will toward “just growth”. In its most basic form, the PDS serves as a means to prevent the famines—previously discussed—that had decimated India in the past. Yet, today the PDS does not just act as a stopgap against famine, but more immediately it provides regular foodgrain assistance to over eighty million families in India, and accounts for one third of the nation’s foodgrain trade.^{xlix} Yet despite its continuing relevance, the central Indian government is currently in the process of dismantling the PDS.

The move to do away with the PDS can only be understood through an examination of the other side of the equation of which it is a part: the adoption of an ever more liberalized agricultural economy focused around un-tariffed imports, bioengineering, and transnational agro-business. None of these three policies deals explicitly with getting affordable food to the people who need it, nor do any of them begin to acknowledge that nearly three in every four Indians is a farmer. In many cases these policies are doing just the opposite. World Trade Organization pressure to accept untariffed imports of food-grains and edible oils from countries such as the United States—which in turn is trying to deal with its own mounting, subsidized surplus—undermines and undercuts the price of the small and marginal Indian farmer’s crops, as well as those of some medium sized ones. Bio-engineering introduces ever more input-heavy seeds into an already

debt-ridden agricultural economy, seeds which are also deeply sensitive to environmental shifts, such as in the case of the hybrid Bt cotton so devastated by pests in Punjab. And finally, transnational agro-business is dependent on an “unsubsidized” internal food economy, thereby necessitating the dismantling of food security devices such as the PDS.

V. PUNJAB AND THE PDS

Here, with the dismantling of the PDS, one can see a point of juncture between the pan-Indian policies of the Delhi government and the crisis now enveloping rural Punjab. It is also a good place to start seeing the connections between global markets, national policies and local consequences in rural India as a whole. After Punjab’s Green Revolution grains finally dragged India out of its long history of famine, the PDS continued to serve the essential role of providing guaranteed markets for Punjab’s chemically bloated surpluses and still increasing production, through the purchasing power of the nationalized Food Corporation of India (FCI). This role is easily noted in the fact that during the peak years of the Green Revolution, the 1970s, “government procurement [via the FCI-PDS] accounted for approximately one-third of [Punjab’s] wheat production and about three-quarters of its rice production.”^{li} For states like Punjab, Indian economic protectionism thus served a role beyond providing affordable food to those in need. In equal share, protectionism “insulated [India’s] farming communities, and thus the majority of its population, from the rapid fluctuations and downswings of world prices.”^{li}

Protectionism came to a halt in 1991, when the Indian Government made a major shift away from subsidized agriculture, and toward World Bank promoted “structural adjustments,” a grab bag of policies aimed at strengthening the private sector while simultaneously dismantling the public sector. Although many of these policies focused on commerce and industry, others aimed squarely at agriculture. Under pressure to liberalize the agricultural economy, in 1992 New Delhi replaced the PDS with the ambiguously titled “Revamped PDS.” The Revamped PDS was not well received and soon gave way in 1997 to the “Targeted PDS,” a program that limits (or “targets”) the number of citizens eligible for its benefits. In many ways the TPDS was born as a way for the Indian Government, at the behest of the World Bank, to fade out of public food distribution altogether. Between the years 1997 and 2001, the government reduced public food distribution by over twenty percent, this despite famine, or near famine, conditions in seven different states during the late 1990s.^{lii}

VI. THE RISE OF DEBT IN PUNJAB

With the severely weakened PDS buying less and less subsidized domestic food grains, its main supplier, the Food Corporation of India (FCI) has in turn lost its biggest customer. For Punjabi farmers, this has then meant that *their* biggest customer, the FCI, is often no longer interested in their crops. The first major effects of this trickle-down effect in Punjab were felt at the end of the 2000 harvest. That autumn, while millions of people went hungry across India, unable to afford the decreasingly subsidized flour and rice of the PDS, Punjab’s granaries were being flooded with un-bought paddy. The national magazine *Frontline* reported that:

Huge heaps of paddy had piled up along the Grand Trunk Road in Punjab this October, driven in by farmers from hundreds of kilometers away in the hope of finding someone who would buy at least part of their crop. There was just no space inside the Khanna Mandi, which advertises itself as Asia’s largest wholesale market,

to store Punjab's plentiful harvest. With the Food Corporation of India (FCI) refusing to pick up the harvest, prices had gone through the floor. Even then, buyers were hard to come by. Last year, Ludhiana farmer Kartar Singh sold his paddy crop for just under Rs. 3.5 lakhs [\$7,890 USD]. "I've made about Rs. 50,000 [\$1,150 USD] so far," he said grimly, "and I don't think I'll be able to earn much more. For farmers like Kartar Singh, the best harvest in years had rapidly turned into a nightmare."^{liii}

Nevertheless, the situation from season to season is schizophrenic. Some years the FCI refuses to purchase grain, such as in 2000—and again in 2003—citing the poor quality of that year's rice crop, a claim that was disputed by local politicians, academics and researchers on the ground. Other years, the FCI purchases up to 85% of Punjab's total salable grain.^{liv} But even when Punjabi farmers can find markets in which to sell their grain, prices are often too low to offset even the cost of inputs that went into producing it; the high production costs that initially priced small and medium farmers out of industrial agriculture are now overwhelming larger ones as well.

These consistently low prices are in many ways the result of the central government-set Minimum Support Price (MSP) going static. The government, seeking to "naturalize" agricultural prices against those of the world market, has let the MSP lag against ever-increasing production costs. As one Punjabi agronomist noted recently, "during the past five years, there was only 1.6 per cent increase each year in the MSP of wheat whereas price of [agricultural] inputs including diesel had gone up about 30 percent."^{lv}

Yet stagnating support prices have not been met without resistance. As recently as February of 2006, the Punjabi government directly demanded that New Delhi raise the MSP by nearly twenty-five percent for the upcoming spring wheat harvest. At the same time it also pleaded for the Central Government not to accept wheat imports for the spring, allowing Punjabi farmers to provide for the domestic markets instead.^{lvi}

Along with and connected to the issue of unresponsive support prices, there are other significant factors contributing to the debt crisis. Some argue that Punjab's excess production has led to a glut in the market, which in turn has deflated the prices it can claim there. Others argue that falling yields, due to soils damaged by years of chemical fertilizer and pesticide use, have meant that farmers' incomes are not keeping up with input costs.^{lvii} Punjabi farmers face a glutted market, damaged soils and rising input costs all at the same time.

Yet, on the other side of the spectrum, often among those most in favor of dismantling price supports, much of the blame is put directly on the farmers themselves. In a December 2002 editorial in *The Tribune*, a leading independent Punjabi newspaper, the columnist V.S Mahajan made the oft-repeated claim that:

An average Punjabi farmer, used as he was to life of extravagance and plenty, [after the Green Revolution] spent lavishly on liquor and social functions. He failed to invest his savings for the future. Often he overspent, thus running into borrowing from *arhtiyas* [money lenders]. As a result, when misfortune visited, as in recent times, he found it difficult to meet the claims of his creditors [and thus went into debt].^{lviii}

If irresponsible party habits are truly the root cause of the Punjabi farmers' debt, then Malsinghwal village, in the state's Mansa district, must have been quite a scene in prior years, one far different from today's:

[As of 2006] the village owes up to Rs 50 million to banks and another Rs 25 million to private moneylenders and commission agents. " We are neck deep in debt. We are left with no other option but to sell our land," says village panchayat head Jasbir Singh. Showing the panchayat resolution that authorized the sale, he said that each of the 4000 residents had an outstanding debt of Rs 13,000. With crop yields faltering, and with no other hope of repaying the outstanding debts, the village had decided to sell off its assets spread over 1800 acres.^{lix}

Malsinghwal's is by no means an isolated case. Since 2001, five separate villages in Punjab have put themselves on auction: Harkishanpura in Bathinda district has been up for sale for over five years, while Bhuttal Kalan in Sangrur district has now done the same after mortgaging nearly eighty percent of its land to moneylenders. It must be remembered that these are unprecedented events in Indian history; Indian villages have simply never been put on the market wholesale before.

Although villages like Malsinghwal represent the most extreme manifestations of rural indebtedness, the debt crisis itself is now endemic across the state. Yet even under such conditions, there are conflicting reports over the actual distribution of debt, specifically distribution along land holding-size lines. A 2004 human development report compiled by Punjab's state government concluded that small and marginal Punjabi farmers were the most affected. Meanwhile, debt-ridden cotton farming villages in Punjab's southern Bathinda district make the opposite claim: "more land means more debts."^{lx} Since nearly all large scale cotton farming in Punjab is done using the input-intensive, and thus costly, methods introduced with the Green Revolution, a situation has arisen in some communities where the greater the amount of land a farmer owns, the more likely he is to be in serious debt trouble. Nevertheless, the majority of available evidence points to smaller Punjabi farmers being proportionally more affected by debt woes than larger ones. For example, although the average level of indebtedness—as of 2004—among Punjabi farmers is about 120,000 rupees,^{lxi} small farmers owe 10,105 rupees per acre compared with only 4230 rupees per acre owed by large farmers.^{lxiii} These are revealing statistics, ones that point to an undeniable interconnection between social inequality and debt accumulation in the rural Punjab.

VII. HAVES AND HAVE-NOTS OF THE PUNJAB: THE GREEN REVOLUTION AND SOCIAL INEQUALITY

"In the agro-economic setting of the Asian countryside, the introduction of capital-intensive technologies *inevitably* increases economic disparities between the small group of surplus farmers on the one hand and the majority of subsistence cultivators, sharecroppers and landless laborers on the other."^{lxiv} [emphasis mine]

-Francine Frankel in *Food, Population, Employment* (1973)

"Contrary to popular mythology, the poor have benefited disproportionately from Borlaug's agricultural Green Revolution. A moment's thought and the barest knowledge of economics would explain why. Thanks to the Green Revolution, the

real price of food is half or less than it was in 1960 which means those who spend the highest portion of their income on food - the urban and non-farm rural poor - garner the most benefit from it. This is apart from the very reasonable counter-factual proposition of what would have happened to the price of food had we had population growth and no increases in yield. The poor would have likely starved.^{lxv}

-Dr. Thomas DeGregori of the CATO Institute (2005)

Could there be two more contrasting interpretations of the Green Revolution's effect on the poor? Dr. DeGregori of the Washington based think tank, the CATO institute, presents the issue as one of food prices and yield. In his view, the poor have been the overwhelming beneficiaries of industrial agriculture in the third world because through it, prices have dropped and yields of available food have grown. Yet how accurate is this assessment when applied to the Indian situation?

In arguing against such a production-focused understanding of hunger, an unexpected source, the World Bank—much like Sen—famously proclaimed in 1986 that although “the world has ample food,” the world's poor “suffer from a lack of food security, caused mainly by a lack of purchasing power.”^{lxvi} Such a conclusion is certainly true in the Indian context, for as we have already seen, India retains a massive foodgrain surplus despite chronic malnutrition and hunger—and occasionally starvation—among nearly one third of her population. Furthermore, DeGregori's argument neglects to mention—as we have already—that nearly three out of every four Indians is a farmer, most of whom hold small, medium or even marginal sized land. As we shall see, *these* poor Indians were not disproportionately elevated by the Green Revolution, and in fact, just the opposite appears to be true.

Critics of the Green Revolution argue that its strategies left behind the vast majority of smaller Indian farmers—including the majority of Punjabi farmers—in their pursuit of higher yields. What this meant in practice is that those farmers with marginal and small sized land holdings soon found their land economically unviable compared to that of their technologically advanced “medium” and “large” neighbors. All the same, one might argue that however painful this “pricing out” was for Indian agriculture in the short term, in the longer view, it was—and is—absolutely essential if India is serious about raising its yields. Small farmers, so the argument goes, are simply unable to produce as much food as large ones.^{lxvii}

Yet the Green Revolution strategy of “building on the best” consciously focused all available resources and energy on the largest of Punjab's farmers for a different reason from the one mentioned above. It has been widely argued that for Green Revolution strategists, the “best” farmers were simply the ones with enough capital to purchase the expensive and necessary inputs of industrial farming. Not surprisingly, these “best” farmers were, with very few exceptions, the state's largest farmers. Small farmers, even if they had wanted to participate in the Green Revolution, had no access to the kind of fixed or working capital needed to do so. The economic discrimination inherent in this pattern laid the foundation for the unequal distribution of debt seen in rural Punjab today.

As the Green Revolution progressed through the 1960s and 70s, land across Punjab became increasingly compressed into fewer and fewer holdings of larger-sized farmers. Marginal and small farmers, unable to keep up with the Green Revolution and/or deeply in debt, sold or mortgaged their land to these larger cultivators, leading to an overall decrease in Punjab's operational holdings by over twenty percent between 1970 and 1996. Simultaneously, holdings of

marginal and small farmers decreased by almost forty percent over the same period, while those of large and “extra-large” farmers increased by over fifty percent.^{lxviii} The small and marginal farmers that have managed to survive on their land since 1970 have done so by adopting industrial inputs and new seeds as best they could, despite their position of economic disadvantage. At the same time, those who lost their land altogether have been placed in an even more precarious situation. While an advocate of the “free market” may assume that these newly landless Punjabi farmers were successfully integrated into other forms of employment, the available evidence suggests otherwise.

Market economics is built in many ways upon the idea that loss of employment in one sector of the economy—agriculture, for example—inevitably leads to increased employment in other sectors, such as in industry or service. But according to the Punjab government’s own 2004 human development report, the shift toward larger and larger farms in the Punjab has meant “dual processes of pauperization and proletarianisation” over its small and marginal farmers, not new economic opportunities elsewhere.^{lix} As evidence of this “depressing” process, the report cites that the number of total cultivators in the Punjab—farmers working their own land—decreased hand in hand with an *increase* in the number of agricultural laborers—landless, bonded workers—between 1970-71 and 1995-96, most of whom live today, “deeply indebted to landowners and moneylenders.”^{lxx} For example, because they can often only find employment during the harvests, agricultural laborers in Punjab’s Malwa region, the state’s “prime agricultural belt,” work for only seventy to one hundred-sixty days a year, relying on interest heavy loans—interest of well over thirty percent—from their land-owning employers to sustain themselves throughout the rest of the year. Once these loans begin to stack up, un-payable and unsustainable, laborers soon find themselves enmeshed in an inescapable “debt trap.”^{lxxi} This devolution, from cultivator to laborer, is one way in which deep indebtedness has come about among Punjab’s peasantry.

Yet even today, a significant number of cultivators still do work small and marginal pieces of land in the Punjab; nearly 400,000 holdings of two hectares or less were recorded in a 1996 state agricultural census.^{lxxii} Despite such large numbers of small holdings, today’s agricultural economy is so heavily weighted toward large producers that these small farmers have almost no ability to secure credit through conventional banks, leaving unofficial commission agents to step in and take their place. The high interest rates that these agents charge, combined with the low annual income of the small farmer, has created another “debt trap” just as vicious as that of the laborer. According to one recent study, seventy percent of all such small farmers in the Punjab were unable to pay back even short-term loans, leaving them with an interest debt of nearly 1900 rupees per acre.^{lxxiii} Once caught in this trap, there is almost no alternative for the small farmer but to sell or mortgage his land, an “extreme” step taken by about fourteen percent of small farmers as well as a few entire villages, as we have seen.

Finally, mention must be given of the rise of the relatively new practice of “contract farming” in the Punjab. Simply put, contract farming is a practice whereby Multi-National Corporations (MNCs) put under contract certain farmers to grow specific crops, such as tomatoes,^{lxxiv} for a specific amount of time. In the mid 1990s, Pepsi became the first MNC to offer contract farming in the Punjab. Since contract farming focuses on growing crops outside of the wheat/rice/cotton “trap,” it is a practice that has been praised by many as an alternative path for Punjabi farmers. Yet as far as issues of social inequality are concerned, contract farming seems to only add more fuel to an already problematic fire.

The issue here is that MNCs only hire the largest Punjabi farmers. Thus, the average amount of operational land^{lxxv} held by a Punjabi contract farmer is seventy-two acres, with the smallest plot being no less than fifteen acres, in stark contrast with the average all-state operational holding of less than nine acres. As the Indian researcher Sukhpal Singh has shown, Multi-Nationals “[prefer] to work with relatively large growers due to the familiar reasons of reducing transaction costs and also to benefit from the resource position of the larger farmers.”^{lxxvi} If the contract farming practice of choosing large farmers in an advantageous “resource position” sounds familiar, it is because it is a practice that closely follows the original Green Revolution model of “building on the best.”

VIII. THE SOIL COLLAPSES

No greater misfortune could perhaps befall the people of India than that their land should be poisoned with artificial fertilizers.^{lxxvii}

-M.K. Gandhi (1947)

While Gandhi’s cautionary words might have seemed at best incongruous during the heady, early years of the Green Revolution, in examining the plight of Indian soils today, they sound almost prophetic. Forty years of industrial farming in Punjab have left its soils weak and, in many ways, dead. Yet Gandhi did not issue such dire warnings alone, for in his words we hear the voices of many who would fear the arrival of chemical farming in India, including that of the Englishman Sir Albert Howard, the man widely held today as the “father” of modern organic farming.

Like Voekler and Russell, Howard was an early champion of Asia’s traditional agricultures, especially Indian agriculture. According to agro-economist Prafulla Sanghvi, Howard was “especially impressed with the [Asian] system of mixed cropping, whereby major cereal and other crops are sown together with small quantities of grams and pulses [legumes].”^{lxxviii} What are the advantages of such a system? Sanghvi himself offers the following explanation:

It is known that mixed cropping has been one of the principal factors in maintaining the fertility of the soil. The scientists’ explanation is that soils in India (and Asia) are normally deficient in nitrogen and that the roots and the leaves which fall from pulse plants are rich in that element. The pulses or the other mixtures act as nitrogen fertilizers. In addition, the root systems of the two plants derive moisture and plant food from different levels of the sub soil. Thus they do not compete for moisture and plant food and can draw on a larger total volume of subsoil to provide their nutrients, thus yielding larger crops.^{lxxix}

This process of drawing the nitrogen of leguminous plants into the soil is known as “nitrogen-fixing.” It is a technique that would be recognized by almost any organic or peasant farmer across the world, and for good reason: perhaps more than anything else, plants need nitrogen to grow. Yet in “conventional” farming, instead of using nitrogen-fixing legumes, chemical fertilizers are used as a sort of nitrogen steroid for crops, literally pumping them full of the element so that they may grow as large as possible, as quickly as possible. Of course, nitrogen is not the only element that plants need to grow, and even the Green Revolution fertilizers came in a cocktail form known as NPK – a mixture of nitrogen, phosphorus and potassium.

Although the use of a synthetic NPK chemical fertilizer routine does initially help plants to grow, in the long run, it ultimately leads to a highly unfavorable and paradoxical situation, one in which the soil is actually *de*-fertilized, so to speak. This de-fertilization happens in two different ways. First:

When fertilizers are added to a crop, a plant absorbs not only the extra nitrogen, phosphorus and potassium from the fertilizer, but also proportionately increased levels of micronutrients from the soil, including zinc, iron and copper. Over time ...the soil becomes deficient in these micronutrients. Lack of them also inhibits a plant's capacity to absorb nitrogen, phosphorus and potassium.^{lxxx}

Thus the nature of NPK fertilizers to literally “mine” the soil of micronutrients is curiously self-defeating in that those same micronutrients that are mined are significantly responsible for the absorption of that very same NPK into the growing plant. At the same time, there is another, more systematic way in which chemical fertilizers “kill” the soil, and it has less to do with the fertilizers themselves than with the greater agricultural paradigm of which they are a part.

Punjab's Green Revolution marked an all but complete departure from the “mixed” cropping patterns and legume-based fertilizers described by Sanghvi. In place of the traditional patterns, a system of continuous mono-cropping of wheat, rice and cotton was instituted, with NPK fertilizers established as the soils' main nitrogen source. This replacement did not happen simply because there was no room left in Punjab's fields to plant other nitrogen-fixing crops, such as legumes. Instead, the replacement was due to very nature of the HYV seed itself: it *needed* more nitrogen than traditional sources could provide.

By the 1980s, none other than the United Nations had concluded that the Green Revolution's hybrid seeds were in fact not so much “high yielding” as they were “high-responsive,”^{lxxxi} meaning that the new seeds worked in concert with inputs of high potency fertilizers and heretofore unheard of levels of irrigation. Under such optimal conditions, yields shot up. However, since the new seeds were not “high yielding” in and of themselves, without these additional inputs, HYV seeds actually produced lower yields than did their traditional counterparts.^{lxxxii}

HYV mono-cropping system allows for basically no nutrient recycling because nitrogen is no longer available through the actual soil. Furthermore, other crops, such as millets and coarse grains, which provide important fodder for manure—which then provides nitrogen—producing animals, are all but eliminated. In addition, HYV rice and wheat crops are “dwarf” sized, giving far less straw than traditional varieties, which then leads to a substantial reduction in available biomass for mulch and again, for fodder. Once this system is in place, the decreasing nutritive qualities of the soil must be made up for with ever-increasing usage of synthetic fertilizers, as well as one more essential input, pesticides.

Because the new rice and wheat seeds were created out of an extremely narrow genetic base, and then planted en masse into increasingly weak soils across almost the entirety of Punjab, breakouts of new, unexpected and voracious pests and diseases have become a major problem for HYV cultivators. As has been argued, “once a pathogen or pest has adapted to the defences of one plant, the defence barriers of all the genetically uniform plants fall with it. Pests or disease can overrun crops with the same genetic make-up as rapidly as an epidemic.”^{lxxxiii} Weak soils, deficient in micronutrients as well as the so-called “beneficial” soil organisms—fungi, protozoa and the like—breed weak, unhealthy plants, which are more easily overrun by pest infestation. In

Punjab, this pattern of infestation has been evident in a number of rice and wheat strands, such as a rice variety known as PR 106:

The rice variety PR 106, which currently accounts for 80 per cent of the area under rice cultivation [in Punjab], was considered resistant to whitebacked planthopper and stem rot when it was introduced in 1976. It has since become susceptible to both diseases, in addition to succumbing to rice leaf-folder, hispa, stemborer and several other insect pests.^{lxxxiv}

In order to protect genetically weak and pest-prone varieties such as PR 106, Punjabi farmers have had no choice but to use ever-increasing amounts of toxic pesticides on their fields. In an almost neo-Malthusian sense, this situation could be described as a race between, on the one hand, soil degradation and pest outbreaks, and new pesticide technologies designed to overcome these obstacles on the other. Yet similar to those of synthetic fertilizers, the negative effects of pesticides were not usually felt immediately by the Punjabi farmers who used them. Lal Singh, a cotton farmer in Punjab's Bhatinda district describes how quickly this situation could change: "before 1990, we had no problems. We used to earn well and so eat well and lived well. But after the pests came, we saw hell. We had to spray throughout the year and sometimes as many as 35 times. As the pesticide was very expensive, we had to take loans."^{lxxxv}

Beyond issues of loans and debts, Punjab's high rates of pesticide use raise serious health issues. A landmark 2005 report by the Delhi-based Centre for Science and Environment (CSE) on four separate Punjabi villages revealed that villagers had levels of pesticide residues in their blood that were 15 - 605 times higher than those found in a 2003 study completed by the U.S. Center for Disease Control on American citizens. The problem of pesticide poisoning is especially acute in relation to drinking water. Water in Lal Singh's district of Bhatinda, for example, has been declared by India's National Commission for Women to be "no longer fit for drinking" due to a build-up of pesticide toxicity in the state's groundwater.^{lxxxvi} Meanwhile, the Punjab government has warned certain communities, such as Harkishanpura village, also in Bathinda district, not to drink their well water, due to excessive levels of chloride pesticide residues.^{lxxxvii} Despite these dangers, most villagers in contaminated areas have little access to alternatives, and continue to drink the available water nonetheless, leading to a multitude of health problems. Incidence of cancer and cancer-like disease has reached such high levels in some areas of the district, such as in the village of Jajjal, that the state's high court recently issued a statement accusing the Punjab government of negligence in protecting its citizens from polluted drinking water, despite its attempts—such as in Harkishanpura—at warning them.^{lxxxviii}

The continued degradation of Punjab's soils, and the health costs that have followed, are directly related to the "debt trap" that Punjabi farmers find themselves in today. Beginning in the mid 1980s, synthetic fertilizers showed their first signs of being overwhelmed by the state's decaying soils, as well as by their own inherent limitations. Without further warning, yields began to stagnate while input requirements stayed the same or even rose. Although in some cases yield actually *declined* as input requirements grew, for more farmers, an ever-increasing amount of fertilizers had to be purchased simply to sustain even stagnant yields. At the same time, pesticide use became ever more necessary, both as the result of weakened soils, and of the inherent vulnerability of HYV seeds to pests and disease.

When input costs for farmers grow greater than the income they are able to generate from crop yields, loans and indebtedness, as we have seen, are soon to follow.

[T]he per capita income of farmers has not grown at the same rate as input prices and sheer cost of agricultural production. As a result, farmers have little surplus cash at their disposal and are forced to borrow huge amounts.

-Punjab State Government Human Development Report, 2004

IX: THE PROBLEM OF WATER

The origins of Punjab's role as the "breadbasket of India" are in the colonial period, when the British introduced a system of irrigation canals throughout the state. In the 1960s, large amounts of available capital in the Punjab, combined with these pre-existing irrigation systems made it one of the "best" in the Green Revolution philosophy of "building on the best." Needless to say, "building on the best" was a concept rooted exclusively in agricultural technology and economics, notably excepting issues of distribution or sustainability.

Also excepted from the planning of the Green Revolution was the fact that Punjab is a relatively dry, or semi-arid, state. This is an important point, for rice is an exceedingly thirsty crop; it needs a lot of water to grow. Perhaps it is for this reason alone that rice is considered a non-traditional crop in the Punjab.^{lxxxix} Wheat, in essence the other half of the Green Revolution, was also never traditionally mono-cropped in Punjab. In fact, across the drier states of north India, nothing was grown at the expense of other crops historically, crop diversity being an essential component of most Asian agricultural systems, as Albert Howard noted in his *Agricultural Testament* (1940).

Even so, during British rule, colonial agricultural schemes recognized an as-yet untapped irrigation resource in the Punjab, its five rivers; in seeking to exploit them, the colonialists constructed a network of canals to better cultivate the dry state:

Throughout its history, Punjab has been the beneficiary of heavy central and state government investment in canal irrigation systems. As a result of this heavy investment, the proportion of cropped area irrigated in Punjab was greater than any other state prior to the onset of the Green Revolution.^{xc}

Nevertheless, despite their *relative* intensity, it would be a mistake to compare these old colonial canal networks with the *truly* intensive irrigation systems ushered in with the Green Revolution; the new irrigation systems were designed to work *outside* of Punjab's pre-existing ecology, not within it, as the canals had been. The colonial canals consistently ebbed and flowed with the natural cycles of weather, and were aligned with the natural drainage features of Punjab's distinct ecology. And while the colonial canals only flowed four to five months a year, they provided enough irrigation for the traditional varieties of wheat and rice to grow successfully, while being ecologically sustainable—if only by default—at the same time.^{xcii}

The introduction of Green Revolution irrigation methods, on the other hand, marked a significant departure from any notion of sustainable water use. The reasons for this departure are straightforward: Green Revolution seeds and technologies were dependent on much heavier irrigation than the canals, let alone solely rainfall, could ever provide. The new hybrid wheat seeds of the 1960s, for example, used three times more water than did traditional ones.^{xciii} Most of these increased irrigation needs were met through a swell in the number of wells in the state; in the Green Revolution years of the 1960s and 70s, well use for irrigation in the Punjab increased by 80 percent.^{xciii} Many of these wells were in turn made possible explicitly through the

installation of “tubewells,” pipes that are drilled deep into the earth to bring up water from underground aquifers inaccessible by other means. Today, more than one million tubewells are scattered across Punjab, irrigating nearly seventy-five percent of the state.^{xciv}

Compared to the “protective” irrigation needed by earlier varieties of wheat and rice, the new seeds introduced into Punjab since the 1960s have been completely dependent on *intensive* irrigation, such as that provided by tubewells. The combined force of one million tubewells, while propelling forward the crops of the Green Revolution, has devastated Punjab’s fragile ecosystem. Thirteen of Punjab’s seventeen districts are currently overexploiting their underground aquifers, meaning that sixty-one percent of Punjab is now an official “black zone,” an area where irrigation use --which has increased two hundred times over the last three decades^{xcv}-- is greater than its rate of recharge.^{xcvi}

Punjab’s water table has been estimated by R.S. Narang and M.S. Gill of the normally conservative Punjab Agricultural University to be retreating by two meters annually over two-thirds of the state, leading them to conclude that, “this [situation] has now reached such alarming proportions that questions are now being asked as to what extent rice cultivation should be permitted in the irrigated Indo-Gangetic Plains.”^{xcvii} Others note that if industrial rice and wheat cultivation *is* to continue, “there is the possibility that shallow tubewells will be rendered useless and instead there will be a requirement of massive investment on deep tubewells.”^{xcviii} Yet beyond even these deeper wells, Joginder Singh, another agronomist at PAU, argued in a recent report that, “the water table may go down to such an extent that lifting water to the surface would require heavy capital investment in the form of high-power electric motors or submersible pumps.”^{xcix}

It goes without saying that given the already excessive input costs that Punjabi farmers face, ever more expensive irrigation—by way of “high-power electric motors” and “submersible pumps”—would not be an option except for the largest farmers, the smallest of minorities in the state. Ultimately, it may not be a realistic economic option for them either, for as the already cited 2004 Human Development Report for Punjab makes clear: “this cropping pattern [wheat and rice rotation] has increased the demand for water for irrigation to a level that simply cannot be met in years to come.”^x

And as Punjab’s water woes grow, similar concerns are being voiced from ever more conservative and unexpected sources, including the World Bank (2003) and the International Rice Research Institute (1994-1995)^{ci}, two long-standing champions of Punjab’s Green Revolution, both of whom have issued statements over the last fifteen years echoing the 2004 HDR report’s dire warning over the state’s dwindling water supply.

Yet elsewhere, in southwest Punjab’s so-called “white zone,” a dreadfully complementary problem to that of the otherwise-sinking water table has emerged as another major threat to the future of agriculture in the state. In the lowland areas of the white zone, where the water table is relatively shallow but inaccessible through tubewells, intensive canal irrigation has waterlogged significant stretches of cultivated land, leaving further options for agriculture in those areas limited at best. As of 1998, over 430,000 acres of farmland in Punjab were waterlogged, with costs for the expensive and difficult task of draining them now running into the tens of millions of rupees.^{cii} In its final stage, waterlogging of agricultural land in Punjab has led to “salt poisoning,” a process through which underground salt is leached into the rising water table and then into the sub-soil. Much more than waterlogging itself, “salinization” of a soil all but permanently destroys its ability to effectively grow crops. As Vandana Shiva explains it:

The salt poisoning of arable land, seems to be an inevitable consequence of intensive irrigation in arid regions [such as Punjab]. In regions of scarce rainfall, the earth contains a large amount of unleached salts. Pouring irrigation water into such soils brings those salts to the surface and leaves behind a residue when the water evaporates... salt-pollution problems [then] diminish the productivity of the soil and, in extreme cases, ruin it forever.^{ciii}

The waterlogged soils of these “wet deserts” represent as much of a hazard to drinking water and human health as they do to growing crops. As the water table rises, not only does salt leech into the soil, but pesticides and chemicals that had previously sunk into aquifers are drawn back up into ground level drinking water as well. This process then leads back, in a vicious full circle, to the dangerous effects of pesticides on human health described earlier in this study.

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Despite the undeniable severity of Punjab’s multiple and interlinked water crises, critical action may not be taken in time to reverse the dangerous trends that have now deeply embedded themselves in her agriculture and ecology. By way of large industrial farms, fertilizer companies and tubewell companies, there remains a powerful status quo at work in Punjab, and little concrete action has yet been taken to solve the complex issues involved with water management in the state.

Water, as the free-existing source of all life, cannot be simply considered another agricultural “input” in the same way NPK fertilizers, pesticides or tractors are. For although the cultivation of Green Revolution crops cannot exist without fertilizers, pesticides or tractors, large-scale human civilization itself cannot continue in the Punjab without a perpetual source of safe drinking water. Thus, as the continuation of today’s intensive irrigation in the arid Punjab threatens the quality -- and even possibility-- of its future harvests, it also threatens the more immediate realms of human health and dignity for a great many of its citizens.

X. CONCLUSION: SUICIDE AND DEVELOPMENT

In the summer of 2006, Indian Prime Minister Manmohan Singh paid a high profile visit to the Vidarbha region of Maharashtra, another Indian state currently facing high levels of farmer debt and debt-driven suicide. What resulted from Singh’s tour was the implementation of a relief package for Vidarbha amounting to 3750 *crore* rupees, or more than 900 million dollars, much of it going directly toward individual debt relief. While Singh’s visit made international headlines, there was little mention of the fact that only six of Vidarbha’s eleven districts received the aid, despite crushing levels of debt across the entire region. Nor was it mentioned that a major component of Singh’s relief program involved replacing open pollinated seeds—“traditional seeds”—with corporate hybrid seeds, such as Monsanto’s Bt cotton.^{civ} This is an important point, for just as it is in Punjab, farmer indebtedness and hybrid seeds in Maharashtra go hand-in-hand. Thus it was debt cycles that brought about the state’s crisis to begin with.

Regardless of its shortcomings in Maharashtra, the greatest failure of Singh’s relief plan is that it simply ignores the multiple other regions of the country facing debt crises, including Punjab. Shortly after the Maharashtra plan was announced, former Punjabi Chief Minister Parkash Singh Badal publicly demanded to know, “why can’t the Prime Minister announce a package for Punjab

on the lines of what he has granted to...[the] Vidarbha region? Once regarded as the food bowl of the country, the state is now being completely ignored by the Congress administration especially when it comes to addressing farmers' woes.^{*cv}

Yet even if Singh were to focus his attention on rural Punjab, it is unlikely that the root causes of its debt emergency would be addressed. Punjab's crisis is but one of many manifestations of a larger, pan-Indian problem, as evidenced by the situation in Maharashtra, as well in Tamil Nadu, Andhra Pradesh, Karnataka and Kerala. Because of its symptomatic approach towards agrarian assistance, Singh's relief program does not address this larger problem, but rather breaks it up and localizes it, as it has done in Vidarbha. As such, issues as wide ranging as crumbling tariffs on foreign agricultural imports, falling water tables, stagnating support prices and rising input costs are simply not figured into the relief plan. No attempt is made to connect the dots between environmental decay and economic hardship, nor between nationwide economic liberalization and rural distress. Yet in Punjab as elsewhere, it is only *through* such connections that the rural crisis can be seen for what it is.

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Perhaps upon a single, cursory glance, it would be difficult to make the direct links between, for example, Punjab's falling water tables and the statewide epidemic of farmer suicide. Suicide can be viewed as an individual decision, one made by a single person driven to despair out of a complex web of motivations, while the direct connections between that decision and a specific ecological moment are haphazard at best. Yet seen in another light, the issue of farmer suicide is *indivisible* from each and every one of Punjab's current environmental, economic and social crises. The particulars of these crises—the “specific ecological moments” of falling water tables or dying soils for example—are then, not superfluous, but rather crucial points for understanding the interconnections at work between them. It is in then seeing these interconnections that linkages can be drawn between water tables, irrigation costs, debt, loans and finally, self-murder; farmer suicide becomes one point at which the totality of Punjab's agricultural crises converge and can be seen in their true magnitude.

Nevertheless, farmer suicide in the Punjab is by no means a completely understood or well-documented phenomenon. One reason for this gap in knowledge is the lack of concrete data available, and there is strong reason to believe that farmer suicide is a far wider problem than the Punjab government formally acknowledges. As Dutch researcher Tom Deiters, one of the few outsiders to have studied this problem at length, explains, “considering [that] the official government data on suicides is collected from criminal records this gives reason to believe that the government figures are grossly underestimated.”^{*cvi} As Deiters alludes to, suicide still goes on the books as a felony in India. This fact has led many to argue that most suicides in the state go unreported simply because doing so would implicate the deceased as a criminal for all time. Although so little is therefore known about the thoughts and voices of many of Punjab's individual suicide victims, they have by no means gone silently into their graves. The deceased have issued, with the collective weight of their final acts on earth, an audible challenge to the world they left behind. Theirs is a challenge to the way in which Punjab's agriculture was and is industrialized. It is a challenge to the wisdom of the free market. And ultimately, it is a challenge to the very notion of “development” itself.

There is a peculiar irony in this final challenge however, the unraveling of development discourse through the despair of agrarian suicide. The irony involves an assumption lying at the center of nearly all development discourse and dogma: *rural despair is left far behind as “development”*

takes hold within a society. Thus, if in the “teleological” trajectory of development, societies, nations and even people can vertically move up and down through various stages of backwardness until they finally reach the point of being fully “developed” and modern, the question arises: toward which direction on this continuum does widespread farmer debt and suicide point?

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Despite the hegemonic assumptions implicit in top-down development doctrine, it has sometimes been re-routed into bottom-up strategies such as “participatory development” or “another development.” Still, far more often than not it appears, as the anthropologist Arturo Escobar describes it, in the former, hegemonic form:

Development fostered a way of conceiving social life as a technical problem, as a matter of rational decision and management to be entrusted to that group of people—the development professionals—whose specialized knowledge allegedly qualified them for the task. Instead of seeing change as a process rooted in the interpretation of each society’s history and cultural tradition—as a number of intellectuals in various parts of the third world had attempted to do in the 1920s and 1930s (Gandhi being the best known of them)—these professionals sought to devise mechanisms and procedures to make societies fit a preexisting model that embodied the structure and functions of modernity.^{cvi}

The extent to which agricultural development in Punjab has followed the course laid out by Escobar is remarkable. As we have seen, the Green Revolution—the supreme catalyst for Punjab’s development—was premised on the belief that feeding India was, in fact, a solely “technical problem.” Food was simply a hurdle to be faced on India’s teleological march toward “modernity,” that greatest of culturally and politically neutral signs of success. As such, the problem of Indian agriculture was laid out in acultural and ahistorical terms, with technology and capital as the solution. Through the promotion of this technological solution above all else, the Green Revolution’s architects—i.e. “the development professionals”—could justify focusing solely on the best endowed farmers in the best-endowed regions, for it was believed that only within such a context could this technological transfer be successful. With all resources aimed at a small demographic and geographic region (Punjab), technology could do its essential work of increasing yields. Supporters of this argument have long stated that the critical context in which this technology was deployed—India’s “terrifying shortage of basic foods”—necessitated such an approach, and it is within this context that the Green Revolution has been declared a success.

Yet if the Green Revolution truly did succeed, what are we to make of the dying soils, shrinking water tables, increased inequality and skyrocketing debt that have become part and parcel with its legacy in rural Punjab? As has been shown throughout this study, the details of these issues matter specifically because *these* details are what are being ignored, disputed or neglected when Punjab’s Green Revolution is unequivocally affirmed to have been a “success.” Of course, when these details *are* described, or bluntly stated through the challenge of farmer suicide, not only is this understanding of the Green Revolution’s “success” threatened, but the teleological assumptions upon which development discourse itself rests are as well. Once the notions of “success” and teleological development are shaken, the central question of this analysis can then be raised: does the scale of Punjab’s current crisis supersede the initial, or even continued, benefits of increased yields?

Those who declare Punjab's Green Revolution—and the Green Revolution in general—a success, see the problems that the state faces today as either unrelated to the successes of the Green Revolution or, more convincingly, related, but dwarfed, in comparison. As a challenge to this hegemonic view, this report has highlighted an opposing argument, an argument that states that these problems are not in fact dwarfed by the successes of yield, but rather call into question the very notion that success can be judged solely by yield in the first place.

In this challenge to the primacy of yield, not only are questions of society and ecology raised, but fundamental economic questions are as well. One immediate question is whether or not a program can be described as economically “successful” if it destroys the wealth upon which it rests. In the case of agriculture, despite continued claims to the contrary, soil and water remain limiting factors to agro-economic growth. Thus, although industrial farming is largely built upon the assumption that the technocratic workings of market economics can outrun the shortcomings of the natural world, as we have seen, these “shortcomings” are not merely “problems” to be solved by economics and technology, but are rather autonomous limits functioning outside the auspices of either one. When these limits are crossed for a long enough period of time, they begin to affect the more economically measurable areas of yield decline and cultivator indebtedness, as we have seen.

The issues raised throughout this study are, by no means, rhetorical in nature. Rather, the question of whether the Green Revolution is ultimately declared a success or failure will have a significant impact on the future course of Punjabi agriculture. Although the same organizations that initially promoted the wheat-rice Green Revolution in Punjab, such as the International Rice Research Institute and the World Bank, are now voicing serious concern over its current form, their understanding of its general methodology remains unchallenged, leaving the Green Revolution as a historical “success,” the basic blueprint for further development. This declaration of “success” has become so deafening that it all but silences the many critical voices that surround it on all sides. The issues raised here, and from the graves of those farmers now gone, give voice to the silenced and the forgotten, leaving “success” not as a statement, but an ongoing, as of yet, unanswered question.

NOTES

- ⁱ “NABARD to Conduct Study Into Farmer Suicides” (New Kerala Online Newspaper; www.newkerala.com October 4th, 2005).
- ⁱⁱ “Gruesome Tale of Sikh Farmer Who Could Not Pay the Interest on His Loan to the Bania (Moneylender)” (Khalistan Affairs Center; www.khalistan-affairs.org; Washington D.C; August 26, 1998).
- ⁱⁱⁱ *Kheti Virasat* Research Team, “Suicides by the Cotton Farmers in Bhatinda District” (An Online Report: http://www.punjabilok.com/agriculture/farmers_suicide.htm; January, 2002).
- ^{iv} Mishra, Pankaj, “The Myth of the New India” (*The New York Times*; 6 July, 2006)
- ^v Aditi Tandon, “Kin of Indebted Farmers Finally Get to Speak” (*The Tribune*; 2 April 2006; Chandigarh, India)
- ^{vi} Sarbjit Dhaliwal, “Punjab Admits to Suicides by Farmers” (*The Tribune*; 20 March 2001; Chandigarh, India).
- ^{vii} Norman Borlaug, (Nobel Lecture, December 11, 1970) <http://www.agbioworld.org/biotech-info/topics/borlaug/nobel-speech.html>.
- ^{viii} Vandana Shiva, *The Violence of the Green Revolution* (Zed Books 1991) 35.
- ^{ix} Shiva. 26.
- ^x Prafulla Sanghvi, *Surplus Manpower in Agriculture and Economic Development* (Asia Publishing House; India 1969) 30.
- ^{xi} A.V. Balasubramanian, from a speech entitled, “Traditional Indian Agriculture and Natural Resources Management: Current Relevance and Future Potential.” Delivered in Kochi, India in August, 2003. (Transcript found at: <http://www.ciks.org/article1.htm>)
- ^{xii} Bharat Dogra. “Traditional Agriculture in India: High Yields and No Waste” (*The Ecologist*, Vol. 13 No. 2/3, 1983)
- ^{xiii} Christopher Baker, in *Understanding Green Revolutions* (Cambridge U. Press; Bayliss-Smith, Tim P. and Wanmali, Sudhir, eds. 1984) 38.
- ^{xiv} Christopher Baker, in *Understanding Green Revolutions*; 40.
- ^{xv} B.M. Bhatia, *Famines in India: A study in Some Aspects of the Economic History of India* (Asia Publishing House, Delhi 1967) 7.
- ^{xvi} http://en.wikipedia.org/wiki/Famine_in_India
- ^{xvii} Amartya Sen, *Poverty and Famines: An Essay on Entitlement and Deprivation* (Oxford, 1981) 1.
- ^{xviii} Sen 79.
- ^{xix} B.M. Bhatia, *Famines in India: A study in Some Aspects of the Economic History of India* ; 9-10.
- ^{xx} Bhatia 9-10.

-
- ^{xxi} Amartya Sen, Poverty and Famines; 160.
- ^{xxii} Sen 160.
- ^{xxiii} Christopher Baker, in Understanding Green Revolutions; 39.
- ^{xxiv} Various, Cooperative Farming. The Great Debate Between Jawaharlal Nehru, C. Rajagopalachari, etc. (Democratic Research Service, 1959, Bombay) 3.
- ^{xxv} Ibid 38.
- ^{xxvi} Francis Moore Lappe and Joseph Collins, Food First (Ballantine Books, 1978 edition) 365.
- ^{xxvii} Lappe and Collins 365.
- ^{xxviii} Hubert Humphrey, 4th Congress, First Session, Senate Committee on Agriculture and Fore try. Hearings: Policies and Operations P.L. 480; 1957; 29.
- ^{xxix} Vandana Shiva, The Violence of the Green Revolution; 31-32.
- ^{xxx} The revolt lasted until 1951.
- ^{xxxi} Research Unit for Political Economy, Mumbai; “Economics and Politics of the World Social Forum; Appendix I: Ford Foundation: A Case Study of the Aims of Foreign Funding” (from the Journal, *Aspects of Indian Economy*; No. 35, September 2003).
- ^{xxxii} Vandana Shiva, The Violence of the Green Revolution; 34.
- ^{xxxiii} Research Unit for Political Economy, Mumbai; “Economics and Politics of the World Social Forum; Appendix I: Ford Foundation: A Case Study of the Aims of Foreign Funding.”
- ^{xxxiv} Vandana Shiva, The Violence of the Green Revolution; 34.
- ^{xxxv} Akhil Gupta, Postcolonial Developments (Duke U. Press; 1998) 55.
- ^{xxxvi} Vandana Shiva, The Violence of the Green Revolution 36.
- ^{xxxvii} Shiva 45.
- ^{xxxviii} Anya Mc Guirk and Yair Mundlak, Incentives and Constraints in the Transformation of Punjab Agriculture (Research Report 87, International Food Policy Research Institute; 1991) 20.
- ^{xxxix} Mc Guirk and Mundlak 19.
- ^{xl} Norman Bourlaug, (Nobel Lecture, December 11, 1970) <http://www.agbioworld.org/biotech-info/topics/borlaug/nobel-speech.html>.
- ^{xli} Francine Frankel, in Food, Population, Employment: The Impact of the Green Revolution (Poleman, Thomas T. & Freebairn, Donald K. eds. Praeger Publishers, 1973) 129.
- ^{xlii} Frankel 130-131.
- ^{xliii} Frankel 133.

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- ^{xliv} David Hopper, in Seeds of Plenty, Seeds of Want (Oxford University Press, 1980) 79.
- ^{xlv} Devinder Sharma, “Farmer’s Suicides” (Znet South Asia, Zmag.org; 24 January, 2004).
- ^{xlvi} Raj Patel and Anders Riel Müeller, “Shining India? Economic Liberalization and Rural Poverty in the 1990’s” (Policy Brief No. 10; Food First May, 2004) page 4 of the “Executive Summary.”
- ^{xlvii} Devinder Sharma, “India Shines!!!!?” (Countercurrents.org; 10 February, 2004).
- ^{xlviii} NP Nawani, *Indian Experience on Household Food and Nutrition Security* (Fao: Food and Agriculture Organization of the United Nations; RAP publication 1994) 1.
- ^{xliv} Devinder Sharma, “Farmer’s Suicides” (Zmag.org).
- ¹ Anya Mc Guirk and Yair Mundlak, Incentives and Constraints in the Transformation of Punjab Agriculture; 39.
- ^{li} Raj Patel and Anders Riel Müeller, “Shining India? Economic Liberalization and Rural Poverty in the 1990’s;” 30.
- ^{lii} Patel and Müeller 42.
- ^{liii} Praveen Swami, “Punjab’s Paddy Crisis” (Frontline Magazine, Vol. 17 – Issue 22; Oct. 28-Nov. 10, 2000).
- ^{liv} Bhaveep Kang, “Green Revocation” (India Today, 29 November 2004, New Delhi) 34.
- ^{lv} Sarbjit Dhaliwal, “Farmers May Get Rs.20 as a Bonus on Wheat” (*The Tribune*; 16 February, 2006; Chandigarh, India).
- ^{lvi} Author Unknown, “Punjab Seeks Hike of Rs 100 Per Quintal in MSP of Wheat” (from New Kerala Online Newspaper; 8 February, 2006; <http://www.newkerala.com/news2.php?action=fullnews&id=5234>).
- ^{lvii} Ibid pp.34.
- ^{lviii} V.S. Mahajan, “Abolish Wheat and Paddy MSP” (an editorial from *The Tribune*; Chandigarh, India; 12 December, 2002).
- ^{lix} Devinder Sharma, “Indian Villages For Sale” (Znet.org; 16, February 2006 <http://www.zmag.org/content/showarticle.cfm?ItemID=9710>).
- ^{lx} *Kheti Virasat* ResearchTea.; “Suicides by the Cotton Farmers in Bhatinda District” (Online Report).
- ^{lxi} Devinder Sharma, “Farmers’ Suicides” (Zmag.org).
- ^{lxii} Or \$2,716, a vast sum of money in a state whose average per capita income is less than \$650 a year.
- ^{lxiii} H.S. Shergill, “Rural Credit and Indebtedness in Punjab” (Institute for Development and Communication; 1998; Chandigarh) 64-66.
- ^{lxiv} Francine Frankel, in Food, Population, Employment: The Impact of the Green Revolution; 121.
- ^{lxv} Thomas De Gregori, “Recognizing a Giant of Our Time: A Tribute to Norman Bourlag” (<http://www.agbioworld.org/biotech-info/topics/borlaug/giant.html>).

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- ^{lxvi} The World Bank; Poverty and Hunger: Issues and Options for Food Security in Developing Countries (The World Bank, Washington, D.C 1986) V.
- ^{lxvii} Although beyond the scope of this paper, it must be acknowledged that there is a strong counter-argument to this claim, to which Moore-Lappe and Collins dedicate several chapters of their 1977 *Food First*.
- ^{lxviii} 2004 Human Development Report: Punjab (The Government of Punjab w/ UNDP; 2004) 41.
- ^{lxix} Ibid 176.
- ^{lxx} Ibid 170.
- ^{lxxi} Ibid 171.
- ^{lxxii} Ibid 41.
- ^{lxxiii} Ibid 175.
- ^{lxxiv} Potatoes and chili peppers are other common examples of contract-farmed crops.
- ^{lxxv} Owned land holdings plus leased land holdings. The average MNC contract grower in the Punjab *owns* only forty acres.
- ^{lxxvi} Sukhpal Singh, “Multi-National Corporations and Agricultural Development: A Study of Contract Farming in the Indian Punjab” (*Journal of International Development*; March 2002) 186.
- ^{lxxvii} M.K. Gandhi, Food Shortage and Agriculture (Navajivan Press; May 1949) 196.
- ^{lxxviii} Prafulla Sanghvi, Surplus Manpower in Agriculture and Economic Development 30.
- ^{lxxix} Sanghvi 30-31.
- ^{lxxx} Helena Paul and Ricarda Steinbrecher, Hungry Corporations (Zed Books, London 2003) 9.
- ^{lxxxi} <http://unstats.un.org/unsd/environmentgl/gesform.asp?getitem=583>.
- ^{lxxxii} Vandana Shiva, The Violence of the Green Revolution; 72.
- ^{lxxxiii} Helena Paul and Ricarda Steinbrecher, Hungry Corporations 8.
- ^{lxxxiv} Vandana Shiva, “The Green Revolution in Punjab” (*The Ecologist*, Vol. 21, No. 2; March-April 1991).
- ^{lxxxv} Ramesh Menon, “The Slow Poisoning of Punjab” (Indiatogether.org February, 2004).
- ^{lxxxvi} Hiti Mahendroo and Sonal Bains, “Water Crisis in Punjab” (from *Water and Women*, a report by the Research Foundation for Science, Technology and Ecology; Delhi, India) 70.
- ^{lxxxvii} Mahendroo and Bains 70.
- ^{lxxxviii} Mahendroo and Bains 70.

-
- ^{lxxxix} Pardeep Rai Singh, “Punjab’s Water Dispute” (Witness84.org; 2004).
- ^{xc} Anya McGuirk and Yair Mundlak, Incentives and Constraints in the Transformation of Punjab Agriculture; 31.
- ^{xc i} Vandana Shiva, The Violence of the Green Revolution; 122.
- ^{xc ii} Shiva 128.
- ^{xc iii} Shiva 31.
- ^{xc iv} Peeyush Agnihotri, “Tubewells, Drilling for Deep Trouble” (*The Tribune*, 16 February, 2002; Chandigarh, India).
- ^{xc v} Hiti Mahendroo and Sonal Bains, “Water Crisis in Punjab” 70.
- ^{xc vi} Peeyush Agnihotri, “Tubewells, Drilling for Deep Trouble.”
- ^{xc vii} Peeyush Agnihotri, “Tubewells, Drilling for Deep Trouble.”
- ^{xc viii} 2004 Human Development Report: Punjab (The Government of Punjab w/ UNDP; 2004) 37.
- ^{xc ix} Peeyush Agnihotri, “Tubewells, Drilling for Deep Trouble.”
- ^c 2004 Human Development Report: Punjab (The Government of Punjab w/ UNDP; 2004) 37.
- ^{ci} David Spurgeon, “Water, A Looming Crisis” (International Rice Research Institute; from the IRRI’s annual report, 1994-1995 <http://www.irri.org/publications/annual/looming.asp>).
- ^{cii} Tribune News Service, “Five Projects Planned to Check Waterlogging” (*The Tribune*, 22 November, 1998; Chandigarh, India).
- ^{ciii} Vandana Shiva, The Violence of the Green Revolution 137.
- ^{civ} Afsar H. Jafri, “Prime Minister’s Relief Package for Vidarbha—Will It Solve the Farm Crisis?” (from Focus on the Global South’s website; 19 July 2006; <http://www.focusweb.org/india/content/view/816/30/>)
- ^{cv} Author Unknown, “Badal Seeks Vidharbha-Type Package for Punjab Farmers” (from New Kerala Online Newspaper; 8 August, 2006; <http://www.newkerala.com/news4.php?action=fullnews&id=3814>).
- ^{cvi} Tom Dieters (from an email communication).
- ^{c vii} Arturo Escobar, *Encountering Development* (Princeton University Press, 1995) 52.

REFERENCES

- Agnihotri, Peeyush. "Tubewells, Drilling for Deep Trouble." The Tribune. Chandigarh, India. 16 Feb. 2002.
- Baker, Christopher. In Understanding Green Revolutions. Bayliss-Smith, Tim P. and Sudhir Wanmali ed. Cambridge: Cambridge University Press, 1984.
- Balasubramanian, A.V. From a speech entitled, "Traditional Indian Agriculture and Natural Resources Management: Current Relevance and Future Potential." Delivered in Kochi, India in August, 2003. (Transcript found at: <http://www.ciks.org/article1.htm>)
- Bhatia, B.M. Famines in India: A study in Some Aspects of the Economic History of India. Delhi: Asia Publishing House, 1967.
- Bourlag, Norman. "Nobel Lecture." 11 December 1970.
- Cooperative Farming, The Great Debate Between Jawaharlal Nehru, C. Rajagopalachari, etc. Bombay: Democratic Research Service, 1959.
- De Gregori, Thomas. "Recognizing a Giant of Our Time: A Tribute to Norman Bourlag." Agbioworld.org, 2005.
- Dhaliwal, Sarbjit. "Farmers May Get Rs.20 as a Bonus on Wheat." The Tribune. Chandigarh, India. 16 Feb. 2006.
- Dhaliwal, Sarbjit. "Punjab Admits to Suicides by Farmers." The Tribune. Chandigarh, India. 20 March 2001.
- Dieters, Tom. Email to Bryan Newman. 10 March 2006.
- Dogra, Bharat. "Traditional Agriculture in India : High Yields and No Waste." The Ecologist. Vol. 13 No. 2/3, 1983.
- Escobar, Arturo. Encountering Development. Princeton: Princeton University Press, 1995.
- Frankel, Francine. In Food, Population, Employment: The Impact of the Green Revolution. Poleman, Thomas T. & Freebairn, Donald K. ed. New York: Praeger Publishers, 1973.
- Gandhi, M.K. Food Shortage and Agriculture. Ahmedabad: Navajivan Press, 1949.
- Ghosh, Jayati. "The Political Economy of Farmers' Suicides in India." New Delhi: India International Centre, 9 Dec. 2005.
- Gupta, Akhil. Postcolonial Developments. Durham: Duke University Press, 1998.
- Hopper, David. Seeds of Plenty, Seeds of Want. Oxford: Oxford University Press, 1980.

Humphrey, Hubert. 4th Congress, First Session, Senate Committee on Agriculture and Forestry. Hearings: Policies and Operations P.L. 480; 1957.

Jafri, Asfar H. "Prime Minister's Relief Package for Vidarbha—Will It Solve the Farm Crisis?" Focus on the Global South website. 19 July 2006.

Kang, Bhaveep. "Green Revocation." India Today, 29 November 2004.

Khalistan Affairs Center. "Gruesome Tale of Sikh Farmer Who Could Not Pay the Interest on His Loan to the Bania (Moneylender)." www.khalistan-affairs.org. Washington D.C. 26 Aug. 1998.

Kheti Virasat Research Team. "Suicides by the Cotton Farmers in Bhatinda District." An Online Report: http://www.punjabilok.com/agriculture/farmers_suicide.htm. Jan. 2002.

Lappe, Francis Moore and Joseph Collins. Food First. New York: Ballantine Books, 1978 edition.

Mahajan, V.S. "Abolish Wheat and Paddy MSP" (an editorial). The Tribune. Chandigarh, India, 12 Dec. 2002.

Mahendroo, Hiti and Sonal Bains. "Water Crisis in Punjab." In Water and Women. Shiva, Vandana and Kunwar Jalees ed. Delhi: Research Foundation for Science, Technology and Ecology, 2005.

Mc Guirk, Anya and Yair Mundlak. Incentives and Constraints in the Transformation of Punjab Agriculture Research Report 87, International Food Policy Research Institute, 1991.

Menon, Ramesh. "The Slow Poisoning of Punjab." Indiatogether.org, Feb. 2004.

"NABARD to Conduct Study Into Farmer Suicides." New Kerala Online Newspaper. 4 Oct. 2005. www.newkerala.com

Nawani, N.P. Indian Experience on Household Food and Nutrition Security. Food and Agriculture Organization of the United Nations. New York/Geneva: RAP publication, 1994.

Patel, Raj and Anders Riel Müller. Shining India? Economic Liberalization and Rural Poverty in the 1990's. San Francisco: Food First. Policy Brief No. 10. May 2004.

Paul, Helena and Ricarda Steinbrecher. Hungry Corporations. London: Zed Books, 2003.

"Punjab seeks hike of Rs 100 per quintal in MSP of wheat." New Kerala Online Newspaper; 8 Feb. 2006. www.newkerala.com.

Research Unit for Political Economy, Mumbai. "Economics and Politics of the World Social Forum; Appendix I: Ford Foundation: A Case Study of the Aims of Foreign Funding." Aspects of Indian Economy. No. 35, Sept. 2003.

Sanghvi, Prafulla. Surplus Manpower in Agriculture and Economic Development. Bombay: Asia Publishing House, 1969.

-
- Sen, Amartya. Poverty and Famines: An Essay on Entitlement and Deprivation. Oxford: Oxford University Press, 1981.
- Sharma, Devinder. "Farmer's Suicides." Zmag.org. 24 Jan. 2004.
- Sharma, Devinder. "India Shines!!!!!" Countercurrents.org 10 Feb. 2004.
- Sharma; Devinder; "Indian Villages For Sale" Znet.org. 16 Feb. 2006.
- Shergill, H.S. Rural Credit and Indebtedness in Punjab. Chandigarh: Institute for Development and Communication, 1998.
- Shiva, Vandana. "The Green Revolution in Punjab." The Ecologist, Vol. 21, No. 2; March-April, 1991.
- Shiva, Vandana. The Violence of the Green Revolution London: Zed Books, 1991.
- Singh, Pardeep Rai. "Punjab's Water Dispute." Witness84.org, 2004.
- Singh, Sukhpal. "Multi-National Corporations and Agricultural Development: A Study of Contract Farming in the Indian Punjab." Journal of International Development. March 2002.
- Spurgeon, David. "Water, A Looming Crisis." From the IRRI Annual Report 1994-1995. Manila: International Rice Research Institute, 1995.
- Swami, Praveen. "Punjab's Paddy Crisis." Frontline Vol. 17 – Issue 22; Oct. 28-Nov. 10, 2000.
- Tandon, Aditi. "Kin of Indebted Farmers Finally Get to Speak" The Tribune. Chandigarh, India. 2 April 2006;
- Tribune News Service. "Five Projects Planned to Check Waterlogging." The Tribune. Chandigarh, India. 22 Nov. 1998.
- World Bank, The. Poverty and Hunger: Issues and Options for Food Security in Developing Countries. Washington, D.C: The World Bank, 1986.
- 2004 Human Development Report: Punjab. The Government of Punjab with the UNDP, 2004.