David W Fletcher, Spring 2000

THE GREEN REVOLUTION: PAPER SUMMARY

Introduction

—The Green Revolution (GR) focused on heightened agricultural production via advanced technology throughout parts of the developing world.

—Pragmatic agriculturalists challenged neo-Malthusians negativism by actually increasing food production.

—With the introduction of high-yielding varieties (HYVs) of wheat and rice in the Indian Punjab and other parts of Asia, a GR in food production occurred.

—Yet this GR affected not only agricultural technology but whole systems of living and thinking in the developing countries.

1. The Seed and Its Needs

—Seed hybrids, developed by Western capitalists, certainly outperformed traditional varieties.

—But the "miracle seeds" created a new ecosystem that displaced the old, indigenous system.

—The HYVs also required high levels of fertilizer, water, and pesticide, which further disrupted the delicate natural balance in rural regions.

2. The Process of Western Imposition

—Western technology, with its "conquest of nature" philosophy, sought to manipulate, for various reasons, agricultural production in developing nations.

—Oriental traditions, centuries old and imbedded in the social structures of these cultures, sharply resisted such manipulation.

3. The Attendant Cultural Revolution

—By the GR, developing nations were thrust forward into the upheavals of modernity in the 1960s and 1970s.

—A vigorous agricultural market economy and all its baggage intruded upon the old colonial-type village and all its conservative deficiencies.

4. The Resultant Displacement of Rural Agriculturalists

—Paralleling historic technological revolutions, the GR added to human suffering by the displacement of rural population to large urban centers.

—Problems of rural displacement and urban absorption could not be handled adequately by elitist policy.

Conclusion

—The GR has happened, and now developing nations must take charge and manage their own processes of "Westernization."

—Marginal peoples and places must be empowered by global, national, and local policies and practices in order to reach and maintain stability and sustainability.

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THE GREEN REVOLUTION

Introduction. From the perspective of an awakened American conscience about ecological issues, an environmental Green Revolution (GR) coincided with the first Earth Day in 1970, sparked by the earlier publication of Rachel Carson's *Silent Spring*.[1] But an earlier global GR, that focused on heightened agricultural production via advanced technology, had already taken shape throughout parts of the developing world. The Food and Agricultural Organization (FAO) of the United Nations issued its first *World Food Survey* only a year after its creation in 1945. Chocked full of terms like "undernourishment" and "malnourishment," the *Survey* identified some seventy countries that represented approximately ninety percent of the world's population and had diet deficiencies or insufficient calories in a sizeable portion of their populations.

Subsequent FAO surveys along with a rash of popular and scientific publications confirmed the existence of a neo-Malthusian dilemma. The voices of doom predicted widespread famine in the mid-1970s and certain starvation by the year 2000 when global population estimates anticipated the six billion mark. A few dissenting voices challenged the legitimacy of the *Survey's* methodology and noted the overestimate of requirements, the promulgation of unrealistic homogeneity in food habits, and the understatement of actual food

[1]Kirkpatrick Sale, *The Green Revolution: The American Environmental Movement, 1962-1992* (New York: Hill & Wang, 1993), 3ff.

production.[2] This latter theme of global food production became a significant development during the mid-1960s. While the theoreticians slugged it out on paper and in the press, the pragmatic agriculturalists with the help of agro-technology went to work in the dirt.

Good weather along with the introduction of high-yielding varieties (HYVs) of Mexican wheat in the Punjab region of India produced steep rises in agricultural output during 1967 and 1968. Experiments by the International Rice Research Institute (IRRI) of the Philippines duplicated this success with HYVs in wetter parts of southeast Asia. As a result, many concluded that a "Green Revolution" had occurred and that the neo-Malthusian alarm was unjustified. Agricultural optimists, and even the FAO in its *State of Food and Agriculture* (1969), opined that "the food problems of the future might well be ones of surplus rather than of shortage."[3] A revolution had come to pass. At the very least, changes in how people farmed substantially altered the presumed arithmetical progression of subsistence. Now food production could clearly outpace growth in population. But had this technological tampering reaped any negative results? Over time, was this revolution better seen as a revulsion?

A problem arises from the assumption that technology is basically neutral. The alternative belief emphasizes the intimate linkage of technology with social change, so that historically "a change in technology [is] virtually always associated with a major change in social

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[2]Thomas T. Poleman, "Food and Population in Historical Perspective," *Food, Population, and Employment: The Impact of the Green Revolution*, eds. Thomas T. Poleman and Donald K. Freebairn (New York: Praeger, 1973), 10.

[3]Ibid., 11.

relations."[4] In other words, technology is not neutral, but rather it actively affects and alters both social and cultural patterns. The GR in this respect can be viewed from either a narrow or a broad perspective. In the narrowest sense, "it consists primarily in the adoption of the new high-yielding varieties of wheat and rice and associated technologies."[5] In the broadest sense, "it includes not only this but all other economic changes as well as the social and cultural changes that either contributed to the technological and ecological changes or were derived from them."[6] Depending on outlook, this technological advance (the narrow view) and the accompanying societal evolution (the broad view) can be construed as either positive or negative. Concerns to be addressed are the seed itself and its subsidiary needs, the process of Western imposition, the attendant cultural revolution, and the resultant displacement of "primitive" or pre-technological agriculturalists.

The seed itself and its subsidiary needs. Until the GR, major seed hybridization benefitted agriculturalists in the temperate climate zones. The GR however capitalized on new seeds advantageous in tropical-subtropical areas. In the 1960s, Dr. Norman Borlaug, Director of the Rockefeller Foundation's wheat-breeding program in Mexico, in conjunction with Dr. Orville Vogel, developed a dwarf wheat variety, amassed from germ plasm collected from Japan, the

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[4]Andrew Pearse, *Seeds of Plenty, Seeds of Want: Social and Economic Implications of the Green Revolution* (Oxford: Clarendon, 1980), 6.

[5]Murray J. Leaf, *Song of Hope: The Green Revolution in a Panjab Village* (New Brunswick, NJ: Rutgers, 1984), 23.

[6]Ibid.

United States, Australia, and Colombia, that performed well in equatorial latitudes. The Ford Foundation correspondingly established the International Rice Research Institute (IRRI) near Manila, and by crossbreeding over 10,000 strains of rice, they produced Dee-geo-woo-gen or "miracle rice" (IR-8) by crossing the Indonesian Peta rice with a dwarf variety from Taiwan. These new strains of wheat and rice held distinct advantages over traditional varieties. They responded well to fertilizer, their yield was greater, and they matured earlier. They absorbed up to one hundred twenty pounds of fertilizer per acre while traditional varieties lodged after only forty pounds. They produced over one hundred percent increase in yield from ten pounds of grain per one pound of fertilizer for traditional seeds to twenty pounds of grain for hybrid seeds. They also matured more quickly, for example, IR-8 matured in only one hundred twenty days whereas traditional rices took from one hundred fifty to one hundred eighty days.[7] The new seeds furthermore were supplied to developing countries virtually cost free, and the farmers utilizing them reaped record surplus production.

But the introduction of these "miracle seeds" into "tradition-sensitive" environments has received sharp criticism. According to traditionalists, the natural genetic diversity of many rural regions has been destroyed. In contrast to industrial farming, which is highly mechanized, quantity oriented, and basically variety-less, "cropping systems involve an interaction between soil, water, and plant genetic resources. In indigenous agriculture, cropping systems include a symbiotic relationship between soil, water, farm animals, and plants. The Green Revolution

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[7]See Lester R. Brown, *Seeds of Change: The Green Revolution and Development in the 1970s* (New York: Praeger, 1970), 18.

agriculture replaces this integration with seeds and chemicals [that] set up their own interactions with soils and water systems."[8] The critics suggested that this new integration reduced indigenous farming systems to individual crops and parts of crops. This, in turn, diminished the nutrient variety and protein value of cereals, pulses, and oilseeds, and minimized the diverse functions of the delicate indigenous ecosystem by replacing it with a "genetically uniform monoculture." As a result, comparisons in yields and productivity have been misleading and have made the nomenclature of HYVs a myth instead of a reality.[9]

Furthermore, the vulnerability of the new HYVs to pests and diseases remained high with a credible life-span of only three to five years.[10] This suggested that new hybrids were nonrenewable, unlike traditional varieties, due to a narrow genetic base. And, their high-response and high-yield factors depended correspondingly on high input of fertilizer, irrigation, and pesticide.[11] The native cycle of organic fertilizers, natural water sources, and pest resistance through diversity was broken, as the artificial, man-made, mechanized system was introduced. Some of the spinoffs were predictably troubling. Chemical fertilizers have decreased soil fertility substantially, and the need for intensive irrigation has resulted in numerous dams, the source of

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[8]Vandana Shiva, *The Violence of the Green Revolution: Third World Agriculture, Ecology and Politics* (Penang, Malaysia: Third World Network, 1991), 68-69.

[9]See "The Green Revolution in Punjab: Indicative costs and benefits" (Table 6.2) in Shiva, *Violence of the Green Revolution*, 200.

[10]"Outbreaks of rice insect pests and diseases in the Punjab" (Table 2.7), ibid., 92.

[11]"Pre-industrial, semi-industrial and full-industrial systems of rice cultivation: inputs and outputs per hectare-year" (Table 2.3), ibid., 80-81.

local water conflicts.[12] Yet the overall negative impact remained questionable, especially since the GR impacted different developing nations in unique ways.[13]

The process of Western imposition. The key role played by Western capital and technology in the GR cannot be downplayed.[14] According to the traditional oriental mindset, this was a most salient criticism of the GR. Underlying this objection was also the charge that the GR was "based on the assumption that technology is a superior substitute for nature, and hence a means of producing limitless growth, unconstrained by nature's limits."[15] In other words, the Western philosophy of nature subservient to man as per humanistic and some Christian thinking, rather than man subservient to nature, led propagandists of the GR to impose a "conquest of nature" on the oriental landscape. While Western promoters lauded their involvement overseas with congratulations about third world benevolence and beneficial results for agricultural research and multinational corporations, Eastern critics noted instabilities such as regional disparities, uncertain food prices, and overloaded marketing systems,[16] and responded with charges of exploitation and manipulation. Promoters in the United States seemingly forgot the

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[12]Ibid., 103ff., 121ff. Compare Brown's "TVAs in the LDCs," *Seeds of Change*, 26ff.

[13]For brief reports on India, Indonesia, Sri Lanka, and Malaysia, see Pearse, *Seeds of Plenty, Seeds of Want*, 77-104.

[14]"IRRI finances according to source (1961-1980)" (Table 1.3), Shiva, *Violence of the Green Revolution*, 40-43.

[15]Ibid., 24.

[16]See Brown, *Seeds of Change*, 47ff., 77ff. See also Keith Griffin, *The Political Economy of Agrarian Change: An Essay on the Green Revolution* (Cambridge, MA: Harvard, 1974).

applicability of an important historic precedent from their own homeland–that of the possible cause-effect linkage of the Great American Dust Bowl in the 1930s to the introduction of agricultural technology in the late nineteenth century.[17]

The attendant cultural revolution. Just as radical sociological changes emerged out of the American experience in the 1930s, so developing nations were thrust forward into the upheavals of modernity in the 1960s and 1970s. Increased mechanization, restructured farm size, and alterations in settled practices of land ownership and tenancy, with concurrent political adaptations,[18] created disruptions for the delicate village ecology with negative implications for its division of labor, its economy, the ancient kinship system, and even its religious beliefs and practices.[19] In essence, the GR meant the intrusion of a vigorous agricultural market economy and all its baggage upon the colonial-type village system and all its conservative deficiencies. In some instances, cultural norms eroded that precipitated conflict and even violence–weighty social and political costs.[20] But questions remained about the certainty of deteriorating agricultural and societal conditions prior to the GR in particular regions. These conditions were both prevalent and widespread. Now that the changes have occurred, it is impossible to go back in time and extract from those situations what might have been. Such can only be conjectured for the sake of

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[17]Shiva, *Violence of the Green Revolution*, 33.

[18]See Pearse, *Seeds of Plenty, Seeds of Want*, 26ff., 41ff., 105ff., 121ff., 142ff.

[19]So Leaf, *Song of Hope*, 37-204.

[20]The classic example is the Indian Punjab. For details on farmer protests and the increase in violence, see Shiva, *Violence of the Green Revolution*, 183ff.

argument. Realistically, the GR has propelled many developing nations into a new circumstance with its concordant challenges and opportunities.[21]

The resultant displacement of oriental agriculturists. The displacement of rural population to large urban centers such as Bombay, Shanghai, Beijing, Jakarta, Lagos, Calcutta, Mexico City, Karachi, and Metro Manila intensified the challenges of heightened urbanization along with potentially explosive problems of overcrowding and unemployment. By an ironic twist, a vicious cycle resulted as greater agricultural technology designed to reduce hunger and human suffering actually aggravated the problem. This evolution was nothing new, for "since the Industrial Revolution, the most enduring social phenomenon everywhere has been the steady movement of population from the farm to the city. This historic trek has created the stark possibility that many great cities may become human trash heaps."[22]

Urban absorption of rural displacements certainly has outstripped geopolitical capabilities in several regions, and this has accelerated illiteracy, poor nutrition, homelessness, and overall environmental degradation.[23] Demographic explosion outpaced infrastructure, and such

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[21]Two books deal with moving forward rather than dwelling upon past mistakes. See Chapter 5 (New Approaches to the Future) and Chapter 6 (Agricultural Strategies and Policies for the Future) in Kenneth A. Dahlberg, *Beyond the Green Revolution: The Ecology and Politics of Global Agricultural Development* (New York: Plenum, 1979); also Gordon R. Conway and Edward B. Barbier, *After the Green Revolution: Sustainable Agriculture for Development* (London: Earthscan, 1990).

[22]Brown, *Seeds of Change*, 101.

[23]For the Latin American model, see Jorge E. Hardoy, "Potentials for Urban Absorption: The Latin American Experience," *Food, Population, and Employment*, eds. Poleman and Freebairn, 167ff.

uncontrolled activity negated implementation of appropriate developmental models toward any decent rebuilding. Unfortunately, past developmental models left transient peasants, who hardly participated in key decisions that affected their future, with little moral or material incentives toward rectification. In some developing countries, rural elites clashed with urban elites over the perceived alternatives of development–usually industrialization versus rural improvements. While the industrialists remained satisfied with the status quo, the rural elites called for needed agricultural reform, i.e., land reform, consolidated farming, and better service to the small farmer.[24] But the people most affected, the poor displaced agriculturalists, usually were left out of the picture, especially concerning policy making processes.

Conclusion. Now that agro-tech is in, proper controls for agricultural performance, economic and political policies, and community and farm structures are a must. Developing nations need to take charge and manage their own processes of "Westernization." Many have done so, but additional work remains. Conway and Barbier provide some useful guidelines for "after the GR." Their priorities include: "at the international level, focusing on the constraints of trade and the global economic order; at the national level, on the resource policies and strategies of governments; and at the local level, on the needs of rural households, including their right and desire to participate in the crucial decisions that affect their livelihoods."[25] The authors additionally suggest the need to: "reorientate agricultural research and development efforts to

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[24]Brown, *Seeds of Change*, 110ff.

[25]Conway and Barbier, *After the Green Revolution*, 13-14.

cater for neglected marginal and resource-poor lands, as well as to improve the sustainability and stability of existing intensive agricultural production; complement these research priorities with appropriate policy measures and institutional changes; and change existing philosophies and practices away from a top-down, technology-driven approach to one that is more sensitive to farmers' goals and needs."[26] Whether developing nations can meet these challenges in the twenty-first century remains to be seen.

[26]Ibid.

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