

***Botanical Imperialism:  
The Stewardship of  
Plant Genetic Resources  
in the Third World\****

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MUCH OF THE LITERATURE ON IMPERIALISM AND UNDERDEVELOPMENT focus narrowly on political economy. There is little attempt to examine the implicit "ecological" or "botanical" aspects of this global process. This essay aims to fill this gap by examining in more detail the botanical and ecological dimensions of this process.

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"Botanical imperialism" is used in this essay as an analytic concept to illuminate the structural processes and dynamics of modern plant use in relation to underdevelopment and species extinction. The term "botanical imperialism" was constructed as a bridgework; applied, it represents an attempt to cross the gap or overcome the schism between the much fetishized disciplinary boundaries within and between the natural and human sciences. As title, concept, and discursive device, "botanical imperialism" was taken originally from two sources. First, from the "old order theories of imperialism" and second from the "new order concept of nature as ecosystem" reflecting the problem of its sustainability and renewability.

Post-modern critiques of modernity characteristically fail to come to terms with a central and utmost crucial feature of modernism: namely, the domination of nature. An unwanted consequence or fatal strategy of much of post-modern theory and practice is that it partly entails an ideology that speeds up the domination of nature; it does so blatantly when it self-indulgently invites and celebrates the accelerating consumerism of late capitalism.

The "abundance" of post-modern society characteristically is based on an ever more narrow but also more intense exploitation of nature; this phenomenon and problematic is what botanical imperialism addresses.

It is a salient, seemingly paradoxical, and defining historical feature of modernism that its historical identities and cosmos of dominating subjects turn, in the course of their objectification of "nature," into fragile subjects; the "lifeworld" or "nature" is transformed into a fragile cosmos.<sup>1</sup> Modernity involves the progressive weakening, if not destruction, of both the social and natural world, i.e., of the concrete and relatively cohesive biological and cultural communities in which human beings have found sustenance, solidarity, and meaning throughout history. It has long become an acknowledged part of modern self-understanding and discourse that both the modern self and its global environment show "signs of exhaustion." The biological and cultural world or landscape is progressively being turned into a global cultural and biological wasteland.

Critical awareness of the precariousness and dangers of these global developments and state of affairs has, for diverse historical reasons, been meager and insufficient in scope as to enable and generate the drastic changes necessary to forestall the ecological genocide of which the human species currently partakes in various forms. The "crisis of modernity" has remained, at least on the surface (culturally and ideologically), a phenomenon

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1. A process in part also described and anticipated in Adorno & Horkheimer's work *Dialectic of Enlightenment*.

specific to the declining centers of the world system.<sup>2</sup> The operative condition and site of the crisis nevertheless remains global. The structural conditions that generate botanical imperialism operate globally and continue unabated. The fatal global, cultural, and biological implications need to be addressed urgently.

This essay is intended as a contribution to the global critique of the previous problems and issues. Adopting an inter- and intra-disciplinary approach, this paper attempts to highlight and critically reflect on some of the ethical and moral dimensions of the debate, particularly those in relation to the modern use and abuse of the global botanical resources. The focus of attention on plants was based on the little appreciated fact that plants are the ultimate source of all foods on the planet, not only for humans but for other species as well.

### Botanical Imperialism

The history of botanical imperialism is, in part, a history of declining food variety as more people are nourished by fewer and fewer of the world's plant species. "[N]inety-five percent of human nutrition is derived from no more than thirty plants, eight of which comprise three-quarters of the plant kingdom's contribution to human energy. Three crops -- wheat, rice, and maize -- account for over 75% of our cereal consumption."<sup>3</sup> Approximately 80,000 edible plants have been used at one time or another since the beginning of agriculture, of which at least 3,000 have been used somewhat consistently.

However, as Ayensu pointed out, only about 150 have been cultivated on a large scale, and less than 25 produce 90% of the world's food.<sup>4</sup> Prehistoric people, Mooney notes, "found food in over 1,500 species of wild plants, and at least 500 major vegetables were used in ancient cultivation. In the space of a thousand years, our vegetable species have been narrowed down to the 200 species grown by backyard gardeners and the 80 species favored by market gardeners. Only 20 vegetable species are used in field cultivation."<sup>5</sup>

The commercialization of agriculture, the imperatives of the market, and the shift from a subsistence, kin/tributary-based production to a capitalist

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2. Jonathan Friedman, "Cultural Logic of the Global System: A Sketch," in *Theory, Culture, and Society* (London: Sage Publishers, 1988), p. 457.

3. Patri Mooney, *Seeds of the Earth: A Private or Public Resource?* (Ottawa: Mutual Press Ltd., 1980), p. 4.

4. Edward Ayensu, "The World's Demising Plant Resources," in S. Jain and K. Mehra, ed., *Conservation of Tropical Plant Resources* (New Delhi: Kapoor Press, 1983), p. 22.

5. *Seeds of the Earth*, p. 4.



mode of production saw the transformation of objects of use value into commodities produced for exchange. It engendered a reshuffling of social priorities. Whereas in pre-industrial societies use value was the prime determinant of production, in the era of botanical imperialism this was profoundly changed. Adorno notes that "exchange value, a purely notional one compared with use value, prevails over and in the place of human needs; illusion governs reality. At the same time it is the most officious reality, the spell that holds the world bewitched."<sup>6</sup>

The principle of exchange value revolutionized the world and had a dramatic impact on the count, constitution, and distribution of global plant genetic resources. On the one hand, it enriched, by creating hybrid forms, genetic engineering and "improved varieties" via techno-scientific applications. On the other hand, it impoverished by destroying much of the heterogeneity of plant genetic resources. Classical areas of crop-specific genetic diversity rapidly became areas of crop uniformity with the introduction of mono-crop varieties.

In the 1920s, the Russian geneticist N. I. Vavilov and his collaborators at the USSR Institute of Plant Industry located and described what have come to be known as "Vavilov centers of genetic diversity."<sup>7</sup> Expeditions were sent out by Vavilov to various parts of the world to collect evidence of the tremendous variability in plant plasm, and the publication of his findings awoke the rest of the world to this variability.

The major geographical centers of genetic diversity of cultivated plants and of their wild relatives were, according to Vavilov, in the Mediterranean, the Near East, Afghanistan, Indo-Burma, Malaysia-Java, China, Guatemala-Mexico, the Peruvian Andes, and Ethiopia. With the exception of a small area around the Mediterranean, the industrialized world is excluded from the centers of diversity. The reason for the botanical poverty stems in part from the ice age; while most of the vegetative assets (flora) of the temperate zone were frozen, tropical climes flourished in genetic diversity.

It became clear then in Europe, which at this time was at the height of colonial expansion, that in those regions where modern methods of selection had made no impact, a veritable genetic treasure had been accumulating. The discovery and mapping of the "Vavilov centers of plant genetic diversity" greatly extended the known range of variation in domesticated and related species, and yielded invaluable material for genetic, cytogenetic, and evolutionary studies; it provided a seemingly inexhaustible reservoir for plant

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6. Theodor Adorno, "Sociology and Empirical Research," in Paul Connerton, ed., *Critical Sociology: Selected Readings* (Middlesex: Penguin Books, 1976), p. 250.

7. *Seeds of the Earth*, p. 22.

breeders and commercial growers. In conjunction with the newly available technologies of plant breeding, it provided the basis for the green revolution and the further integration of the world system.

The green revolution saw the large introduction of commercial high-yield hybrid crops in the 1960s which vastly increased the productive capacity of major crops such as wheat, barley, corn, and rye; but the genetic wealth of many areas of plant genetic diversity vanished within a few years under the production pressure of single imported hybrid varieties.

In Afghanistan in the late 1960s one could go into any single field of wheat and might find anything up to 30 or 40 and occasionally more varieties in the same group of fields associated with a single village. In the early 1970s, there was a drought and a famine and the seed that was usually used as seed was eaten before seed wheat of the green revolution was flown in to sow the next year's crop. Literally, within two years, this massive introduction of uniform varieties has virtually extinguished wide stretches of genetic variation in wheat in Afghanistan.<sup>8</sup>

When a modern high-yield variety comes in the market, farmers usually stop growing the old-fashioned, low-yield, local varieties, which then die out. Egyptian farmers, for instance, now grow Giza 6 improved onions, instead of the hundreds of kinds they have been growing since the pharaohs.<sup>9</sup> "Wheat erosion" occurred at such a rate in the Near East under the advance of the green revolution between the mid 1960s and the 70s, "that a complete loss of the Near East 'center' (geographic center of plant genetic diversity) was anticipated at the Food and Agriculture Organization (FAO) by the end of the eighties..."<sup>10</sup>

The genetic uniformity in modern crops not only displaces the heterogeneity of plant plasm in traditional agronomic systems but also amounts to an invitation for epidemics to destroy these crops. The Irish potato blight of the late 1840s is one of the most dramatic examples of the possible consequences of a mono-culture-oriented mode of production. With the depletion of plant cultigens and their wild relatives in the Vavilov centers (centers of plant genetic diversity of cultigens and their wild relatives), the occurrence and threat of various plant diseases and crop epidemics throughout the world increased dramatically. Coffee rust destroyed crops in Sri Lanka, India, Java, Malaysia, the Philippines, and a dozen African countries; and stem rust destroyed millions of bushels of wheat in America and Canada.<sup>11</sup>

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8. Barry Barclay, *The Neglected Miracle* (film transcript, Wellington: Pacific Films Ltd., 1985).

9. Debora Mackenzie, "Seeds of Conflict over Food Genes," *New Scientist*, Vol. 22 (Dec. 29, 1983):870-871, p. 870.

10. *Seeds of the Earth*, p. 15.

11. *Ibid.*, p. 13.



Old varieties of plant cultigens, often selected over many generations and carefully stored and reproduced from one season to another, have at times disappeared almost overnight. They are rendered obsolete or are simply eaten up with the introduction of higher yielding hybrid-forms in "agro-industrial" forms of world production. Of the 30,000 rice varieties (cultigens) current in India in 1983, there will only be some 50 left by the end of the century, if current rates continue.<sup>12</sup> Genetic "erosion," according to Mooney, "means far more than a theoretical loss for future scientists: quite literally, the genetic diversity of a millennium in a variety can disappear in a single bowl of porridge."<sup>13</sup>

### Historical Origins

Botanical imperialism began with the early "voyages of discovery" and emerged as a global phenomenon with the traders and merchants that followed early European explorers. The accumulation of mercantile wealth that ensued in part from the trade of plant resources such as pepper, dyewood, and timber during the 16th and 17th centuries provided the initial material base for industrialization and for the consolidation of colonial expansion.<sup>14</sup> A main condition of the formation of capitalism as a mode of production was that enough raw materials had to be siphoned off from the peripheries to create the material base for the purchase of labor power and the creation of factories in the metropolitan countries. As Ford notes, "Britain and other countries of Western Europe dragged themselves across the barrier between feudalism and industrialization by mobilizing world capital in its broadest sense. They used precious metals, plants, animals and technology as tools to speed up the exploitation of the colonies..."<sup>15</sup>

The volume of world trade in tropical plants increased greatly in the 19th century. Cash crops and plantation economies based on tropical resources such as coffee, tea, sugar, opium, cinchona, rubber, and sisal provided the revenues that helped the building of empires and the initial wealth upon which some of the largest contemporary European private enterprises were built.

The appropriation, transfer, and commercial use of tropical food plants and plant cultigens in areas outside their place of origin has profoundly

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12. Rudolf Augustein, "Landwirtschaft-Der Alltaegliche Irrsinn; Subventionen, Ueberschuesse, Naturzerstoerung: Das Globale Disaster der Agrarpolitik (1)," *Der Spiegel*, Nr. 42 (1989).

13. *Seeds of the Earth*, p. 12.

14. Eric Wolf, *Europe and the People without History* (Berkeley: University of California Press, 1982), p. 196.

15. Glyn Ford, "Gin and Tonic: On Botany and the British Empire," book review in *New Statesman*, v.101 (Jan. 30, 1981):18-19.

influenced the course of the political economy of the world over the past two hundred years. Much of the world's economic and population growth since the "Age of Discovery" can be attributed to such plant transfers: rice, wheat, and sugar cane to America, maize and potato to Eurasia, and manioc to Africa, to name but a few. European varieties of cultivated grasses became the basis of the export-oriented grazing economies of New Zealand and Australia, and oil palm cultivars originating from Africa provided the material base for oil palm plantations in Malaysia and the Pacific. Forest plants of the humid tropics have supplied us with many staple foods, including cereals such as rice and millet, pulses such as peanut and mung bean, roots and tubers such as yam, cassava, and taro, and other well known crops such as pineapple and banana.

Tropical forests not only supported modern agriculture through their genetic contributions to established crops, but they also offered other goods such as medicine. Approximately one quarter of all prescription drugs sold in the United States is directly derived from plant materials of tropical origin.<sup>16</sup>

Plantation or "military agriculture" as a form of agricultural organization was a mark of European colonialism, a vehicle of European expansion.<sup>17</sup> It was on the basis of this new form of production organization that the bulk of world trade in tropical crops and manufactured goods came to account for the bulk of global capitalist accumulation before the turn of the 20th century. India's trade in cotton and textiles, for example, rose in the second half of the 19th century from US\$ 4 million to US\$ 50 million.<sup>18</sup> The mobilization and use of plant genetic resources and the harnessing of labor power had by then developed to an unprecedented scale.

### The Role of Botany and Science

Botany and science played an important role in the colonial expansion of the West and in the growth of the world system.

Plant collecting expeditions have been mounted for several thousand years. Around 2500 B.C., the Sumerians dispatched plant collectors to the heart of Asia Minor in search of vines, figs, and roses. In 1570 B.C., Queen Hatshepsut of Egypt sent expeditions to the country of Punt (Somalia) in search of frankincense trees.<sup>19</sup> It was not until the sixteenth century, however,

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16. *Seeds of the Earth*, p. 17.

17. *Europe and the People*, p. 315.

18. *Ibid.*, p. 312.

19. *Seeds of the Earth*, p. 6; D. Plucknett and N. Smith, *Gene Banks and the World's Food* (New Jersey: Princeton University Press, 1987), p. 59.

that "plant-hunting" took on a commercial and systematic character. John Tradescant, keeper of the garden of Charles I, was one of the first to organize plant collecting trips on a systematic basis. He collected plants from France, Holland, Russia, and Algeria, taking the larch tree from Russia, and lilac, crocus, and jasmine from the Mediterranean.<sup>20</sup>

Plant collecting went hand in hand with the "voyages of discovery." Sir Joseph Banks joined Captain James Cook on a voyage to Tahiti for extensive plant collecting, and visited New Guinea, the East Indies, New Zealand, and Australia, where Banks named "Botany Bay." He became the unofficial director of the Royal Botanical Gardens at Kew (established 1841) which became a major facility for moving plants around the world. Benjamin Franklin sent seeds and plants back to the United States during his European visits in the latter half of the eighteenth century.<sup>21</sup> During the 1920s and the 1930s, the plant explorer Nikolai I. Vavilov conducted lengthy overland plant-hunting trips in over 50 countries in the USSR, Asia, the Americas, northern Africa, Europe, and the Mediterranean. Together with exchanges from other institutions, Vavilov amassed over 50,000 seed samples of wheat, rye, oats, peas, lentils, chickpeas, and maize.<sup>22</sup>

Botany, as Brockway's case study of plant transfers illustrates,<sup>23</sup> played an important part in facilitating the economic exploitation of the colonies for the metropolitan empires. Firstly, the transfer of cinchona seeds from the Andean republics to the Nilgiri Hills of South India in the 1850s meant that these new plantations produced the raw material for the quinine and totaquine that saved British soldiers from malaria throughout the empire. Secondly, the transfer of latex-producing *Hevea brasiliensis* from the Amazon forest to the rubber plantations in Malaya, Ceylon, and Sumatra occurred just as the automobile made rubber indispensable to industrial economies in the early 20th century. Thirdly, the transfer of sisal plant (the raw material for binding twine) from Yucatan to Florida in 1838 and to German East Africa in 1893 supported a major plantation economy under German rule.

The British Royal Botanical Gardens was involved in all the three plant transfers. In the first two, agents were sent to South America to smuggle out the desired plants and seeds and arrange for their shipment to Kew and from there to Asia. In the third example, Brockway explains that the Botanical Garden's research, through

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20. *Gene Banks*, p. 59.

21. *Ibid.*, p. 60.

22. *Ibid.*, p. 62.

23. See Lucile Brockway, *The Role of the British Royal Botanical Gardens: Science and Colonial Expansion* (New York: Academic Press, 1979).



its dissemination of scientific information, and its practical activities, which included plant smuggling, ... played a major part in the development of several highly profitable and strategically important plant based industries in the tropical colonies. These new plantation crops complemented Britain's home industries to form a comprehensive system of energy extraction and commodity exchange which for a time, in the nineteenth and early twentieth century, made Britain the world's superpower.<sup>24</sup>

The motto and rationale of this syndrome of "organized plant raiding" was "aiding the mother country with anything that is useful in the vegetable Kingdom."<sup>25</sup> As most economically advanced industrial nations remain relatively resource poor in relation to plant plasm resources (in part due to the last ice age), they depend heavily on plant genetic resources and cultigens from tropical regions. The bulk of plant genetic resources reside in the Third World and global forays for seeds have targeted the Third World as a source of new types and exotic varieties. As in many industries, it is poor countries which possess the resources, plant genes, and it is the rich ones which have the capital and technology to use them.

The poor countries desperately need the product and the improved crop; with increasing awareness they have tried to resist giving away freely valuable resources to visiting seed collectors. The grievance at the FAO in Rome on the part of the underdeveloped countries was, as McKenzie points out: "We give them our plants, then they sell the (hybrid) seed back to us."<sup>26</sup> The rubber plant was taken from Brazil and the cinchona from the Andes region against national laws (for the purpose of commercial exploitation elsewhere). The rationale on the part of the industrialized countries for this kind of theft was genetic conservation. But whereas a century ago, the effort was to identify commercially useful plants and transfer them around the world, today the need is to identify and transfer genetic materials, germ plasm, and gene complexes globally. Thus, botanical imperialism had shifted by the end of the 19th century from plant raids to the diffusion of plant genetic information around the world.

### Colonial Stewardship and Western Property Rights

In order to understand how colonial appropriations of plant cultigens have been legitimized, it is useful to look at the philosophical and ideological underpinnings of Western notions of property rights.

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24. *Ibid.*, p. 6.

25. "Gin and Tonic...", p. 18.

26. "Seeds of Conflict...", p. 870.

Historically, pedigree was recognized in custom and law, and people were given rewards for husbandry of plants and animals. The modern tendency among some plant breeders to downgrade the historical contributions of "Third World" producers is not accidental. The definite mass of congealed labor time of plant cultivars (which constitutes its value) is concealed in the commodity form. As the value of the commodity form is only realized in exchange, the labor input loses its relevance. The historical contribution of the producer disappears behind the ideological veil of fetishist exchange relationships.

The notion of "stewardship" thus became an ideological form and the means to legitimate the translocation, storage, and control of plant genetic resources. For example, "stewardship" was used in the transfer of the cinchona plant so the British colonialists could apologetically argue that it was necessary to save the cinchona trees from extinction because of over-cutting and wasteful practices in the Andes.<sup>27</sup> Similar arguments have been used to justify the monopoly control of the international seed industry by transnational corporations.

The idea that the transfer and commercialization of such crops as rubber, quinine, and sisal was of benefit to all concerned ignores the uneven division of the rewards from such transfers.

When the British East India Company brought tea plants from China to be raised in Ceylon's plantations and achieved a world-wide monopoly in its production, the host economy, Ceylon, benefited little from the economic exploitation of the crop as the surplus generated for the most part accrued as profits to metropolitan interests. Ceylon today remains torn by open conflict between the Sinhalese (who lost a large amount of their village common land to the planters at the end of last century) and the Tamil plantation proletariat (who were imported under colonial rule from southern India to work in Ceylon's labor intensive tea cultivations).<sup>28</sup> There are many similar examples: American banana plantations in South America and the sugar cane plantations in the West Indies and Fiji.<sup>29</sup>

The "stewardship" over genetic resources, either as 19th century plant transfers or 20th century conservation of genetic resources in gene banks, was

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27. *The Role of the British*, p. 111.

28. *Europe and the People*, pp. 339, 340.

29. *Ibid.*, pp. 324, 325, 333-334; and Sidney Mintz, *Sweetness and Power: The Place of Sugar in Modern History* (New York: Viking Penguin, 1985), pp. 74-186.

The South American writer Garcia Marquez, who synthesized the experience of several settlements of Columbian banana cultivators in his portrayal in the novel *One Hundred Years of Solitude*, poignantly describes some of the changes wrought by plantation wage-labor in the life of the local population.

legitimized by appeals to altruism. Its apologists in part labored under the ideological self-delusion of altruism. Like other aspects of imperialism, however, plant transfers were carried out for the benefit of metropolitan countries, and the benefits which accrued to non-Europeans were very unequally distributed.

Industrialized countries are now gene importers, while Third World countries are gene exporters. This means that the poor (in peripheral regions) of the world are being asked to donate the raw materials of a major industry to the rich (metropolitan countries) of the world, and to do that for free. Because of this, developed countries have proposed a concept of "common heritage."<sup>30</sup>

[Seed companies insist that germ plasm is, and ought to remain, a "common heritage" (and therefore be seen as valueless), while Third World nations seek futilely to attach a price to centuries of value added by primitive agriculturists and peasant farmers. The irony, of course is that the concept of "common heritage" was anathema to U.S. companies before the development of hybrid seeds...<sup>31</sup>

Despite efforts to claim property rights for the raw materials, Third World nations, lacking the financial resources and technical expertise for collecting, conserving or processing plant genetic resources, find themselves systematically deprived of these resources.

Third World governments and plant breeders who "historically" provided the genetic material in the past, as Mooney notes, "will be the last to receive, or be able to afford, whatever genetic material remains to be traded."<sup>32</sup> They have little success in acquiring political leverage or economic rents from the germ plasm gathered within their boundaries.

"In a classical example of the Marxian concept of 'unequal exchange,' claims about the value of these raw materials have thus far been stalemated by the alleged value added by seed companies."<sup>33</sup> For the seed and petrochemical companies in developed countries, the stewardship of genetic resources and cost-free import of "common heritage" plant plasm from the underdeveloped world for the improvement of their commercial crops is lucrative business.

Barley and gene plant material (resistant against *gelbverzwergungs virus*), as *Der Spiegel* notes, is imported cost-free from Turkey and saves American farmers an estimated US\$ 150 million annually in the prevention of spoiled

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30. Robert Thomas, "Germ Plasm as Property," book review on Jack Kloppenburg, *First the Seed: The Political Economy of Plant Bio-Technology* (New York: Cambridge University Press, 1988), *Science*, Vol.20 No.1 (1989):412-413.

31. *Ibid.*

32. *Seeds of the Earth*, p. 74.

33. "Germ Plasm..."



harvests.<sup>34</sup> American agrarian economists estimated that the cost-free importation of plant plasm from underdeveloped countries has meant profits or savings of some US\$ 66 billion in the US alone.<sup>35</sup> Ethical attitudes in the use of plant genetic resources have been slow to develop, since developed countries have given little thought to the loss sustained by the country of origin of the plant.

### **Hybrids, Petrochemical Monopolies, and Underdevelopment**

"Hybridization" proved to be a powerful tool in transforming a free good into a commodity. Hybridization held two significant attractions: (1) it produced dramatic, sustainable increases in yield, and (2) it represented "a mechanism for circumventing the biological barrier that the seed had presented to the penetration of plant-breeding and seed-production by private enterprise."<sup>36</sup> Hybrid seeds cannot be saved and replanted without considerable reduction in yield, so farmers who use hybrid seeds are forced to go back to the market each season to replenish their supply.

The change and relocation of selective breeding from individual growers to bio-laboratories helped pass control from the farmers to the seed company, and with it went a significant leverage over credit, finance, and other critical factors of production. The impact of hybridization was magnified by the simultaneous increase in reliance on chemicals and capital equipment, leading to a profound restructuring of the agricultural economies also in the Third World and allowing the US and the European seed industries to cement their domination of the world seed market.

Therefore, the main characteristic of the food and agro-industry is the constant striving towards horizontal and vertical (monopolistic) integration in the pursuit for control of the various economic spheres. This drive towards monopolistic control over the agricultural sector is manifested in the petrochemical industry with the marketing of bio-technical hybrid seed "packages," i.e., of hybrid seeds with inbred biases towards high dependency on various fungicides, herbicides, or pesticides and fertilizers. Control of seeds and inputs means control of the entire food system: what crops will be grown, what inputs (fertilizers, pesticides, fungicides, and herbicides) will be used, and where the inputs will be sold.

The aim of the strategy of the seed industry is to combine the sale of seeds as closely as possible with the "blessings" ("products") of the petrochemical

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34. Rudolf Augstein, "Irgentwann gibt es ein Patent für Brot," *Der Spiegel*, Nr. 21 (1989), p. 239.

35. *Ibid.*

36. *First the Seed*, p. 93.

industry. The company that offers high-yield varieties thus can simultaneously raise the use of pesticides, provided both are sold as a "package." International agro-business began controlling the "seed end" of the green revolution fairly early, closely followed by monopolistic aspirations and an increasingly intricate control over this food sector by the petrochemical industry. The seed industry, as Mooney notes, "has been the fastest growing and most profitable industry in the food chain."<sup>37</sup> The groundwork for the global seed industry was laid by the green revolution.

For many years, the petrochemical industry has been aware of the key position of the seed markets, and has begun buying up hundreds of enterprises in the plant genetic engineering industry throughout the world since the 1970s. The Swiss petrochemical conglomerate Sandoz, for example, rose within a few years to become the second largest seed producer in the world, closely followed by Ciba-Geigy, the oil multinational Shell, and the British company ICI.<sup>38</sup> The Frankfurt petrochemical giant Hoechst bought up KWS (Kleinwanzlebener Saatzucht) which, with annual sales of DM 230 million, ranks 11th among the world's seed multinationals.<sup>39</sup>

Developments in gene technology provided the petrochemical industry the foreseeable hit of the 1990s: plants made resistant to the "total poison" (or "Totalgift") which ties farmers closer to their respective petrochemical suppliers.<sup>40</sup> Chemicals with sonorous names such as "Roundup" (Mosanto) or "Basta" (Hoechst) kill all weeds and plants except the specifically developed, resistant hybrids, saving the farmers much of the work associated with the previous generation of crops and herbicides. On the basis of these developments, farmers now only need to spray the "Totalgift" provided they also use the correlate hybrids of the same company.

Many of the large chemical corporations engaged in military production are the same companies who produce chemicals for agribusiness or support genetic engineering, plant patents, and other negative practices which especially exploit people in the Third World.<sup>41</sup> Universities are instrumental (via funding and faculty links) in the perpetuation of these practices and interests.<sup>42</sup> They represent in part the instrumentarium and backbone of contemporary botanical imperialism par excellence.

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37. *Seeds of the Earth*, p. 47.

38. "Irgentwann...", p. 235.

39. *Ibid.*

40. *Ibid.*

41. Boris Frankel, *The Post-Industrial Utopians* (Oxford: Polity Press, 1987), p. 134.

42. Jonathan Feldman, "Agrochemical Companies: From Napalm in Vietnam to Pesticide Poisoning in Central America," in *Universities in the Business of Repression: Academic Military Industrial Complex and Central America* (Boston: South End Press, 1989), pp. 39-72.



With the advent of hybridization and increasingly capital-intensive breeding techniques since World War II, Third World nations have found their own genetic resources, albeit transformed by plant breeders, confronting them as commodities. This pattern, as Kloppenburg notes, "has been seen as doubly inequitable because the commercial varieties purveyed by the seed trade have been developed out of germ plasm initially obtained free from the Third World."<sup>43</sup> This loss of control over resources lies at the heart of most of the controversy over preservation and use of plant genetic resources. The hotly debated question as asked during meetings at the FAO remains: "Who owns the world's store of plant genes? The countries in which the plants grow? The international corporations that crossbreed them for new varieties? Or 'the peoples of the world,' as represented by whatever group that claims to speak for this amorphous body?"<sup>44</sup>

In sum, before Western expansion, tropical plant cultigens supplied the existential means and sustenance of many diverse indigenous civilizations and peoples in the tropics. With the advent of European expansion, many of such plant cultigens entered large scale international commerce, on terms favorable to Europeans. The network of colonial-market relations emanating from the West has penetrated all societies, binding colonized to colonizers, and remains intact today. As both legacy and historical process, this "network of relations" represents a classical example of unequal exchange, whereby human value in the form of underpaid labor, and bio-energy in the form of plant genetic resources are extracted by the core from the periphery of the world system. Although many attempts have been made to reverse these global practices of destruction and misuse of plant plasm resources, little progress has been made.

### **Species Extinction and Environmental Destruction**

Beneath the political issues over monopolistic control of plant genetic resources lurks the important problem of species extinction. Plant breeding, like all other evolutions, is dependent on variation. The lesson in breeding crops and livestock is that domestication inevitably involves a narrowing of the genetic base. Among the genetic determinants that are soon to be lost are those controlling disease resistance and adaption to marginal environments. The structural trend towards ever larger units in capitalist agriculture (so-called "landmining") and the associated increase in the use of petrochemical produce are highly problematic and have grave ecological consequences.

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43. *First the Seed*, p. 171.

44. William Tucker, "Seeds of Discord: The UN and Scientists Clash over Control of Plant Genes," *Barrons*, 64 (Jul. 30, 1984):26.



The increase of monopolistic control over the international seed industry is but one aspect of a complex of problems in modern agriculture. The purposive-rational, profit-driven use of plant genetic resources threatens the well-being of the ecological heritage of the globe. The masses of agricultural producers in the Third World are impoverished and displaced from the countryside, leaving them at the mercy of commercial, industrial, and petrochemical corporations. In addition, there is the destruction of the soils, the leaving of highly toxic residues in food and water, and hence the destruction of whatever there remains of *kulturlandschaft* (ecologically productive, "cultivated" landscape or "commons").

The character of the ecosystem has been dramatically changed since the beginning of the dual Industrial Revolution. The growth rates and change of global political economies and populations during the twentieth century have been exponential. We are living in the most significant period of plant destruction in the history of the planet; with the rates of extinction during a modern human lifetime being some ten thousand times higher than evolutionary average; this amounts to the largest extinction event since the disappearance of dinosaurs. We are obliterating species far faster than they can evolve. Evolution takes thousands and sometimes millions of years but this current destruction, in some cases, occurs in less than decades.

Species extinction, a result of global habitat destruction, at present occurs at rates, and has reached a point, that threatens evolution; it threatens to destroy the global ecology and niche of the human species beyond repair. Fisheries collapse, forests disappear, grasslands are converted into barren wastelands, and croplands deteriorate at alarming if not catastrophic proportions. "About 70,000 hectares of forests are being cleared each day amounting to the astounding ten million hectares a year -- equal to the area of the British Isles."<sup>45</sup> Global top soil losses according to the Worldwatch Institute amounts to approximately 24 billion tons a year.<sup>46</sup> Some 35% of the earth's land surface (on which about one fifth of the world's population depends for its livelihood) is threatened with desertification according to reports of the United Nations Environment Program (UNEP). The process of destruction of the world's environment and ecosphere is fueled by a global economy that has expanded some 4% per year or 50% this century<sup>47</sup> and by a world population that has increased four-fold during that same period.<sup>48</sup>

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45. Harold Koopowitz, *Plant Extinction: A Global Crisis* (Washington: Stone Wall Press, 1984), p. 79.

46. Lester Brown, "The Global Economic Prospect: New Sources of Stress," *World Watch Paper*, No. 20 (Washington: World Watch Institute, 1978), p. 3.

47. *Ibid.*, p. 30.

48. The global population has been estimated to increase at a likely annual average of 96 million during the 1990s. ("The Global Economic Prospect...," p. 11.)

If the current rate of decimation of the world's vegetation is sustained, we stand to lose about one-third of the three million organisms within the next twenty years. One third of all the different organisms in the tropics alone (both plants and animals), conservatively estimated at about one million species, are likely to become extinct by the end of the century. This is as many species as those that occur in the Amazon forest, the largest single gene pool in the world.<sup>49</sup>

### **Overproduction and Underdevelopment**

In this respect, although modern agronomies may be highly efficient and productive in terms of immediate outputs and profits, they have resulted in disastrous consequences. The terrible truth is that most modern affluent nations have participated and shared for several decades in the Western world's net importation of proteins from the undernourished (and frequently starving) Third World. Cash crop production in underdeveloped countries has led millions of Third World people to go hungry, because subsistence crops are sacrificed for the sake of exporting high protein foods to the affluent Western countries. As the geographer and food scientist George Borgstrom noted more than two decades ago:

Through oil seeds (peanuts, palm kernels, copra, etc.), oilseed products and fishmeal, the western world is currently acquiring from the hungry world one million metric tons more protein than is delivered to the hungry world through grain. In other words, the western world is exchanging approximately three million metric tons of cereal protein for four million metric tons of other proteins which are superior in nutritional aspects.

Thus it is ironic that while millions of Third World people die of hunger every year, people in the affluent Western countries are dying prematurely from (meat-) rich "refined" diets.

This irrational form of global agronomic production on the other hand displaces Third World subsistence crops, while on the other hand contributing to overproduction in metropolitan areas (exemplified by butter, milk, and meat mountains in the European Common Market [EEC]). Augstein notes that in 1985 one could find in the storage rooms of the EEC some 16 million tons of surplus cereal grains, more than one million tons of butter, 870,000 tons of beef, 520,000 tons of milk powder, 60,000 tons of olive oil, and 5,000 tons of pork.<sup>50</sup> The annual costs of storage alone were estimated to be DM3.2 billion. Hence the profit-driven frenzy of modern agriculture has produced mass waste, mass poverty, and mass destruction on a global scale.

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49. "The World's Demising..." p. 19.

50. "Landwirtschaft..." p. 90.

Agriculture has been humanity's worst activity cross-historically from the point of view of maintaining a stable environment. Modern agronomic practices present themselves in total as a global disaster, and produce "almost only losers."<sup>51</sup>

On the one hand, overproduction and "landmining" practices in the agricultural sectors of Western industrialized countries are heavily subsidized, benefitting mostly the large-scale "agro-factories/agro-business houses," the petrochemical industry, and the agro-machinery industry, while costing Western taxpayers and consumers an absurd sum estimated at US\$120 billion dollars annually.<sup>52</sup> On the other hand, overproduction led to the dumping of expensive foodstuffs into underdeveloped countries, destroying their fragile agronomic structures, displacing local agricultural products from local markets, and forcing the impoverished agricultural producers into the slums of the cities. As a result the capacity of underdeveloped countries to produce their own foods, their weapon against starvation, continues to decline and their dependence on food imports from the metropolitan countries increases.

None of the metropolitan countries is willing to take the first step to alter this irrational system of global agricultural production. Each metropolitan country, region or business fears the competition could reduce profit, thereupon rendering their production more expensive and less feasible or profitable. Trade barriers rise, while each Western conglomerate or agribusiness producer watches the other mistrustfully, with any minor and banal occasion having the potential to set off trade wars (e.g., the US unsuccessfully pressuring the EEC to liberalize its laws in order to allow the import of hormone-fed American beef during the mid-eighties).

The ways by which modern civilization produces its foods and livelihood produces nothing but vexation, enmity, and destruction. This grotesque and chaotic state of affairs of modern agronomy and plant use, where people are dominated by the exchange principle, by the commodity form, and by its abstraction, money, can be seen as analogous to the theme of Dukas's scherzo *The Sorcerer's Apprentice*, where the brooms "take over" and create

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51. *Ibid.*

52. *Ibid.*, p. 71.



disaster by drawing water from a seemingly endless well after the apprentice forgot the appropriate spell.<sup>53</sup>

### Conclusion

The world is faced with a multiplicity of crises. Humanity no longer even confronts its environment: it is itself virtually part of the environment to be protected. As Mitscherlich notes, "Insofar as manipulation of the environment succeeds, there simultaneously succeeds a manipulation of man, who himself becomes an object of manipulation; that is to say, simple environment."<sup>54</sup>

The inexorable erosion of the capacity of the natural environment to support life, however, poses a threat that potentially undercuts all other constructive efforts of crisis resolution. It is the paradox of botanical imperialism that it destroys the very basis upon which it is built. Year by year, vast quantities of land races, cultigens, and their wild relatives die out and become extinct as they are displaced by high-yield, petrochemical-dependent, monocrop varieties.

As the above discussion has shown, the appropriation, control, and socio-economic use of plant genetic resources (botanical imperialism) is not simply a scientific or technical problem but a political and economic problem that requires a political solution. Without altering existing unequal relationships between the developed and underdeveloped countries, i.e., without fundamental changes in global economic relations, and without fundamental changes of current agronomic practice, developed nations will end up making short term gains that will ultimately be seen as having been very poor judgments.

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53. Paul Dukas, "The Sorcerer's Apprentice," *Kalmus Miniature Orchestra Scores*, No. 65 (New York: KOC, 1933).

Lucion's tale (based on Goethe's poem *Der Zauberlehrling*, derived from Lucion's *The Lie-Fancier*; later taken up and ingeniously illustrated in a Walt Disney animation) relates the story of a sorcerer's apprentice, "who, in his master's absence, invokes the magic formula, which starts the broom fetching water to fill the pots and pans; however, he cannot remember the mystical word which will stop the broom; in panic he splits the broom with an axe and now, to his horror, there are two bringing water, soon the house is afloat. At this point the sorcerer arrives, rescues the frightened apprentice, and stops the broom." ("The Sorcerer's Apprentice," p. 2) This theme was also taken up in Mozart's opera *Die Zauberflöte* (*The Magic Flute*), where Papageno is given magic bells and the hero is given a flute.

54. Jean Baudrillard, *For a Critique of the Political Economy of the Sign* (St. Louis: Telos Press, 1981), p. 202.