Gender Relations, Political Economy, and the Ecological Consequences of State-Socialist Soil Science*

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1. Introduction

Departing little from those of liberal democratic regimes, environmental practices under state-socialism proved to be considerably damaging from an ecological perspective. Using Hungary as a case study, I analyze the reasons for the failure of state-socialism to resolve the antagonism between industrialization (relations and forces of production) and ecological sustainability (the conditions of production and reproduction). To do so, I concentrate on the evolution of soil science from the inception of state-socialism in 1948 to its decline in the late 1980s. This historical development of scientific practice is associated with a recurrence of soil degradation that can be explained by the intersection of soil science with male-centered farming and with wider political economic relations. Ultimately, state-socialism exacerbated the problems associated with gender inequality, the commodification of the rest of nature, state-building, and industrial productivism ("modernization") in a global context of inter-imperial struggle, rather than creating the conditions for greater social equality, global solidarity, ecological awareness, and the prioritization of use value. These social processes resulted in the persistence of environmental degradation, such as soil erosion and acidification.

The promise of a socialist society characterized by a more rational use of resources and social equality became in fact a largely illusory affair already by the 1950s, thanks to the Stalinist regime. Nevertheless, there was great optimism in scientific circles regarding the possibility of improving upon the faults of bourgeois society. In 1952, Zoltán Fekete included the following rhetorical question in his

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opening remarks to an introductory soil science textbook: "Why was the older form of soil science unable to direct agriculture?"[1] For Fekete and other prominent soil scientists, it was the previous fragmentation of soil science in Hungary that had impeded the rational use of soils. The foremost task under the new regime would therefore be the unification of disparate branches of soil science so as to achieve the complete scientific management of agriculture. This managerial view of nature was intrinsic to the socialist improvement of pre-existing soil conservation measures. It formed part of the socialist triumphalism of the period, much like democratic transition and free-market rhetoric imbue current economic and political discourse.

There was some justification for the optimism expressed by Fekete. Throughout the socialist period in Hungary, soil scientists were at the forefront of environmental concerns regarding soil degradation. Soil conservation measures were expanded and applied as never before.[2] For instance, the basis of current soil conservation largely derives from a law passed by the Hungarian Socialist Workers' Party in 1961, during the 11th Party Congress. According to agricultural policy, it was obligatory for co-operative and state farms to sample their parcels annually for soil quality control. Since the systemic change of 1989-1990, this extensive monitoring system has been reduced as a result of land privatization and the contraction of funding for agronomic extension agencies. Nevertheless, the many writings, policies, and measures devoted to address the problem managed to accomplish mixed

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[1]Z. Fekete, *Talajtan [Soil Science]* (Budapest: Mez-gazdasági Kiadó, 1952), p. 11, my translation. See also P. Stefanovits, *Magyarország talajai [The Soils of Hungary]* (Budapest: Akadémiai Kiadó, 1956).

[2]See T. Bakács, *Magyar Környezetjog [Hungarian Environmental Law]* (Budapest: Springer-Verlag, 1992); M. Bánki, "The Place of Legislation on the Protection of the Environment Within the Hungarian Legal System" in A. Tamás and D. Lodner, eds., *Environmental Control and Policy* (Pécs: Centre for Regional Studies, Hungarian Academy of Science, 1988); D. Lodner, "The Legal Regulation of Nature Conservation in the Hungarian People's Republic, with Special Regard to the Conservation Areas" in *ibid.*; K. Pickvance, *Democracy and Environmental Movements in Eastern Europe: A Comparative Study of Hungary and Russia* (Boulder: Westview Press, 1998); G. Szendrei, *Talajtan [Soil Science]* (Budapest: ELTE Eötvös Kiadó, 1998).

[3]Zsuzsa Gille has found similar patterns, though much more environmentally destructive, with regards to the treatment and conceptualization of waste in Hungary during state-socialism, with

results.[3] To this day, soil erosion and acidification problems continue, while salinization has been reduced, but not resolved.[4]

Liberal democratic systems have not performed much better. According to Pimentel et al., roughly 4 X 10^9 tons of soil are eroded away each year from US cropland, while the situation in Western Europe is replete with examples of soil erosion, contamination, and acidification.[5] These relative failures under both state socialist and liberal democratic systems beckon a critical reassessment of the conservationist aims of soil science. The appraisal that follows pertains mainly to state-socialism in Hungary, but it could be extended in a moderately different yet equally vigorous form to capitalist societies as well.

Such a reassessment can proceed fruitfully by placing scientific practices in their social context and by analyzing the scientific discourse (what is said, omitted, institutionalized) about an object of study (in this case soils) according to its concrete basis in social relations and prevailing economic structure. By doing this, one can see the sources of contradiction between stated scientific intentions and actual outcomes. As has been amply demonstrated by numerous scholars, science is a social practice informed by prevailing norms and assumptions. It is, as any perspective, a partial view of the world that advances through

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practices and conceptual shifts correlating with the changing form and level of integration of state-socialism into the capitalist world-system. See Z. Gille, "Wastelands in Transition: Forms and Concepts of Waste in Hungary since 1948" in W.L. Goldfrank, D. Goodman, and A. Szasz, *Ecology and the World-System* (Westport, CT: Greenwood Press, 1999). See also J. Böröcz, "Dual Dependency and Property Vacuum: Social Change on the State Socialist Semiperiphery," *Theory and Society*, 21, 1992.

[4]G. Várallyay, "Soil Quality and Land Use" in D. Hinrichsen and Gy. Enyedi, eds., *State of the Hungarian Environment* (Budapest: Hungarian Academy of Sciences, 1991).

[5]D. Pimentel, C. Harvey, P. Resosuddarmo, K. Sinclair, D. Kurz, M. McNair, S. Crist, L. Shpritz, L. Fitton, R. Saffouri, and R. Blair, "Environmental and Economic Costs of Soil Erosion and Conservation Benefits," *Science*, 267, January, 1995; N. Boatman, C. Stoate, R. Gooch, C. Rio Carvalho, R. Borralho, G. de Snoo, and P. Eden, *The Environmental Impact of Arable Crop Production in the European Union: Practical Options for Improvement*, http://europa.eu.int/comm/environment/agriculture/pdf/arable.pdf, pp. 27-29 (consulted April 5, 2002). See also A. Sensi, "Agriculture and Environment: Agriculture and Acidification," http://europa.eu.int/comm/agriculture/envir/report/en/acid_en/report.htm (consulted April 5, 2002).

encounter and dialogue with perspectives beyond its own.[6] It is therefore unexceptional that soil science should be likewise imbricated within the convolutions of political economic and cultural processes.

What might be surprising is the banality with which soil science complied and continues to comply with the directives of a ruling elite and the trajectory of the prevailing social system. In practice, soil science was dictated by an androcentric market-oriented farming system in a context of global capitalism in which the socialist state not only participated but also contributed effectively to foreclose alternative forms of agriculture. Soil science represented masculinized state interests in commodifying and expanding production for capital accumulation, which enhanced the centralization of power, enabled debt repayment, and fulfilled the demands of developing a military-industrial complex contributing to the geopolitical strategies of the Soviet state. Although arguably most state-socialist regimes in eastern Europe engaged in these activities, the Hungarian context departed significantly from the prevailing political economic configurations in the region. This peculiarity rested fundamentally on the gradual market-oriented reforms following the unsuccessful revolt of 1956 and on the dual dependency between a technocratic elite, supported by the increasing ties established with capitalist powers, and political elites, maintained through the regional hegemony of the USSR.[7] The farming sector constituted a crucial testing ground for these economic reforms and gender relations were central to the ensuing commodification process in agriculture through the reproduction of the pre-socialist externalization of primarily women's subsistence use of soils. For instance, soil scientists ignored women-controlled subsistence plots until they and women's unpaid labor were integrated into lucrative male-controlled, small-scale farming ventures, which were rendered possible by the 1968 reforms.

Given these findings, I argue that Hungarian state-socialism, rather than provide an alternative form of development, actually exacerbated and sometimes introduced environmentally destructive forms of production. The reason for this relates to the state's prioritizing the capitalization and industrialization of farming for the purpose of

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[6]See D. Demeritt, "Science, Social Constructivism and Nature" in B. Braun and N. Castree, *Remaking Reality: Nature at the Millennium* (New York: Routledge, 1998); D. Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991); B. Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge: Harvard University Press, 1999).

[7]J. Böröcz, 1992, *op. cit.*

centralized capital accumulation and redistribution. Soil science, as in the case of capitalist states, was subordinated to capital accumulation and patriarchal relations through an allegiance to gender-biased market-oriented agriculture. It therefore reinforced pre-existing gender relations based on productivism and male control over large-scale and profit-oriented farming, while promoting ever more destructive environmental practices through an insistence on increasing productivity at any environmental cost. The eminent failures of Hungarian state-socialist environmental practices and those of its scientific entourage suggest that the achievement of ecosocialism requires the overhaul of an entire social system, including the state, so as to redirect scientific practice towards more constructive ends. Furthermore, as world-system pressures (debt relations, trade-based capital accumulation, etc.) promote soil-degrading farming practices, there must be a concerted struggle towards a global egalitarian order that improves upon and supersedes both capitalism and the system of national states that supports it.

2. Capitalism and State-Socialism: Divergent and Convergent Tendencies

In order to grasp the lessons of state-socialism, some of the basic system-specific characteristics require elaboration relative to capitalism. It is nevertheless the case that differences between capitalism and state-socialism have been exaggerated thanks to Cold War tensions and rhetoric stemming from the propagandistic and military organs of both the Soviet and American empires. Much theoretical and empirical effort has been devoted to counter the misconceptions pervading lay and academic spheres alike regarding the nature of state-socialism. Many have stressed the detrimental role of the state itself, inter-statal competition, global market processes, and the resulting quasi-marketization of state-socialist systems, especially from the 1960s onwards.[8] Most of this work has unfortunately ignored the issue of

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[8]See A. Berkman, *Bolshevik Myth* (London: Pluto Press, 1989); A. Cervetto, "Tesi sullo Sviluppo Imperialistico, Durata della Fase Controrivoluzionaria e Sviluppo del Partito di Classe [A thesis on the development of imperialism, the duration of the counter-revolutionary phase, and the development of a working-class party]," *Bollettino Interno della Sinistra Comunista*, November, 1957; C. Chase-Dunn, *Socialist States in the World-System* (Beverly Hills: Sage, 1982); M. Lampland, *The Object of Labor: Commodification in Socialist Hungary* (Chicago: University of Chicago Press, 1995); M. Mies, *Patriarchy and Accumulation on a World Scale: Women in the International Division of Labour* (London: Zed Books, 1986); C. Tilly, *Coercion, Capital, and European States, AD 990-1992* (Cambridge: Basil Blackwell, 1992); I. Wallerstein, *The Capitalist World-*

environmental problems under both political economic systems and how each system is causally related to them.

From an environmentalist point of view, there are many similarities in both practices and outcomes between state-socialism and capitalism. Arran Gare has provided a fruitful framework of analysis to explain the destructive relationship between both capitalist and state-socialist systems and the rest of nature.[9] Pavlínek and Pickles have recently attempted to resolve the problem of comparativity by highlighting the ways in which state-socialist systems emulated their capitalist counterparts in order to gain popular legitimacy through economic advances, and thereby adopted a productivist rationality that resulted in environmental degradation.[10] What emerges from the results of this scholarly work is that both systems have engendered environmental devastation and both treat environmental problems as externalities until they cut into productivity.

Realizing the convergence between two systems, however, does not entail their commensurability. While state-socialist systems were hardly insulated from international market processes and inter-imperial competition, it is also true that such systems were not equivalent to capitalist states. Although the wage-form of labor was actually expanded under state-socialism, the right to, and economic importance of, private property, basic foundations of capitalism, were drastically curtailed under state-socialism.[11] Price fluctuations were radically restricted relative to subsidized pricing. Arguments posed regarding the capitalist nature of state-socialism cannot hold without denying the occurrence of large-scale systemic institutional changes since 1990.

Economy: Essays (Cambridge: Cambridge University Press, 1979). For a general review, see also I. Szelényi, K. Beckett, and L.P. King, "The Socialist Economic System" in N.J. Smelser and R. Swedberg, *The Handbook of Economic Sociology* (Princeton: Princeton University Press, 1994).

[9]See A. Gare, this issue of *CNS*, as well as his earlier work, *Beyond European Civilization: Marxism, Process Philosophy and the Environment* (Bungendore, Australia: Eco-logical Press, 1993).

[10]P. Pavlínek and J. Pickles, *Environmental Transitions: Transformation and Ecological Defense in Central and Eastern Europe* (New York: Routledge, 2000), p. 25.

[11]P. Marcuse, "Privatization and its Discontents: Property Rights in Land and Housing in the Transition in Eastern Europe" in G. Andrusz, M. Harloe, and I. Szelényi, *Cities after Socialism: Urban and Regional Changes and Conflict in Post-Socialist Societies* (Oxford: Blackwell Publishers, 1996).

Similarly, the pressures putatively exerted on the state-socialist systems through inter-state competition do not suffice to explain environmental degradation and a lack of environmental policy enforcement. These were still decided within state-socialist institutions that prioritized environmentally destructive development strategies as a result of their lack of concern for the fundamental material interconnections between humans and the rest of nature that, ironically, Marx lucidly recognized.[12] Their deleterious consequences must also be traced to a dearth of restraint on state activities owing to severe restrictions on public participation and a common Neoplatonic and mechanistic ideology.[13] It is in this light that the development of state-socialist soil science in Hungary should be understood, with its gendered allegiance to conventional agriculture, its masculinist externalization of subsistence work, its conflation of natural wealth with value, and its treatment of soils in general as bearers of capital for economic expansion.

These basic differences between the two systems denote a succession from early industrial capitalism to state-socialism to the current phase of capitalism. The succession undermines any model of development that sees societies progress linearly from one stage to another.[14] In this connection, it is instructive to consider and reject Lenin's rigid interpretation of history, based on a stage-theory of development:

> We expected — or perhaps it would be truer to say that we presumed without having given it adequate consideration — to be able to organise the state production and the state distribution of products on communist lines in a small-peasant country directly as ordered by the proletarian state. Experience has proved that we were wrong. It appears that a number of transitional stages were necessary — state capitalism and socialism — in order to *prepare* — to

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[12]See N. Smith, *Uneven Development: Nature, Capital and the Production of Space* (Oxford: Basil Blackwell, 1984); J.B. Foster, *Marx's Ecology: Materialism and Nature* (New York: Monthly Review Press, 2000).

[13]See A. Gare, *Postmodernism and the Environmental Crisis* (New York: Routledge, 1995); B. Jancar, *Environmental Management in the Soviet Union and Yugoslavia: Structure and Regulation in the Federal Communist States* (Durham, NC: Duke University Press, 1987); R.J. Johnston, *Environmental Problems: Nature, Economy and State* (London: Belhaven Press, 1989); K. Pickvance, *op. cit.*

[14]I am indebted to József Böröcz for this insight.

> prepare by many years of effort — for the transition to communism. Not directly relying on enthusiasm, but aided by the enthusiasm engendered by the great revolution, and on the basis of personal interest, personal incentive and business principles, we must first set to work in this small peasant country to build solid gangways to socialism by way of state capitalism. Otherwise we shall never get to communism, we shall never bring scores of millions of people to communism. That is what experience, the objective course of the development of the revolution, has taught us.[15]

Such analytical closure precludes any alternative vision of progress without incurring the charge of political deviation (or, worse, reactionary sabotage). Indeed, such was the case for many who dared impede this narrow view of progress, as Arran Gare and John Bellamy Foster have demonstrated.[16] The accompanying state-centered developmentalist perspective played a major role in the increasing subordination of environmental concerns to the "objective" needs of the Soviet economy even prior to Stalinism and concerns over gender inequalities in the realm of unpaid work never emerged. The subsequent establishment of state-socialism in eastern European countries by and large followed the androcentric industrial development path dictated by the Stalin-led Bolshevik elite. This subsumptive process and stage-theory of development deeply affected both gender relations and soil science practice in Hungary so that agriculture was increasingly reduced to a male-dominated generator of capital to be centrally reinvested into the manufacturing sector.

3. The Gendered Commodification of Society and Soil Management

The confidence betrayed by those like Fekete who wished to unify soil science reflected the industrial and military priorities of state-socialist regimes and the increasing state repression of the peasantry that accompanied them in the early 1950s. During the Stalin-supported Mátyás Rákosi regime (1949-56), land was redistributed to formerly lower-status peasants, who were subjected to a policy of forced

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[15]These statements were made on the occasion of the Fourth Anniversary of the Russian Revolution of 1917. V.I. Lenin, *Collected Works: Vol. 33*, 4th English Edition (Moscow Progress Publishers, 1966), p. 58 (I am indebted to Federico Bonetto for alerting me to the above-quoted excerpt).

[16]See A. Gare in this issue of *CNS* and J.B. Foster, *op. cit.*

deliveries, reinforced by stiff prison sentences for those who did not fully comply. The discontent of the peasantry was compounded by state appropriation of landholdings for the sake of "collectivization" and by the intentional deflation of prices on farm products relative to manufactured goods. These policies clearly aimed at transmogrifying the peasantry into a supposedly more revolutionary proletarian force, facilitated by the expansion of industrial production and the wage system based on factory regimes. Ironically, the widespread discontent caused by the Rákosi regime extended to the proletariat as a whole, as workers began demanding greater shares of the surplus produced and as Soviet military occupation aided the fomenters of nationalism.[17] With Stalin's death, the Hungarian Workers' Party ousted Rákosi in favor of Imre Nagy, a politburo member and reformer who had previously suffered temporary demotion for his outspoken critiques of domestic economic policies. Tensions reached a peak by 1956, when worker and peasant revolts erupted in conjunction with the negation of the short-lived Nagy reforms. At that time, more than half of the "collective" farms dissolved. Throughout this convulsive period, women's farm labor continued to be treated largely as an economic externality, like social reproduction in general.[18]

In affinity with capitalist contexts, the process of proletarianization was accompanied by new gender differentiations in terms of economic and environmental practices simultaneously. These gendered shifts resulted from a combination of pre-existing rural gender relations and state-socialist development policies. Male prerogatives over the disposal of large-scale productive soils was buttressed by a gendered structure of control over land and other means of agricultural production. During the early 20th century, women mostly contributed to farming through subsistence production, which included the gathering of plants for thatch and linen production, as well as gardening.[19] Women working within the wage system served as manual farm laborers, maids, shop

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[17]See A. Anderson, *Hungary '56* (London: Solidarity, 1964); Lotta Comunista, *Ungheria 1956: Necessità di un Bilancio* (Milano: Edizioni Lotta Comunista, 1986).

[18]See I. Asztalos Morell, *Emancipation's Dead-End Road? Studies in the Formation and Development of the Hungarian Model for Agriculture and Gender (1956-1989)* (Stockholm: Elanders Gotab, 1999); J.H. Sas, *Életmód és Család: Az Emberi Viszonyok Alakulása a Családban [Lifestyle and the family: The formation of human relations in the family]* (Budapest: Akadémiai Kiadó, 1976).

[19]See also G. Kiss, *Ormányság* (Budapest: Sylvester R.T. Kiadása, 1937), pp. 66-68; J. Kodolányi, *Ormánság* (Budapest: Gondolat, 1960), p. 41.

assistants, and underpaid factory workers in textile and ceramic industries.[20] In contrast, men acquired their status in peasant hierarchy through land ownership and the fulfillment of the multifaceted aspects of the ideal of the "proper" peasant. The inheritance of the house and land was supplemented by an inheritance of kinship obligations and societal expectations. For men, these were constituted by self-reliance, independence (derived from property), prominence in village affairs, self-confidence, an ethic of hard work, and a complete loyalty to the preservation of family land. Within this ideal, the *gazda asszony* ("lady of the house") was to be a deferent spouse to the *gazda* (a peasant small-holder). She was socially expected to practice self-denial and act authoritatively in domestic affairs.[21]

Farming and gardening practices were characterized by a spatial division of labor. Women remained near the home to tend the garden and smaller domesticated animals (usually birds), while men traversed relatively longer distances to work their plots or to bring domesticated animals to pasture. Both subsistence and cash-crop agriculture consisted almost entirely of organic inputs without the aid of biocides. Synthetic fertilizers and biocides were available only to a few large estate owners, who could thereby produce sufficient surplus to engage in export activities thanks to the labor of landless peasants.[22]

In summary, prior to the implementation of state-socialist industrialization policies, biocides and mechanization were rarely employed on farms and gender differentiation entailed gender-based

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[20]See I. Fehér, *A Soknemzetiség-Baranya a 20. Században [The Multiethnicity of Baranya County in the 20th Century]* (Pécs: Pannónia Könyvek, 1995), pp. 9 and 21; Zs. Lengyel, *Mez-gazdaság, Szövetkezetek, Parasztság a Hetvenes Években [Agriculture, Cooperative Farms, and Peasantry in the 1970s]* (Budapest: Kossuth Könyvkiadó, 1982).

[21]See P.D. Bell, *Peasants in Socialist Transition: Life in a Collectivized Hungarian Village* (Berkeley: University of California Press, 1984); E. Fél and T. Hófer, *Proper Peasants: Traditional Life in a Hungarian Village* (Chicago: Aldine, 1969), pp. 379-382; M. Sozan, "The Pillar of Hungarian Society: The 'Good Peasant'" in S.B. Várdy and Á.H. Várdy, *Triumph in Adversity: Studies in Hungarian Civilization in Honor of Professor Ferenc Somogyi on the Occasion of his Eightieth Birthday* (New York: Columbia University Press, 1988).

[22]See B. Gonda, "A Kemizálás a Magyar Mez-gazdaság Fejlesztésében" [Chemicals in the Development Agriculture in Hungary], *Agrártörténeti Szemle*, 27, 1-2, 1985; B. Gunda, "Gathering of Wild Plants among the Hungarian People" *Acta Ethnographica,* 26, 1-2, 1977; B. Gunda and E. Ráduly, "The Use of Animal Manure in the Great Hungarian Plain" *Acta Ethnographica*, 24, 3-4, 1975; Kiss, *op. cit.*;

environmental practices. With the development schemes of the state-socialist regime and the eventual greater capitalization of farming by the 1970s, industrial proletarianization and the reconfiguration of farming meant a decrease in organic methods of farming for both subsistence or commercial purposes. The gender-based division between women's subsistence and men's large-scale farming was reinforced by state-socialist practices that involved larger salary gaps relative to other economic sectors (creating incentives for women workers to abandon paid farming altogether for better paid office jobs), greater agronomic education and preferential allocation of machinery operations to men, and the proscription on women's use of biocides. Other gender-differentiated environmental practices were modified by state-socialist industrialization as well. For instance, women's direct procurement of plant resources for household production declined along with the knowledge associated with those resources.[23] Masculinity was redefined according to position within party, and/or co-operative farm, hierarchy. Economic status turned towards a more socially encompassing monetary standard, such that farming men's higher worth was translated into higher salaries relative to those of farming women, rather than through land tenure.[24]

As agriculture increasingly involved commodity circulation, so soil scientists began to focus on soils as bearers of capital. Soil scientists increasingly represented soils as calculable parts of nature, existing for the purpose of maximizing state investment into an enlarging gendered industrial-military complex. With the establishment of state-socialist institutions, soil science became a more centralized, yet more ramified discipline. Having become fully integrated into the state, soil science bifurcated, as any bureaucratic organ, into theory-producing experimenting branches and theory-executing agronomic stations.[25] Soils occurring under ecosystems outside of agricultural contexts featured less prominently in scientific endeavors, while methodologically, soil scientists, a majority of whom were and remain male, continued to exclude largely women-run subsistence plots from the entire research agenda.

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[23]During fieldwork, I have found that some women have nevertheless retained a modicum of knowledge of medicinal plants, while Roma women and men, having been marginalized through racist state-socialist assimilation policies, have maintained a relatively high degree of botanical expertise regarding local flora. See also Fehér, *op. cit.*; M. Stewart, *The Time of the Gypsies* (Cambridge: Cambridge University Press, 1997).

[24]See Asztalos Morell, *op. cit.*

[25]Stefanovits, 1982, *op. cit.*, p. 6.

Soils came to be subjected to the conditions of valorization in an increasingly monetized regime of agricultural production. They were ultimately rendered manipulable by transforming them into calculable nature. This was attained through the mathematical refining of inputs and extractions calculated through commodity production and sale. Soil scientists began speaking of soil in economic terms, in sharp contrast to the earlier employment of organismal and anatomical metaphors.[26]

> We understand a soil economy as the total quantity of nutrients available in a soil, that is, its nutrient capital. If we were to extract total nutrients through acid reagents, then certain points of reference can already be gained regarding permanent production income. However, the data derived through chemical analysis do not inform us about profitability at that particular moment.[27]

Soil nutrients could be essentially traded in their derivative crop-form through nutrient extraction processes. They could be measured in absolute monetary terms through nutrient content analysis. Soil scientists strained to disassociate themselves from economic constructs, while the economic aim was nevertheless clear regarding profitability potential as deduced from soil nutrient content. Soils already contained the potential for large-scale agricultural profitability, not for mere sustenance as in subsistence agriculture, not for mere ephemeral utility to nomadic gatherers. The new economic value system, thinly masked by a veneer of chemical and physical formulae, also maintained the invisibility of women's subsistence production mentioned above.

What this commodification of soils signified was a fundamental conflation of "natural wealth" with value. Scientists confused a means of production that transfers no value with value-generating human labor, as Marx had instead emphasized.[28] Natural wealth cannot be

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[26]See S. Engel-Di Mauro, *Soil Use, Soil Science, and Gender Relations* (New Brunswick: Rutgers University dissertation microfiche, 2000).

[27]Fekete, *op. cit.*, p. 340, my translation.

[28]This conceptualization of the rest of nature is explicit in the following passage, for example: "It is thus strikingly clear, that the means of production never transfer more value to the product than they themselves lose during the labour-process by the destruction of their own use-value. If such an instrument has no value to lose, if, in other words, it is not the product of human labour, it transfers no value to the product. It helps to create use-value without contributing to the formation of exchange-value. In this class are included all means of production supplied by Nature without human assistance, such as land, wind, water, metals in situ, and timber in

commodified and treated as capital under the labor theory of value because human labor does not produce it. Soil scientists like Fekete, began defining soil not only as "the topmost, loose, and productive covering layer of the Earth's solid crust," but also as "the most important means of production in agricultural production."[29] Conforming to the logic of state-based capital accumulation, soil scientists redefined soils as an implicitly commodifiable means of production, given earlier metaphorical references to the soil economy.

Once soils were reduced to means of production that bear capital, they could be treated as any commodity, though a fictitious one, as Karl Polányi would put it. The commodification process, enlarged through state-socialism, was beginning to pervade soil science as well. Put differently, scientists extended a scheme of exchange-value production from the general economy to their own subject of study. This epistemological change could not have been more removed from Marxist concepts of the rest of nature. Indeed, it was stimulated by the same contradictory universalization and objectification of nature prevalent in advanced capitalist societies.[30]

4. Contradictions of the Soil Economy: The Conservation of Profitability and the Degradation of Soils

The 1956 suppression of the workers' revolt at the hands of the USSR and much of the national elite did not entail the resumption of forced deliveries. On the contrary, farm worker demands were granted much consideration during the subsequent regime led by János Kádár. State investments were finally injected into agriculture, while the government made political and economic concessions to the formerly land-owning middle peasants who had until then been subjected to discrimination and harassment by the previous regime. Gradually, the same welfare benefits enjoyed by industrial workers were extended to all farm workers employed in co-operative and state farms. These improvements were not sufficiently enticing to maintain an active farm labor force so that many abandoned farming altogether for industrial and service jobs. Workers began to be attracted to farming again between 1961 and 1968, when agricultural wages rose and were finally guaranteed throughout the year. These factors greatly expanded co-

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virgin forests," K. Marx, *Capital: A Critique of Political Economy, Volume 1, Translated by S. Moore and E. Aveling* (New York: International Publishers, 1867/1992), p. 197.

[29]*Ibid.*, p. 7, my translation.

[30]See Smith, *op. cit.*, p. 15.

operative agriculture, which became relatively more popular with the New Economic Mechanism of 1968.[31]

The Mechanism allowed for the use of household plots for private gain, especially in the case of labor-intensive crops, and with the help of the co-operative farm infrastructure in terms of input provisions, storage facilities, processing, marketing, and other amenities. Nevertheless, the reforms did not expand the already limited decisionary discretion of co-operative farm members. Non-elected managers and an elected farm president dominated the co-operative leadership, de facto the decision-making body. Workplace meetings allowed workers to express grievances, but they seldom impinged upon the division of labor, the wage structure, and other such organizational decisions. The substantive control over the agricultural means of production was exerted by management, and increasingly so after 1968. This resulted in wider wage gaps between managers and low-ranking workers and in the allocation of bonuses to the co-operatives' upper echelons concomitant with higher productivity.[32]

It was during this period of increasingly direct reintegration into the capitalist world-system that a more forceful and direct highlighting of soil as means of production and soil fertility as the source of yield maximization emerged within a context of intensifying commodity circulation. In other words, soils were considered worthy of study according to their importance to crop production and, implicitly, according to their utility in the fulfillment of planned yields. By the late 1960s, production targets were increasingly directed toward trade with and loan repayment to core countries. Soil scientists responded by incorporating fertility enhancement as a principal focus of research for the explicit purpose of expanding cash-crop production. Accordingly, the notion of soil fertility was subordinated to marketable yield. "Soil fertility means that our cash crops should grow well and be capable of bringing yields."[33] This research emphasis on yields became especially urgent during the early 1970s, when imports from core countries rose from $7.8 billion in 1970 to $30.8 billion in 1974 for all the countries belonging to the Council for Mutual Economic Assistance (CMEA). Hungary's trade with CMEA countries decreased 8 percent during this

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[31]See Fehér, *op. cit.*; Lengyel, *op. cit.*; N. Swain, *Hungary: The Rise and Fall of Feasible Socialism* (London: Verso, 1992).
[32]See Swain, *Collective Farms which Work?* (Cambridge: Cambridge University Press, 1985), pp. 161-180.
[33]Fekete, et al., *op. cit.*, p. 7.

oil crisis period.[34] By the 1980s, with the sustained expansion of decentralized marketization, the role of soil science became unambiguous.

> Strictly speaking, the possibilities and directions for national agricultural development depend on [rational soil use]; these possibilities and directions are not only crucially important for the provision of adequate agricultural goods and food for the general population, but they also decisively affect the national economy's possibilities for exports (and the smaller, but not insignificant import needs).[35]

The alignment of soil science with economic policies became even more direct, with soil quality being unabashedly tied to the production of cash crops for export.

During the latter part of the state-socialist period, soil management continued to be subsumed under the control of soil scientists, who assumed different and sometimes contrasting positions within the state apparatus. Tensions arose between the conceptualizing and executional organs of soil science through a bureaucratized division of scientific labor. Agronomists and applied soil scientists differentiated the technical aspects of scientific practice according to a commitment to the rationalization of resource use and distribution by the state. In the 1960s, scientists in general expressly linked the "rational" use of soils to the intensification of cash-crop production, which was purported to improve solely through technological innovation and modernist efficiency. The methods whereby "rational" soil use was to be achieved

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[34]See L. Brainard, "Eastern Europe's New Five-year Plans: The Outlook for Intra-CMEA and East-West Trade" in R.D. Laird, J. Hajda, and B.A. Laird, eds., *The Future of Agriculture in the Soviet Union and Eastern Europe* (Boulder: Westview Press, 1977). For additional information on the importance of agriculture in Hungary with respect to international trade, capital accumulation, and the development of industry see C. Beaucourt, "East European Agricultural Trade Policy" in J.C. Brada and K.-E. Wädekin, eds., *Socialist Agriculture in Transition: Organizational Response to Failing Performance* (Boulder: Westview Press, 1988); I. Benet, "Hungarian Agriculture in the 1970s and 1980s" in J.C. Brada and K.-E. Wädekin, eds., *ibid.*; I.T. Berend, *The Hungarian Economic Reforms 1953-1988* (Cambridge: Cambridge University Press, 1990).

[35]See Gy. L. Várallyai Sz-cs, A. Murányi, K. Rajkari, and P. Zilahy, "Magyarország Term-helyi Adottságait Meghatározó Talajtani Tényez-k 1:1000000 Méretarányú Térképe. II." *Agrokémia és Talajtan*, 29, 1-2, 1980, p. 3.

became the point of contestation involving conservationist and productivist factions.

From the late 1960s to the 1980s, the conventional view of soils of the previous period shifted slightly within the framework of a more conservationist perspective abetted by noticeable dents in productivity levels. After much documented soil degradation, scientists largely agreed that

> [w]ithout the continuous intensification of the maintenance of a land's conditions and productivity level, the development of production is unimaginable. Accordingly, time devoted to production and human and tool-aided work, such as with machinery, implements, and other material, should raise the quantity of agricultural crops with suitable efficacy and should make production more economical.[36]

In other words, the suitability of land was commensurate with its ability to provide more crops for sale.[37] Yet the increase in productivity was eventually recognized to impede long-term profits in a classical contradiction between production relations and ecological conditions identified and explicated by Jim O'Connor some 15 years ago.[38]

The ecological consequences of heightened industrialized farming productivity became increasingly clearer as a direct result of the capillary reach of soil science. The increasing capability to monitor soils resulted in the exposure of contradictions between industrial resource extraction and soil dynamics. By the end of the 1960s, soil scientists were already very clear regarding the problems that most warranted scientific attention. "Today, national long-term scientific research encompasses all those problems raised by the organs of crop production development, planning, and fulfillment."[39] These problems concerned declining soil fertility levels resulting from soil degradation (erosion, salinization, acidification). They were to be confronted in a

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[36]T. Duck, *Alapfokú Talajvédelem a Mez-gazdasági Üzemekben [Fundamentals of Soil Conservation in Agricultural Enterprises]* (Budapest: Mez-gazdasági Kiadó, 1969), p. 5.

[37]The word used in these scientific texts is *termény*, which denotes the production of a crop for the market, in contrast to *vetemény*, which is a term used to describe subsistence garden crops.

[38]See J. O'Connor, *Natural Causes* (New York: Guilford Press, 1998).

[39]Z. Fekete, Z., L. Hargitai, and L. Zsoldos, *Talajtan és Agrókémia [Soil Science and Agrochemistry]* (Budapest: Mez-gazdasági Kiadó, 1967), p. 16, my translation.

concerted way through the state's co-ordinating research and extension branches, but the failures under the direction of soil scientists could not have been more palpable to the soil science community itself. Impugning agronomists and planners, as expressed by the above quotation, may have been convenient, but a rift between the application and purported intention of soil science, exacerbated by the production demands of the military-industrial complex, could not have become more transparent.

The position gained as an institutional appendage of the state eventually translated into the capillary extension of soil science to the scale of six-hectare plots (roughly 15 acres).[40] This was accomplished by means of the centralization of land under state and co-operative farms, which extended the reach of soil cartography, soil monitoring, and agronomic services. As more agronomic data were gathered and studied, soil degradation became ever more ineluctably obvious[41] so that the rest of nature was reassessed within the primary characteristics of soils as part of an environment to be protected and conserved.

This environmental concern was echoed in subsequent writings during the 1980s, in which soil was deemed part of the environment to be protected in order to maintain the high level of productivity required by state-socialism.

> The soil is...in part a section of the environment and in part the means of agricultural production. As part of the environment, it is a non-renewable resource that stores and transforms energy and matter. As the means of agricultural production, it furnishes the

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[40]See Gy. Várallyai, "Land Evaluation in Hungary — Scientific Problems, Practical Applications" in J. Bouma and A.K. Bregt, *Land Qualities in Space and Time* (Wageningen: Centre for Agricultural Publishing and Documentation, 1989); Várallyai, Sz-cs, Murányi, Rajkari, and Zilahy, 1980, *op. cit.*

[41]See F. Baranyai, A. Fekete, and I. Kovács, *A Magyarországi Talajtápanyag-vizsgálatok Eredményei [The Results of Soil Nutrient Content Analyses in Hungary]* (Budapest: Mez-gazdasági Kiadó, 1987); Á. Kertész, D. Lóczy, and I. Oláh, "Soil-Conservation Policy and Practice for Croplands in Hungary" in J. Boardman, I.D.L. Foster, and J.A. Dearing, eds., *Soil Erosion on Agricultural Land* (Chichester: John Wiley and Sons, 1990); M. Szabó, I. Dimény, and P. Sárközi, *Mez-gazdaság számokban IV: Növénytermesztés [Agriculture in numbers IV. Crop production]* (Budapest: Agroinform-Stagek, 1989).

> basis for crop production and for all those activities aiming at the achievement of larger harvests.[42]

Regardless of conservationist sentiment, throughout the state-socialist period soils were regarded primarily as a means for the ever-larger production of commodities. This discursive treatment of soils meant that, as means of production, soils could be integrated into the circuits of capital more directly.

At first glance, however, there might not be any reason to suspect that this scientific reconceptualization of soils would necessarily contradict Marxian principles, especially regarding natural wealth aiding in the constitution of, but not transferring value of any form into, a commodity.[43] In this more conservation-minded soil science, scientists considered soils as partly environmental (nonhuman) and partly the product of human labor. In other words, they regarded soil as a combination of both human labor and natural wealth, which would be in consonance with Marx's writings.

However, scientists considered soils themselves, as natural wealth, to contain capital, which directly contradicts Marxian notions of natural wealth as in themselves having no use- or exchange-value. This discrepancy precisely reflected soil scientists' adherence to conventional agriculture subordinated as it was to state-socialist policies aimed at centralized capital accumulation. Soils retained economic importance as means of production for a commodified and increasingly industrialized agriculture. In a context riddled with an obsession with generating exchange-value, it was not coincidental that soils should be regarded as capital-bearing means of production (even metaphorically), rather than as conditions of production. Indeed, during the latter phase of state-socialism, soils acquired a quasi-monetary quality. As Baranyai, et al., for instance, surmised, "[t]he estimated value of soil is nearly 20 percent of the national wealth."[44] National wealth, based on exchange-value and the wage system, was therein clearly conflated with natural wealth. In the end, soil scientists could not separate the commodification of labor from the associated commodification of the means of production. In other words, in direct connection with state-socialist ideologies of industrial modernization and undemocratic centralized accumulation, soils and labor constituted fictitious capital

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[42]Stefanovits, *op. cit.*, p. 5.
[43]See Marx, *op. cit.*; see also footenote 27.
[44]Baranyai et al., *op. cit.*, p. 6.

and the dichotomy of externalized and universal "nature"[45] persisted in ways similar to those of core capitalist countries.

5. Gendered Contradictions of Soil Commodification and Mechanized Farming

Industrial methods intensified in agriculture with the introduction of mechanized production in the late 1960s and 1970s. The maximization of crop production permitted an increase in export revenues to reduce an ever-encumbering relationship of debt with core capitalist countries. Technological imperatives clashed with the realities of persisting soil degradation, yet fueled the legitimacy of soil science interventionism.

Technological improvements in agriculture, such as mechanization and biocide application, resulted from the combination of two contradictory processes. One was the legitimacy derived from full employment, which contrasted with the requirement of increasing labor productivity. The imperative of productivity expansion was directly related to the USSR's military-economic struggle against the US throughout the state-socialist period. Increasing productivity permitted an economic competitiveness that ensured the reproduction and maintenance of the labor force as well. Yet the mechanization and the increased use of synthates (e.g., biocides, synthetic fertilizers) that augmented labor productivity also resulted in a reduction of labor demand, eventually compromised soil productivity, and potentially undermined the very legitimacy of the state through the reduction of wages and/or full-time employment. These contradictory movements were the result of a continuing policy of industrial expansion. Industrialization entailed farm-labor shortages to which the state replied with the introduction of mechanized farming. Agricultural mechanization, in turn, induced seasonal surpluses and labor deficits, while male "skilled" workers could mostly be enticed to the countryside through full-time positions.[46]

The contradictions of industrial expansionism were resolved through several policies. One was the gendered differential wage system, which reduced budget expenses and kept most men relatively content with some components of the economic system. Another process involved redefining skills in favor of men during the industrialization of

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[45]See Smith, *op. cit.*

[46]See Zs. Orolin, "Hungarian Agriculture and Problems with the Supply of Labour" in I. Benet and J. Gyenis, *Economic Studies on Hungary's Agriculture* (Budapest: Akadémiai Kiadó, 1977).

agriculture.[47] This redefinition was realized through both educational and legislative means. Agronomic training and education institutions were predominantly run by males, with a consistently overwhelming majority of male students.[48] Male advantage through qualifications was reinforced through legal proscriptions against women regarding the performance of certain activities, such as biocide application, as noted above.[49] This redefinition of skills allowed men another potential source of supremacy while enabling the state to re-allocate wages so as to provide incentives for highly trained professionals.

Another avenue to surmount the contradiction between increasing productivity and seasonal surplus was by transferring women to under-employing and lower-wage positions in the textile industry. A depleted agrarian workforce was rejuvenated through state incentives and the opening of large factories to absorb women's paid work during low farming seasons. The introduction in the early 1970s of lower-paying "light" industrial jobs within a village or in its vicinity provided a solution. Non-agricultural production such as food processing comprised one-third of total co-operative and state farm activities by the 1970s. Most of the women who were displaced by the reinsertion of male workers in household and co-operative farm production were reinstated as cheap labor in processing and textile industries within the countryside. These processes of sectoral dislocation were accompanied by new constructs of masculinity, as machinery and technical expertise became a pre-eminent source of virility.[50]

Finally, the intensification of subsistence provisioning mostly through women's work in private household plots was unleashed through the New Economic Mechanism. The labor force could be maintained and reproduced by encouraging or ignoring existing masculinist practices in the division of labor. Women remained home through welfare programs while producing for subsistence without direct pay, thereby increasing the state's ability to absorb surplus labor and simultaneously create the conditions for the maintenance of the labor force.

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[47]See I. Hoffman, *Háztartás-közgazdaságtan [Household Economics]* (Budapest: Kossuth Könyvkiadó, 1982); Lengyel, *op. cit.*; H. Répássy, "Changing Gender Roles in Hungarian Agriculture," *Journal of Rural Studies*, 7, 1/2, 1991, pp. 23-29.

[48]See C. Corrin, *Magyar Women: Hungarian Women's Lives, 1960s-1990s* (New York: St. Martin's Press, 1994).

[49]See Asztalos Morell, *op. cit.*

[50]*Ibid.*, p. 31; Swain, *op. cit.*

International and regional processes had important repercussions on soil use and its gendered aspects. With the partial privatization of farming through the New Economic Mechanism, labor-intensive crops became part of lucrative farming household ventures. Men became increasingly involved in household production so that subsistence gardens at times turned into cash-crop plots and men and women increasingly shared subsistence crop production in some regions.[51] This higher labor sharing in household production was largely maintained through the same gender division of labor of past generations. Women hoed, weeded, and processed crops, while men tilled, applied fertilizers and biocides, and used machinery. The inception and intensification of private farming correlated with a sharp decrease in the importance of CMEA relative to capitalist trade.[52] Agriculture turned into a profit-maxizing quasi-capitalist co-operative structure long before 1989. From the late 1960s, state productivist policies, translated through co-operative and state farm management, effectively increased male presence in agriculture to a larger degree than ever before. Soil use was thereby impacted differentially according to gender. It is important to stress that this gendered aspect of soil use did not result from some intrinsic abilities on the part of women or men, but from the articulation of patriarchal divisions of labor in agriculture with the demands of a changing patriarchal state aided by the practices and ideologies promulgated by an androcentric soil science.

The reinforcement of gender differentiation in farming was not the sole consequence of economic reform. The reach of the policies started by the New Economic Mechanism extended to soil status by affecting soil management practices in household plots. At a national scale, soils in household plots were until then mostly managed by women through a low-input system composed of such practices as organic fertilizer additions and manual weeding and hoeing. When household plots were turned into profitable labor-intensive ventures, they gained the full infrastructure of the co-operative farm, including the attention of agronomists and soil scientists' extension services.[53] The complex of

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[51]See Sas, *op. cit.*; J. Szalai, "Some Aspects of the Changing Situation of Women in Hungary," *Signs*, 17, 1991.

[52]See T. Újhelyi, "Hungary as a Trade Partner for Socialist and Market Economies" in J.C. Brada, and K.-E. Wädekin, *Socialist Agriculture in Transition: Organizational Response to Failing Performance* (Boulder: Westview Press, 1988).

[53]Baranyai, et al., *op. cit.*, p. 13; interview with soil scientist at BMNTÁ, 1999. This provision potentially formed part of land quality assessment for taxation purposes, see Swain, *op. cit.*, p. 61.

state and co-operative farm management finally extended the infrastructure available to large-scale farms (chemical fertilizers, biocides, machinery) to the smallest viable parcel, where until then manual labor and organic inputs had been the norm. As the waged labor of men entered the domain of household production, subsistence plots began to turn into cash-crop producing units for export-oriented farming. Some of the farmers interviewed in 1999 remarked that during this time many forested household plots in the Ormánság (southwest Hungary) were cleared in some villages so as to generate supplemental family or household income. Men's increasing involvement in household farming signified a radical agroecological shift away from subsistence gardening practices in many household plots. As described above, this shift was not due to any inherently masculine tendency towards soil-degrading practices, but to the set of gender-biased incentives promoted through state-socialist policies and practices that were intertwined with pre-existing patriarchal gender relations. The capitalization and mechanization of farming preferentially bolstered men's economic status and resulted in the predominance of male involvement in large-scale and lucrative farming tied to soil degradation.

Soil scientists' general allegiance to mainstream, profit-oriented agriculture underlay a productivist imperative that promoted a contradiction between the soil conditions of production (natural wealth) and relations of production ("state-socialism," directly integrated with global capitalism by the 1960s). The same allegiance contributed to the transposition of the commodification of labor into scientific principles through the discursive creation of soils as bearers of capital (soil-nutrient as potential capital). In other words, at least in Hungary, the semi-periphery of the "Soviet" core, the central planners' instrumental treatment of workers and the rest of nature acquired the specificity of the commodified form through relations based on controlled pricing, wages, and profits underpinned by international transactions predicated on monetary circulation (possibly a form of "dual functionalism" integrating state-socialist and capitalist regions).

The commodification of soils was itself directly connected to the alienation of the means of agricultural production from the workers (by means of expropriations and reappropriations by the state). Moreover, gender relations played a crucial role in the commodification process through the reproduction of the pre-socialist externalization of mostly women's subsistence use of soils. Just as capitalists externalize social reproduction costs in their accounting system, so did firm managers,

state bureaucrats, policy-makers, and central planners discount both the soils useful to worker's subsistence and the work of women that mostly buttressed the maintenance of such soils. The political economic ends of state-socialist soil science were thereby almost indistinguishable from those characterizing capitalist farming in general: the extraction of surplus-value from workers and accumulation and centralization of the ensuing capital. Yet this intersystemic convergence resulted more out of a common imperialist strategy than a shared internal economic arrangement. Nevertheless, the ecological consequences of soil science practices, directly related to commodified farming, resemble those encountered under capitalism. This could be interpreted as a case of "homologous equifinality," meaning that both systems arose from similar political philosophies developed during the Enlightenment.

Given the history of soil science under state-socialism in Hungary, the continuation of masculinist physico-discursive practices revolving about the calculability of nature is a logical extension. The significance of soils changed according to the degree of exploitability for maximizing profits through commodity circulation. Subsistence plots became important objects of soil science scrutiny only when they began to be transformed into labor-intensive cash-crop production units during the 1970s. Women's subsistence plots extended beyond the purview of soil science discourse until they were integrated into capitalist farming ventures and commence the production of surpluses from which profits could be gleaned.

Women's involvement in soil use was not only invisible to practicing soil scientists but it was also extraneous to soil research and methodology in general, regardless of the higher productivity and nutrient level maintenance capability of subsistence plots. The invisibility was related to the agricultural practices upon which soil science founded its basis of legitimacy. The increasing removal of women from official farming merely followed a trend established since the inception of state-socialism. In an affirmation of the consequent,[54] the removal process fulfilled the expectation that women were not farmers and therefore unskilled in soil use techniques that matter to large-scale agriculture. That it was women and not men who were

[54]This is a logical fallacy in which an argument takes the form "A implies B, B is true, therefore A is true." In this case, the logical fallacy can be described as developing in the following way, at least implicitly: if women were real farmers, then one would witness at least as many women as men involved in conventional large-scale agriculture; since women are less involved than men in conventional farming, then women by and large must not be real farmers.

largely excluded from conventional farming was contingent upon the pre-existing and reinforced division of labor, stereotyped roles, rights, and responsibilities prevailing in Hungary, especially in the countryside, rather than an intrinsic environmental sensibility associated with femininity or womanhood.

6. Conclusions

There are several lessons that can be learned from the scientific practices spawned by the Hungarian version of state-socialism. First, scientific practice is a particular form of social practice that acquires the characteristics of predominant political ideologies and social norms. This is regardless of whether a social system is defined by relatively greater state control over economic activities and resources. Second, in terms of environmentally destructive practices, state-socialism strongly resembled capitalism not because of the interlinkage between the two systems, nor because the two systems may have shared many characteristics. Rather, it was because state-socialism as a system privileges industrialization and state control at the expense of workers' control over decision-making processes, gender equality, and the fundamental material interconnections between humans and the rest of nature. Hence, any struggle for an ecosocialist society must be wary of any state-based alternatives, especially if they purport to represent "workers" through vanguard parties. Third, an ecosocialist revolution cannot be accomplished simply through the takeover of state institutions since the environmental record of state institutions is as dismal as that of capital.

As many have demonstrated in the case of liberal democracies, science is permeated by prevailing political directives and ideological norms that guide the epistemologies, methodologies, and activities of a scientific community. In this case, the former reflected Soviet geopolitical strategies and elite interests in progressively market-oriented industrialization, while the latter expressed widespread patriarchal arrangements that, among other functions, ensured the resolution of contradictions in agriculture through the reinforcement of women's subordination. The centralized accumulation and redistribution of the fruits of workers' labor indeed rested on the maintenance of some forms of pre-existing patriarchal gender relations. Thus, until the childcare grants of the 1980s, women's unpaid subsistence work covered the external systemic costs of childcare. Moreover, the state bureaucrats, industrial firms, and farming co-operative managers depressed the worth and reproduced the relative segregation of women's work. By so doing they curtailed the achievement of full economic independence from men,

which effectively allowed for a divided workforce and the extraction of greater surplus from women workers.

Soil science is not immune to such a social context, but may be prone to more obvious biases as a result of its relevance to a large economic sector like agriculture (the same could be expected of engineering, nuclear physics, and other scientific branches pivotal to an industrial-military complex). Presumably, the development of an egalitarian society would entail the simultaneous democratization of science. However, soil scientists form communities that may be strongly interested in self-preservation, just as any other institution or social group. Further study should be focused on the changing institutional interests of soil science practitioners to understand under what conditions and to what extent they conform to mainstream political directives and incorporate prevalent ideological assumptions at different points in history.

The similarity between state-socialism and capitalism suggests that neither the state's nor capital's appropriation of resources and control over decision-making processes can guarantee the development of environmental sustainability. This convergence between political-economic systems should stimulate further analysis regarding common social processes that can be linked to environmental degradation. Nevertheless, several of these can be clearly identified, such as global imperialistic competition, the absence of community control over resources, subordination of science to patriarchal values and to a political elite's imperatives, and the marketization and commodification of society.

Finally, the struggle to end environmental destruction is a complex and arduous process and the state-socialist experience in Hungary demonstrates that class struggle is insufficient if it does not include a struggle against gender inequality and androcentric conceptions of work. Nor can a state guarantee the democratic control over the decision-making process regarding environmental practices such as agricultural production. Be that as it may, environmental problems certainly cannot be resolved via the introduction of stiffer environmental regulations within a bourgeois context, as attested by the continuing and ever-larger scale of degradation under the current capitalist world-system. Yet the state-socialist experience also indicates that the demolition of capitalism is necessary but insufficient to fulfill ecosocialist aims without a global systemic overhaul. In order to shift scientific practices towards sustainable ends there must develop a fully egalitarian and socially pervasive structure that informs and directs them.

The Hungarian case demonstrates that reliance on the takeover of state organs for socialistic ends is not just inadequate for resolving environmental problems or gender disparities, but potentially deleterious to human health as well (in this case, sustained soil degradation will lead to reduced food productivity and increasing concentrations of carcinogens in food and the water supply, among other persisting problems). The state-socialist model reveals the ineptitude of creating the conditions for greater economic equality without at the same time changing gender relations and the attendant disparities that contribute to the differential control of and access to resources, including knowledge-technology complexes such as soil science.

The question of method for a global revolution remains unresolved by my analysis and in any case beyond the scope of this writing, but it should encompass a critical awareness of the severe limitations of state-based approaches and the corruptive effect of political inequality (always predicated on economic disparity) in any sector of society, including science. A more socially and environmentally responsible science would be facilitated by the (gradual) replacement of state and capitalist institutions with competent collective organizations based on egalitarian principles and practices.

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