Commentary

Farm to Fork's Discourse on Resources and Population

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Farm to Fork (F2F) is an ongoing policy initiative that represents the vision for reforming the European agri-food system. The F2F text, as most policy texts, belongs to a discourse, i.e. a positioned way of representing the world, and constitutes a practical argument over what to do about food and the environment. This article's goal is twofold: to critically question the internal logic of the F2F text and to sketch an explanatory critique that characterizes its discourse, ideological resonance, and likely socio-ecological effects. We use a simple Critical Discourse Analysis technique to map F2F's semiotic structure and single out three key mental categories – *food affordability*, *environmental crisis* and *adequate technology* – that represent crucial components of its practical argument. Next, we describe how the F2F construes the ecology of agriculture and food production/consumption through these categories. The F2F's underlying ontology of resources and population is teased out by stressing the continuities and discontinuities with Malthusianism and neo-Malthusianism, and the specific articulation of these components is identified as green neo-Malthusianism, a discourse that resonates strongly with growth-bound democracies and with the notion of research as service.

> Of things vnseene how canst thou deeme aright, (...)
> Sith thou misdeem'st so much of things in sight?
> Edmund Spenser, *The Faerie Queene* (V, II, xxx-liv)

1. Introduction

Recent years saw a rise of advocates (ranging from business associations to think tanks and governmental agencies) for ecologically minded reforms to agriculture that seek to redirect subsidies

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and scientific research to practices that benefit human planetary health[1][2][3]. Common to these proposals is the notion that we may reform agriculture without reforming the rest of the social practices upon which it is predicated. These discursive representations of agriculture separated from society also contain, sometimes implicit, sometimes explicit, propositions concerning scarcity and the contentious issue of resource-population nexus that is often overshadowed by Malthus' dismal theorem[4]. These views eventually inform actual agricultural policies such as the fairly recent and still underway Farm to Fork initiative. The Farm to Fork (hereafter F2F) initiative is a subsidiary strategy of the European Union's European Green Deal that is working to reform the agri-food sector on a continental scale and is part of the main political response to the perceived ecological crisis. It is, nonetheless a strategy of such magnitude[1] that it virtually excludes all alternative strategies for dealing with environmental damage in the European agri-food system. The blueprint for this continental endeavour is the policy text–A Farm to Fork Strategy For a Fair, Healthy and Environmentally-friendly Food System[5] officially adopted by the European Commission on May 20, 2020.

Policies are essentially practical arguments[6][7][8] (more on practical arguments below). They are socially structured and socially structuring and also, particularly when their subject matter is agriculture, environment-making[9]. In this article we aim to critically question the internal logic of the F2F text and to sketch an explanatory critique that unpacks its view on the relationship between resources and population so as to make *its environment-making logic* clearer. Section 1 lays out basic concepts of critical discourse analysis (CDA)[10] that will be relevant for what ensues. In section 2, we map F2F's argumentative structure and identify three key mental categories – *food affordability*, *environmental crisis* and *adequate technology* – that represent crucial components of its practical argument and the notion of scarcity lying at its core. In section 3 we describe how the F2F construes the ecology of agriculture and food production/consumption by going over the aforementioned categories in a dialectical approach[10]. It characterizes these three categories as implicitly reliant upon the reproduction of flows of cheapness[11][12][13][14] into and out of farm sites[2]. Section 4 characterizes the discourse present in the F2F text, by unravelling the F2F's underlying ontology of resources and population and stressing the continuities and discontinuities with Malthusianism and neo-Malthusianism. We conclude with some of the implications and significance of green neo-Malthusianism as the framework for the environmental reform of agriculture.

2. Discourses and Socioecological Effectivity

As a policy directive, the F2F contains a proposed course of action that is formally deliberative: it represents a process of weighing options on matters of common concern like the distribution of resources or the appropriate collective response to circumstances (food crises and environmental problems). It is, like most policy discourse, a practical argument[15]. Contrary to theoretical (or epistemic) arguments which are concerned with establishing the truth about something, practical arguments are concerned with what to do given certain circumstances and goals. Deliberation covers alternatives that are within the agency of the deliberators (including the alternative of not doing anything) and seeks the support of those implicated in the action that it presents as necessary and over which, given the uncertainty of the world, disagreement is naturally expected to persist. The selection of an argument for policy is determined by factors both exterior and interior to the practical argument and, once it is selected, it is structured around a presumption of truth[8]. Presumptions shift the burden of proof to those who wish to deny the validity of that truth; the "interlocutor assumes the burden of rebutting it"[16]. Practical (presumptive) arguments stand in contrast with the deductive and inductive types of argument[10].

I. Fairclough & Fairclough[10] founded a particular strain of critical discourse analysis for policy discourse (henceforth CDA) that proposes that the structure of practical arguments contains four sets of premises and a central practical claim. A *goal (G) premise* is what the agent wants or does not want but ought to want anyway, a *circumstantial premise (C)* is the agent's description of the (material and semiotic) context in which the goal is to be pursued, and necessary in the first place because certain problems were detected, and a *value premise (V)* in the sense of concerns about the world that inform both the goal and the description of circumstances. In the face of these three premises, a tentative, hypothetical assertion is added connecting certain actions to the goals, which constitutes the *means-goal premise (M-G)*. The conclusion from these premises is a *Claim*, the presumptive statement, asserting that the goal will be achieved if the actions put forth in M-G are performed.

The above description of these sets of premises is necessarily a brief and roughly sketched description of the premises of practical arguments but hopefully useful as a way to flesh out the underlying logic of the F2F discourse on agriculture: any practical argument encapsulates a certain vision of the world and by mapping its structure we may see it with added clarity.

3. The F2F Practical Argument

The official document that lays out the initiative is called "A Farm to Fork Strategy For a Fair, Healthy and Environmentally-friendly Food System"[5], and our reading of this document is also informed by an ancillary document by the European Commission that lays out the basis for an impact assessment of different F2F policy scenarios titled "Sustainable food system framework initiative[17]. Interpreting text is necessarily partly subjective and we are not making any claims in the following depiction of its argument as the only possible one but we believe that the diagram below (Figure 1) is an accurate and fairly uncontroversial depiction of the F2F's four sets of premises and its central claim. We also provide a more fully-fledged reconstruction of the argument in its own wording in Table 1 (below).

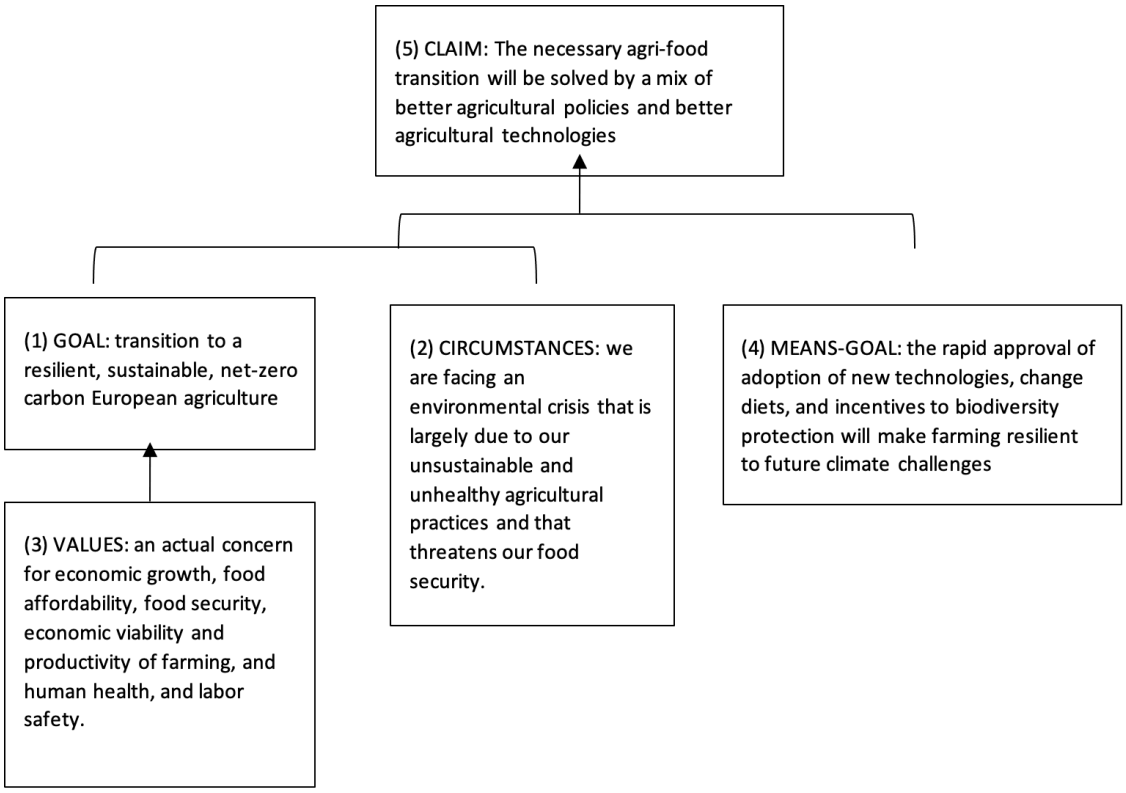

Figure 1. *Farm to Fork – Map of argument.*

The F2F text describes a reality in which the environment is increasingly hostile, in general, and to food security in particular, this is its *2) Circumstantial premise*. Its description also includes some causal statements that ascribe anthropogenic origins and single out the food system (denoting the

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whole value chain and final consumption) as "[o]ne of the key drivers of climate change and environmental degradation" (p.5). The same food system is also portrayed as incapable of delivering food justice - "33 million cannot afford a quality meal every second day" (p.5) - nor economic justice - "improving the incomes of primary producers [is a necessity]" (p.6) - nor public health - "over half of the adult population in the EU are now overweight" (p.5).

The F2F *1) Goal premise* is carbon neutrality and the resilience and sustainability of the agri-food system. Its view of what the socio-ecological reality should be like can be broken down into at least five objectives that are clearly stated in the document: #O1 Sustainable food production (less pesticides, antibiotics and fertilizers and more organic farming), #O2 Reducing greenhouse gas emissions, #O3 Improving farmers' incomes and food affordability, #O4 Protecting biodiversity, #O6 Resilient and reliable food chain and production. We have synthesized how each of these objectives is matched by a set of preferred means of action *(*Table 2 *in the Annex)*.

The *4) Means-Goal premise* encompasses such preferred means of action and proposes the rapid adoption of new technologies, along with a widespread dietary change, better regulation and incentives for increased functional biodiversity (see Table 1). These three levers (policy, technology, diets) have been proclaimed as necessary to reform the agri-food system elsewhere[18]. The relative weight to be given to each of the three levers in practice cannot be determined from discourse analysis alone. Some of these measures are expected to affect productivity[19] (and thus threaten food affordability), unless technological developments (and removal of barriers to technology) mitigate the expected declines in productivity that certain goals (see[19]). A global report by FAO echoes this same sentiment: "Technological progress, including digital technology, will be critical to achieving this [productivity criterium]"[20].

The description of the map of the argument shown in Figure 1, is completed with the *3) Value* premise. In practical arguments, values precede all other elements in the sense that it is only in terms of these values that there is a problem to be solved and a goal to be achieved. The F2F is anchored by a set of values that encompasses the viability of economic growth, the economic profitability of agricultural activity, human health and safety at work and, finally, affordable food. This set aims to strike a balance between market imperatives and social and environmental concerns in the agri-food system. Among these, food affordability is the hardest to pin down as a concern. Food affordability is an economic measure of access to food, that can be pursued in many ways ranging from capping food prices to complete market deregulation. The only thing that can be said of it as a *Value* is that it belies

the position that access to food is to be market-mediated (regulated or not) and that it is possible to treat food as a commodity while achieving social justice and environmental goals. All other values, including both economic growth and the economic viability of farming are formally compatible with the decommodification of food, only food affordability is not. Moreover, to the extent that food affordability is equated to access to food, it presupposes the commodification of the entire agri-food system.

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Claim	The F2F strategy "ensures that agriculture, fisheries and aquaculture, and the food value chain contribute appropriately to [a climate neutral Union]" p.3
Circumstances	- "The increasing recurrence of droughts floods, forest fires and new pests are a constant reminder that our food system is under threat and must become more sustainable and resilient." p.4 - "it is clear that we need to do much more to keep ourselves and the planet healthy" - "food systems remain one of the key drivers of climate change and environmental degradation" (p.5). - "urgent need to reduce dependency on pesticides and anti-microbials, reduce excess fertilization, increase organic farming, improve animal welfare, and reverse biodiversity loss" (page 3) - "Current food consumption patterns are unsustainable from both health and environmental points of view." p.11 - "33 million cannot afford a quality meal every second day" (p.5)
Goals	"transition to sustainable, healthy and inclusive food systems from primary production to consumption." P.6 "The EU's goals are to reduce the environmental and climate footprint of the EU food system and strengthen its resilience, ensure food security in the face of climate change and biodiversity loss and lead a global transition towards competitive sustainability from farm to fork and tapping into new opportunities." p.4
Values/Concerns	- "preserving the affordability of food, while generating fairer economic returns in the supply chain." p. 4 - "[A] robust and resilient food system that functions in all circumstances, and is capable of ensuring access to a sufficient supply of affordable food for citizens" p.2 - "promoting fair trade, creating new business opportunities, while ensuring integrity of the single market and occupational health and safety." p. 4 - "Ensuring a sustainable livelihood for primary producers, who still lag behind in terms of income, is essential for the success of the recovery and the transition." p.2 - "To ensure a successful global transition, the EU will encourage and enable the development of comprehensive, integrated responses benefiting people, nature and economic growth." P.17

Means-Goal	- "New legislative initiatives (...) underpinned by (...) better regulation tools. (...).p.5 - "[P]ublic consultations [and] impact assessments will contribute to making efficient policy choices at minimum costs, in line with the objectives of the Green Deal. (...).p.5 - (...) [A] legislative proposal for a framework for a sustainable food system (...). p.5 - [C]ertification and labelling on the sustainability performance of food products and with targeted incentives, the framework will allow operators to benefit from sustainable practices and progressively raise sustainability standards so as to become the norm for all food products placed on the EU market." p.5 - "Farmers, fishers and aquaculture producers need to transform their production methods more quickly, and make the best use of nature-based, technological, digital, and space-based solutions to deliver better climate and environmental results, increase climate resilience and reduce and optimise the use of inputs (e.g. pesticides, fertilisers). These solutions require human and financial investment, but also promise higher returns by creating added value and by reducing costs." p.5 - "The Commission will seek commitments from food companies and organisations to take concrete actions on health and sustainability, focusing in particular on: reformulating food products in line with guidelines for healthy, sustainable diets(...). p.12

Table 1. *Farm to Fork - Argument Reconstruction*

Overall the argument views a world in which environmental factors threaten food productivity and food productivity threatens the environment (its Circumstances) and proposes changes in production and consumption (its Claim) that protect both the environment (its Goal) and the affordability of (healthy) food (its Value). This reasoning works discursively through three categories: affordable food, ecological crisis, and new technologies. Each category performs a specific role in the argument. Food affordability signals the socially relevant goalposts within which solutions must operate, i.e. the commodification of the agri-food system. The environmental crisis, represented by phrases like "environmental degradation" and "climate change", provides the locus of the problem. Technological inadequacy frames the problem (ecological crisis) as technical in nature. We are now in a position to

probe into its environment-making logic and its underlying stance on the resources-population relationship.

4. Food production in a Farm to Fork world

4.1. Food affordability

Food affordability is the ability of the market to provide a good at a price that virtually everyone can afford. In the F2F practical argumentation, food affordability is expressed as the necessary and sufficient condition of access to food (which is the underlying moral strength of the premise). Because access to food is essentially market-mediated in the EU[21], food affordability is easily equated with access to food. Despite its importance in food systems, the text itself gives little indication of how affordability is to be guaranteed except that it is threatened during eventual "economic downturn" (p.3) and somehow connected to "fairer economic returns in the supply chain" and fair trade (p.4). In any case social and environmental goals subscribed in the F2F must operate under the constraints of food affordability, and in this section, we explore what that means.

The price of food is ultimately affected by multiple factors both within the supply chain (such as varying climate, subsidies, the price of labor, machinery and inputs, etc.) and exterior to it (like retail markup, market speculation, tariffs, taxes, food vouchers, etc.). Affordability is also a function of wages and inequality, and so it comes to be the result of multiple policies affecting all of these factors feeding back into policies with a myriad of goals besides food affordability, in a complexity which, however hard to disentangle, dictates the actual distribution of resources, and works to define the prevalent notion of resources and, consequently, scarcity[4]. In its processes of defining resources and scarcity, food affordability is environment-making[9]. Ultimately, from the point of view of food affordability, this multitude of factors revolves around the shaping of the production costs of food into a market price for food staples and wage levels. But food prices and wages are not unrelated. This is because labor can become less expensive the lower subsistence costs (which include, among other things, food prices) especially in informal labor markets but also in national wage-setting processes[3]. If food affordability increases by food becoming cheaper, subsistence costs decrease and so can the cost of labor, i.e. wages. When wages decrease the proportion of wages spent on food increases, making food less affordable. In essence, all else equal: food affordability increases with wages which decreases with food affordability.

This paradoxical relationship is visible in the way in which standard microeconomics portrays production and the way in which wages are determined. The structure of food production costs can be represented by a production function such as[22]:

$$Q = f[N, L, K, t, E] \quad \text{(eq. 1)}$$

The quantity of (food) output, Q, is a function of L, the quantity of labor, N, natural resources, K, the amount of capital, t, the level of technology, and the somewhat opaque E, degree of entrepreneurship[4]. Productive factors (inputs) must be paid for, and so for a given amount of Q, the cheaper the factors of production the lower the costs. Food affordability can thus be increased via cost reduction in natural resources, labor, capital (machinery, tools), and efficiency gains in technology. In order to minimize the costs of food production, one must then secure cheap inputs in the form of natural resources and labor. This simple instruction implicit in the production function reveals that food affordability constantly defeats itself by procuring cheaper labor. But it also obscures the concrete processes of cost reduction of both labor and nature, through which it is generated that are incompatible with environmental and social justice goals.

Any discourse on agriculture that subscribes to food affordability as the main criterion of access to food is forced to operate within the ecological confines of these cost-reduction processes. Its practical arguments, and resulting policies like the F2F, will have to reconcile the socio-ecological reality of these processes with environmental and political goals.

In the equation above, the degree of entrepreneurship is a factor of production that also gets paid; it rewards the Entrepreneur's ability to lower the payment to other factors. This is ecologically relevant because the rate at which nature is mobilized will affect the rate at which entrepreneurship is rewarded and the rate at which nature is depleted and labor exploited. Market economies trust this abstract entrepreneur to deliver affordable food as a side effect of her own reward-maximizing agenda[5], but the other implicit side effect is, of course, environmental degradation and social injustice which are inconsistent with the F2F *goal*. In its argument, the F2F simultaneously acknowledges the danger of market-led food production, the need to regulate it, and the need for food affordability.

At this level of abstraction, the cost of nature and labor is determined by their respective markets and the *quantity* at which they are made available at each moment. These equations cannot guide us further through the concrete reality of procuring low-cost nature and labour. We cannot apply a production function to these quantities because they are what Polanyi calls *fictitious commodities*: they

are not produced with the purpose of sale[23].[6] The diagram in Figure 2 describes at an abstract level the options available to the entrepreneur to secure low costs/realize cheapness and illustrates the circular, self-defeating, socially stratified, biophysically expansive character of food affordability.

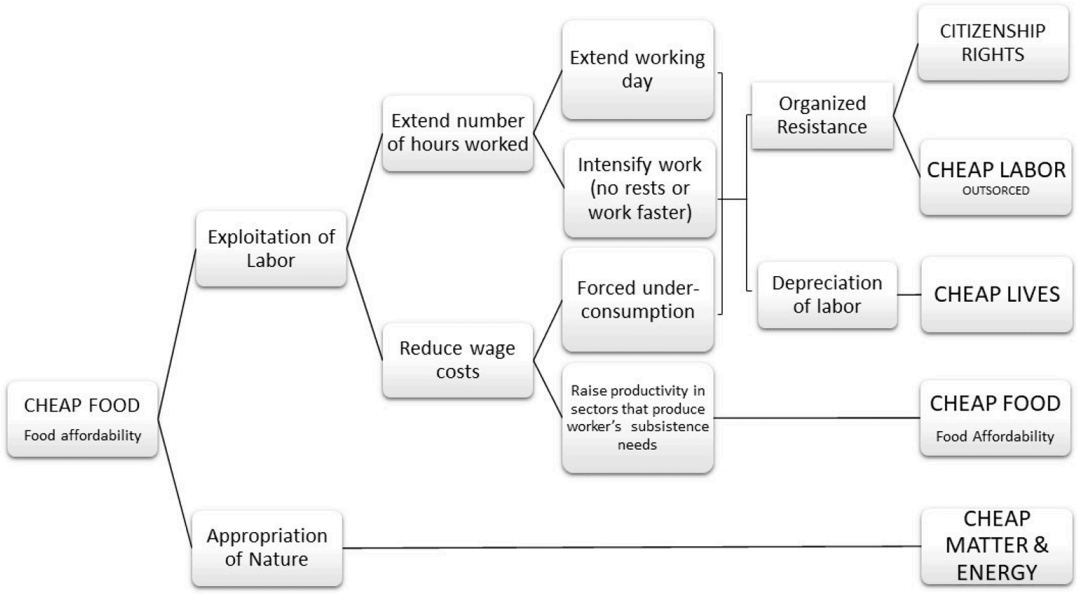

Figure 2. *Flows of Cheapness. Food affordability in market economies: cheap food begets cheap food and cheap nature.*

A) Labor cost reduction

The circular and self-defeating character of food affordability is most apparent in the upper main branch of the diagram concerning labor cost reduction, which is drawn from the Marxian explanation of how competing capitals must seek to reduce the value of labor power (see Araghi[24] for the detailed account in the context of food regimes from which we borrow). This upper branch, stemming from the *Exploitation of Labor*, illustrates two of the available routes of reducing the cost of labor relative to the price of food. One is reducing wage costs. This pushes workers into either forced consumption, or to search for more affordable (cheap) subsistence needs (including food) which requires a raise in productivity in the sectors that supply those goods thus renewing the initial need to produce cheap(er) food.

This circularity, in the labor exploitation branch, can be escaped through *the extension of the number of hours worked*: i.e. getting more work in return for the same wage costs through either intensification by cutting resting periods, disciplining into faster work rhythms, or by extending working days. Along with the just mentioned forced underconsumption, this route leads to the depreciation of labor, which defeats the purpose unless there is an unconstrained supply of workers (cheap lives). It can also lead to organized labor resistance, which defeats the purpose by either causing attrition in production or securing rights that raise labor costs; and eventually force the procurement of cheap labor outside the jurisdiction of social protection and labor rights[7].

This outsourcing of cheap labor underpins the process whereby "the expansion of citizenship rights under bourgeois democracies have been counterbalanced by slavery, political coercion, military dictatorships and political suppression of modern working classes elsewhere in the world."[24]. It is a process that creates pockets of food affordability through the asymmetrical allocation of rights and protections to workers across territories under the same market economy[25]. This bears another implicit contradiction of food affordability: the intention of universalizing access to food creates stratified access to food. The processes through which this route leads presuppose a continuous supply of cheap lives and/or cheap labor[14] so that the stratified relations are perpetually expandable. In a market economy with high-income inequality, food affordability benefits high-income wages such that it allows them to buy more labor from low-income workers. If food affordability decreases, either income inequality compresses somewhere in the income distribution curve with the forced increase of lower wages, which is a relative decrease of higher wages, or alternatively leaves low-income people vulnerable to dearth. This is why the 'affordability' of food, works in the F2F text as an otherwise fairly *decontested*[26] social goal with advocates across the political spectrum. Its decontestation lends further legitimacy to existing inequalities but it also stands in as a *right to food access*.

B) Nature cost reduction

The remaining route available for food affordability is the cost reduction of nature. This is done by mobilizing the biogeochemical funds and flows[27] necessary for food production at "significantly lower costs than the system-wide average"[28]. This mobilization of nature is essentially the exclusion of access (or the privileging of access) made possible by/through/with state-like power via a wide range of strategies: subsidies, laws, tax breaks, price controls, state lobbying for private

interests, cash transfers, funding of research projects, privatisation of knowledge, war, colonisation, and so on[29]. The abstract entrepreneur, attempting to maximize her rewards, pursues these concrete strategies "whereby ecological cycles and flows are disrupted or even ruptured as capital attempts to bend material reality to the ceaseless accumulation of an immaterial substance (value)"[30]. These strategies enable the appropriation of nature and the expansion of commodity frontiers[31][12][9][13][32][33][34]. Such expansion denotes the process whereby a political entity increases the total mass of energy/matter/labour to which it has access, without having to increase the costs associated with the expansion of the legality[8]; of entities with rights from entities without rights.

C) Primitive accumulation

Food affordability presupposes the concrete operations for the cost reduction of nature and labor, and these operations can be subsumed under the process of primitive accumulation[35]. Primitive accumulation is "the actual historical experience of separating people from their means of production"[36] and the process through which nature and labor can socially become fictitious commodities (the basis of all other commodities) and be secured at low cost from the abstract entrepreneur in the equation above. Contrary to what the name suggests, primitive accumulation is an ongoing and constantly renewed process[36]: which is configured by a) asymmetrical access to limited natural resources, knowledge and technology, (and thus, food) b) by the continuous renewal of the expansion of limited access (the cost reduction of nature), c) and by the social relations of production in which asymmetrical access is reproduced and exchanged for human labour in the form of wages (the cost reduction of labor). These features are essentially at odds with the goal of "transition[ing] to sustainable, healthy and inclusive food systems from primary production to consumption."[5] To secure the production of affordable food the F2F must either reproduce the processes of primitive accumulation for which the continuous expansion of available cheap nature is central – and compromise its goal and some of its values, or replace them with something historically new. As the next two sections illustrate, the F2F seems indeed to aim for something *ex novo:* a technology that evades the metabolic confines of food production.

4.2. Circumstantial Premises: Ecological Crisis

Ecological circumstances are described with words such as "environmental degradation", along with the need for an "ecological transition". The text identifies a set of causal relations leading to the

problem that can be expressed in the following plain terms: unfortunate technological choices disrupted the otherwise favourable environmental conditions for farming (cf. Table 1 F2F's argument reconstruction). This causal explanation of the problem allows a characterization of food insecurity as an *accidental crisis*, as opposed to *form-determined crises* [37]. Unpredictable exogenous events – "logistical disruptions of supply chains, labour shortages, loss of certain markets and change in consumer patterns"[5] – include: 1) the misguided and ineffective use of fertilizers and antibiotics which led to an excess of nutrients in the environment and antimicrobial resistance[5], 2) chemical pesticides which are necessary for plant health but bear regrettable effects that make them unsustainable (*idem*, p.6), and 3) the GHG emissions stemming mostly from the animal sector which is conceived as an unwelcomed side-effect from dietary preferences (*idem*, p.7). All these effects are *accidental:* they bear no causal relations to phenomena outside the food value chain, they are not the actualization of structural features of a given social form and its inherent contradictions, and, as such, they appear as unpredictable as natural disasters but manageable. Ecological crisis is the outcome of said social form's unlucky technological choices with no social processes behind them.

The word "crisis" is only used in the F2F text to describe eventual and past food crises (shortages in supply) and while there is no unfolding food crisis, there are increasing threats to food security that are identified as environmental degradation and climate change (here subsumed under the term "ecological crisis") which are themselves partly driven by the food system. While the catastrophic effects of mainstream agricultural practices (fossil-fueled monocropping with synthetized fertilization and pesticides) on earth's ecosystems, biodiversity and climate are promptly acknowledged in the text, other known crisis signals are not simply omitted: the slowdown in productivity growth over the last three decades[20], the rising food production costs[38][27], peaking expansion of arable land[39] and the deteriorating productivity of arable land[40].

The idea that these unlucky choices are key threats to the food system is misconstrued because there is no particular technology that is ecologically (un)sound. The expanding socio-ecological relations of cheap food upon which food affordability is predicated describe a trajectory that is governed by cycles of ecological surplus[9] (*shortages in ecosystem services and arable land*, would be a plausible translation to the F2F lexicon). The fluctuation of ecological surplus in food production is made apparent in the succession of plundering enterprises for inputs in cheap nature for cheap food: graveyard bones for superphosphate fertilizer in the 1840s[9], guano extraction in Peru dependent on cheap African and Chinese lives, and the American soil's fertility again dependent on cheap lives, the subsidized

conversion of nitrogen factories for nitro-glycerine explosives and their subsequent subsidized conversion to fertiliser production[29].

The contraction of the ecological surplus is historically countered by either making available new useful forms of matter and energy, new places from which to source old forms of matter/energy, or new ways to facilitate the use of known forms of matter and energy; all of the above accelerate the transformation of nature into useless energy/matter (and, consequently, global increases of labor productivity). Even the comparatively harmless agrarian technologies of the Roman empire[41] caused sufficient ecological problems to play a role in its demise. Previous ecological crises cannot be tied to a singular particular technology, only the excessive social aggregate use of technologies available to any given civilization can. The key drivers of environmental degradation are thus the social processes that generate the excessive aggregate use of existing technologies and any causal explanation is incomplete without reference to them.

The F2F's construal of the role of technology is possible under what[4], identifies as the Aristotelian materialist view of the world in which

> things are thought to have an essence of some sort and are, regarded as definable without reference to other things. p. 265

This Aristotelianism was, according to Harvey[4] at the time of his writing, the dominant methodological stance in resources-population thought and it arguably still is.

This Aristotelian view is discursively materialized in the F2F through nominalization: "reducing processes to their effectivity and thus concealing details of both processes and agency"[42]. The nominalization of the metabolic processes involved in the social consumption of food as a *food system* obfuscates and simultaneously excludes the legal economic and political dimensions that generate asymmetric access to food via wealth disparities, income inequality, and unequal access to land. Biodiversity and climate conditions are equally excluded from the food system; they become both the receptacle of the negative effects and sources of (in)security of the food system *strictu sensu.* This *strictu sensu* isolates the food value chain and diets (consumer choices), as the causally efficacious phenomena on food security (either via agriculturally induced environmental damage, market failure or crop failures). The biased formulation of the problem sets the stage for the proposed course of action.

4.3. Claim: New technology

The crucial critical question aimed at a practical argument concerns the truth status of its claim. An argument can be invalid and/or unsound, as the F2F appears to be, but its conclusion can still be true. Only a counter-claim demonstrating that the proposed action should not be pursued because it defeats its goal can effectively rebut the argument[10], for more details on critiquing practical arguments). To recapitulate, the F2F claim is that *technological development, coupled with better regulation and dietary changes, will connect present circumstances (crisis) to goals (food security and decarbonized food chain).* In this section, we explore the possibilities of making a counter-claim: technological development coupled with better regulation and dietary change is unsustainable and increases environmental degradation along with its threat to food production.

Several critical questions operate in the production of a counter-claim, the first concerning the adequate description of the proposed action. Ultimately the counter-claim to the F2F needs to establish its sustainability. Sustainability is a spatio-temporal concept, it can only be mentioned in relation to spatio-temporal boundaries. In the case of the F2F, these boundaries are not readily discernible. Its proposed measures roll out several alternative models – precision farming, organic, integrated farming, agroecology and conservation agriculture – which, individually, presuppose widely different spatio-temporal boundaries. If we take the F2F stance on growth seriously, they are nonetheless, as an ensemble, subordinated to increasing productivity with decreasing resource depletion: "growing more with less is the guiding principle"[43]. Molina et al.[27] described this general stance as a sort of "consider all options" approach that they termed *sustainable intensification.* Even the most sensible approach which is, arguably, agroecological intensification (the integration of ecological principles into farming systems for the reduction of dependency on off-farm inputs[44]), will generate short-lived productivity gains (the volume of production will stabilise)[27][45]. Not surprisingly, sustainable intensification has been described as having no thermodynamic foundation: i.e. we cannot grow more with less indefinitely. Nevertheless, the sustainability of F2F's specific sustainable intensification can only be assessed if its spatio-temporal boundaries are determined.

The F2F's sustainable intensification comprises a mix of: 1) investment in new technologies, 2) incentives for sustainable practices, and 3) research and innovation. Their combination constitutes a seemingly impenetrable socio-ecological concreteness. Research and innovation (R&I) are self-evidently postulated as "key drivers in accelerating the transition to sustainable, healthy and inclusive

food systems"[5] and are expected to deliver technological development and solutions to scale up sustainable practices. R&I is expected to unlock the necessary expansion in useful forms of energy (like alternative proteins, (*ibidem)*; or renewable energy from agricultural waste), raise productivity by increasing the efficiency of known forms of energy/matter (like precision farming), restore soil health and functional value (*ibidem)*, deliver plant protection services (through biotechnology and bio-based products), and scale-up agro-ecological approaches (*ibidem)*. The need to digitize farms and mainstream precision-farming, and the concomitant acceleration of the "roll-out of fast broadband internet in rural areas to achieve the objective of 100% access", is stressed throughout the text. R&I will also be important in establishing the "circular bio-based economy" through bio-refineries, bio-fertilizers and so on (*idem,* p.6). These developments will be adopted in good measure, "provided they are safe for consumers and the environment while bringing benefits for society as a whole" (*idem,* p.8), while uncovering "new market opportunities" (*idem,* p.15*)*. This is to be funded by investments aiming to "encourage innovation and create sustainable food systems" (*ibidem*). From 2021 to 2027, *Horizon Europe*, the EU's key funding programme for research and innovation, proposed 10 billion spending on F2F-related matters, out of a total of 93.5 billion[10]. Further investments are to be channeled through the European Regional Development Fund, the InvestEU Fund aiming to "de-risking investments by European corporations" (*ibidem*) in the agri-food sector, and the CAP which will among other things "accelerate the green and digital transformation of farms" (*idem,* p.16).

The common trait about all the measures in the F2F is that they extend and shift the boundaries (spatio-temporal and socio-ecological) of the food system in one of two ways: by introducing new technology (including new inputs) in the production sites and/or by financing certain productive strategies through subsidies *latu sensu*, i.e. financing farm activity from the surplus of other economic activities. Both imply biophysical flows far removed from the farm, and they must operate within the thermodynamic constraints of food production, reproduce the socio-ecological relations of cheap food, and generate some semblance of environmental achievement This can be illustrated by looking at the shifting spatio-temporal boundaries of each F2F's sub-goal. For example, the sub-goal (the list of sub-goals is in the annex, below) is to reduce the use and dependence on pesticides antibiotics, and fertilisers, through measures of precision agriculture and integrated production (henceforth, M1).

M1 is a set of measures that reduces the ratio of circulating capital (inputs and raw materials) to fixed capital (machinery, tools, infrastructure) that contributes to the final result of the food commodity. M1 operates in two main strategies: input-saving technologies, and input-substitution by natural

processes (so-called ecosystem services). Our entrepreneur from above, who is expected to produce cheap food, will need to invest in new equipment such as precision technologies. The reduction of "working conditions" (in the sense that Sombart[46]) gives them: soil fertility, functional biodiversity, and adequate rainfall) outside the circuit of capital, that resulted from previous capitalisations requires new a capitalisation of the farm. Within this context, M1 equates to making the substitution of "the agroecosystems' biogeochemical circuits with working capital that depends on resources outside the agrarian sector (...)"[45], more efficient and less wasteful. Efficiency gains will depend on the elasticity of replacing circulating capital with fixed capital such as precision technologies. Access to raw materials needed for the manufacture of these technologies must be provided and guaranteed as a matter of priority and at low cost, and politically legitimised by the imperatives of affordable food. The sale of this technology can also be ensured by state subsidies, compulsory regulation, and special access to credit by banks.

But M1 also relies on integrated production and agroecological approaches that may ameliorate the reproduction of biogeochemical flows providing so-called ecosystem services. This is achieved by funding nature: the opposite of cheapness because the free gifts of nature need to be paid for. Rather counter-intuitively, affordable food is to be generated by expensive methods, namely subsidies in their many guises. The subsidy is typically seen as environmentally innocent. It is a payment that society makes to the farmer for the service he provides to the environment and the nutritional quality of the food[47][21], and it is generally assumed that this money is clean in the sense that it has been generated by productive activities that do not harm ecosystems[11], but it is nonetheless an incoming flow with socio-ecological concreteness equivalent to that of Figure 1 above and becomes central in injecting cheapness back into farms. Its crucial role in the history of ecological crises of cheapness has been detailed in[29].

To recapitulate, M1 extends spatio-temporal boundaries of the food system mainly through flows of machinery/equipment and subsidies which can generate some positive environmental results in farm sites and negative ones elsewhere. Financing such expected environmental net benefits in farm-sites with surplus from other economic activities is thermodynamically incoherent because a growing economy cannot be decoupled from environmental pressures[48][49][50]. The ecologically-minded re-capitalisation of farms and other environmental measures that negatively affect food prices by omitting the socio-ecological processes (the rest of the economy) that re-direct cheapness into food

products are nonetheless discursively conceived as temporary actions with definitive results after which thermodynamic incoherence is dissolved.

This ambiguity may invite efforts to produce a detailed and extensive accounting of the net-benefits of boundary reshuffling of food systems to determine how much can such and such type of measures and approaches extend the duration of existing socio-ecological relations of cheapness. Indeed, the F2F may be unsustainable in the very long term and simultaneously not actually making the problem worse, while buying time to find better solutions. Such accounting will not however be able to compute the ways in which F2F's sustainable intensification *exacerbates the problem* by increasing the complexity, geographical expansion, and ecological depth (new manipulations of life-forms), of existing unsustainable socio-ecological relations of food affordability much like previous iterations of ecological scarcity in food production solved by new flows of matter/energy.

Measures such as M1 are appropriately described as socio-ecological fixes[51][52][53]: reorganization of production that removes the symptom and exacerbates the problem by increasing the physical space and complexity of unsustainable socio-ecological relations. This is a useful term to denote the socio-ecological concreteness of the concept of space-time fixes[54][55][56]. The latter describes the drive to resolve "inner crisis tendencies by geographical expansion and geographical restructuring"[57]. F2Fs socio-ecological fixes allow for environmental degradation to be shifted across ecosystems and planetary boundaries[58][59] while generating market opportunities by "broaden[ing] inputs markets that are showing signs of stagnation or uncertain growth"[27]. It does so through the creation of farmers' debt along with new markets (e.g. genetically modified seeds and micro-organisms) and the reorganisation of space (e.g. carbon farming and fields dedicated to the generation of alternative energies). Entangled trends of ecological-, food-, investment, and cheapness-crisis are socio-ecologically postponed and displaced in space-time by streaming capital flows into fixed capital that reorganizes metabolic processes[60] with decreasing effects on the ability to generate cheapness (see[38][27]).

This vignette of a counter-claim just elaborated has ignored the role of diets and partly of regulation not because they are irrelevant for sustainability in food production but because their role in F2F's actions is quite secondary. A more prominent role would not change the nature of the counter-claim provided the socio-ecological relations of cheap food remained intact. The recurrent nature of the kind of claim produced in the F2F, which is explored in the following section, makes the development

of this counter-claim into a more robust argument along with its effective communication a worthwhile endeavour.

5. F2F DISCOURSE: Green Neo-Malthusianism

To characterize F2F's *positioned way to represent the world* [61] it is useful at this point to engage with David Harvey's[4] comparative analysis of David Ricardo, Thomas Malthus and Karl Marx's approach to the subject of resources and population and notions of scarcity. These notions are also at play in the F2F text.

Scarcity is socio-ecologically determined by symbolic appraisals of social needs and their relation to technical and environmental factors which then inform the distribution of resources[4]. For Malthus, as for Ricardo, scarcity is a self-correcting mechanism which is also partly determined by capital accumulation dynamics to which population size responds and "regulates itself by the funds which are to employ it, and therefore always increases or diminishes with the increase or diminution of capital"[4]. Malthus' "utterly dismal theorem", states the unwavering natural imperative of non-intervention in scarcity even if means starvation for the poorest, otherwise, the system's self-correcting mechanisms cannot do their (socially stratified) work.

The F2F conceives access to food as a function of individuals'' purchasing power and mediated by the market. This mode of access faces an impending threat: "feeding a fast-growing world population (...) with current production patterns"[17], under environmental degradation. Further threats may come from crises that push subsistence costs above the purchasing power of low-income citizens, and/or lead to misguided dietary choices (which are themselves socially stratified both domestically[62] [63] and transnationally[64]) which may trigger other crises such as through increasing public health costs. In the F2F, scarcity looms from behind these processes and can be staved off through supply-side management (subsidies to technology, adoption of certified practices for sustainability, and for production in general) and demand-side management (by marketing appropriate dietary shifts, not by raising wages).

Let us now contrast the two notions of scarcity. Much like in Malthus thinking, in the F2F nothing can be really done about the stratification of access to food but, contrary to Malthus, scarcity is a system failure, not a necessary feature. Part of what separates these notions of scarcity is a differing stance on economic growth. Malthus could not foresee the stretch in the domestic supply of food far beyond

domestic agroecological constraints that were to materialize a few decades after his writing. This development resulted both from the international cereals market that Great Britain was to give birth to[65] and the subsequent triumph of fossil fuels and synthetic fertilizers in agriculture.

The interaction of free trade and democracy which, as Araghi[24] put it, means the "suppression of modern working classes elsewhere in the world", narrowed the path to classist approaches to resources-population issue[12] and placed at its core the possibility of limitless growth. Neo-Malthusianism, as a particular discourse in which the world is divided into natural forces on the one hand and their technical-scientific control on the other came to occupy the role of Maltusianism in the resource-population thinking[29]. For neo-Malthusians like biologist Paul R. Ehrlich or agronomist Norman Borlaug[29] technological developments (which mostly meant sourcing off-farm inputs[45]), would be pitted against scarcity indefinitely by growing productivity perpetually. Scarcity is therein requalified as *temporarily inadequate technology for production requirements*.

Neo-Malthusianism's superstitious reliance on perpetual growth is often explained as the beguilement from the stupendous success of fossil-fueled technology or less innocently as an imperialist instrument of *soft* diplomacy[29]. But there is a case to be made that the institutional arrangements of capitalist democracies make neo-Malthusianism a very appealing and resonant discourse in such regimes. This is most apparent in rational choice models of democracy. As abstract, stylized, or overly simplistic they may be, they aptly capture the metabolic confines of capitalist democracies: the redistribution of growth is the bond that keeps the edifice together. Such models posit democracy as an institutional solution to a class conflict that constitutes a credible commitment to future redistribution (see for e.g.[66][67]). Class compromise is represented as a non-zero-sum game: workers accept the institution of profits so as not to threaten investment and future gains and capitalists accept democracy as a better alternative to the costs of militancy and radical action from labor[68]. In this model the whole institutional edifice of capitalist democracy is predicated on future gains: growth.

Democracy, understood as such compromise, is not semiotically compossible with Malthusianism which accepts no-growth economies. David Ricardo, who "accepted Malthus's principle of population without any reservations"[4], had no quarrel with the idea of a stationary state. He conceived such a scenario as the natural fate of a capitalist economy; under his model, growth had limits. In the F2F, like in neo-Malthusianism, food production needs to maintain productivity growth, without

undermining future productivity growth. There is, contrary to Ricardo and Malthus, no mention of natural or economic checks to population growth.

The notion of democratic class compromise is however extremely compatible and perhaps reliant on neo-Malthusianist discourse. Climate change and biodiversity loss-induced strain on resources that the resource-elasticity of neo-Malthusian technologies conjured have undermined its previous discursive dominance. Under accruing ecological constraints, the fundamental nexus of population-resources management and free trade and democracy (in some countries) can nonetheless be semiotically kept in place via what may be called *green neo-Malthusianism*. Like the original Malthusianism, it accepts socially stratified access to resources as a given and takes scarcity in Aristotelian terms, as a "thing in itself", an absolute (not as a function of social organization and of its particular ends[4]) that is unrelated to the structural features of society and the economy. It views the food system as separated from the economy but bound to serve it. From neo-Malthusianism, its green variant borrows the idea of perpetual growth, crucial for capitalist democracies, that has been managed, so far, by labor productivity gains in technology and the outsourcing of nutrients and food from trade. New about green neo-Malthusianism is the knowledge that the core antagonism at its root between natural constraints and the science to eliminate them is a generative interaction to which technology must henceforth abide.

6. Conclusion

We have mapped the components of F2F's practical argument and examined their consistency and validity. Food affordability, one of its central values requires an ongoing process of primitive accumulation generating continuous expansion of cheap nature and cheap food that contradicts F2F's goals. It tends to make us think of access to food in terms of food affordability. The F2F also construes the ecological crisis of the metabolic processes involved in the social consumption of food as an ensemble of discrete items: the food value chain, diets, biodiversity, climate, etc., with the economic and political dimensions severed from it. The F2F advocated means of action are subsumed in new technology which stands in as the neutral, amicable, face of socio-ecological fixes: the reshuffling of metabolic processes to postpone/displace crisis symptoms and reproduce flows of cheapness. These components, combined in the F2F, form a persuading discourse advocating growth, research, innovation, and, implicitly, the stratified access to food in the shape of income inequality. Ultimately the rebuttal of F2F's central claim concerning sustainability is a function of the spatio-temporal

boundaries we choose to evaluate it from. But this task is itself a semiotic effect of Malthusian thinking: the "conception of nature as a set of scarce resources" that invites quantitative reasoning on how much to extract from it, instead of explorations of how to live in/with it"[69]

The specific articulation of these components was characterized as a green neo-Malthusianist discourse of resources and population. The power of green neo-Malthusianism lies in the reification of sustainability under ambiguous spatio-temporal boundaries, the mystification of its key categories, and ultimately its semiotic resonance. Such mystification and resonance, it was here suggested, is rooted in the non-relational ontological stance of Aristotelian materialism that Harvey[4] discerned in Malthus's method. Green neo-Malthusianism is arguably very adequate to the market-societies, and the growth-bound democracies to which it is addressed. More importantly, it seems to resonate strongly with the (agro-)ecological science of entrepreneurial universities[70][71] that line up for F2F funding. There, research is seen as a service to perceived economic needs. To satisfy these needs food systems must be seen as unrelated to the social and cultural forms they feed, because the latter are the ones requiring the service, and the customer is always right. The analysis done here suggests that a different method is in order; that might not be deployable in most academic contexts.

Annex

Objectives		Measures
#O1 sustainable food production (less pesticides, antibiotics and fertilizers, and more organic farming)	#M1 integrated production and precision agriculture:	- "this will be achieved by implementing and enforcing the relevant environmental and climate legislation in full" (p.7) -"biotechnology and the development of bio-based products, may play a role in increasing sustainability" (p. 8)
O#2 reducing greenhouse gas emissions	#M2 Reduced use of fertilizers:	- "(...) facilitate the placing on the market of pesticides containing biological active substances and reinforce the environmental risk assessment of pesticides." (p.6)
O#3 improving farmers' incomes and affordable food	M#3 Incentives to adopt sustainable practices, implementation of new technologies, dietary changes (rising meat prices):	- "Farmers should grasp opportunities to reduce methane emissions from livestock by developing the production of renewable energy and investing in anaerobic digesters for biogas production from agriculture waste and residues, such as manure." (p. 5)
O#4 biodiversity protection	M#4 More incentives, habitat restoration targets:	- "(...) a legislative proposal and other measures to avoid or minimise the placing of products associated with deforestation or forest degradation on the EU market." (p.17)
O#5 resilient and reliable food chain and production	M#5 Approval and rapid adoption of new technologies (which do not affect production levels and/or prices), transformation of food demand on the consumer side,	- "(...) advanced bio-refineries that produce bio-fertilisers, protein feed, bioenergy, and bio-chemicals offer opportunities for the transition to a climate-neutral European economy and the creation of new jobs in primary production." (p.6)

Objectives		Measures
	digitization and training for the digitization of agriculture:	- "Farmers need to have access to a range of quality seeds for plant varieties adapted to the pressures of climate change. The Commission will take measures to facilitate the registration of seed varieties." p.8 - "Farm houses and barns are often perfect for placing solar panels and such investments should be prioritised." (p.6) - "Access to fast broadband internet will also enable mainstreaming precision farming and use of artificial intelligence. (...)[Will] allow the EU to fully exploit its global leadership in satellite technology. [Will] in a cost reduction for farmers, improve soil management and water quality, reduce the use of fertilisers, pesticides and GHG emissions, improve biodiversity and create a healthier environment for farmers and citizens." (p.15)

Table 2. *Farm to Fork's objectives and corresponding preferred means of action.*

Footnotes

[1] It is coordinated by 4 Directorates-General of the European Commission (SANTE, AGRI, ENV, MARE) and supported by the activity of the Joint Research Centre including its "Policy Lab for Sustainable Food Systems". From 2021 to 2017, *Horizon Europe*, the EU's key funding programme for research and innovation, proposed a 10 billion spending on F2F-related matters, out of a total 93.5 billion (https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en, accessed August, 2024.

[2] At the system level, cheapness/lowering production costs refers to the concrete processes that contribute to make sure that money (M) is transformed temporarily into commodities (C) in a way that can be later transformed into a higher quantity of money (M'); a cycle that Marx described as M-C-M', the general cycle of capital.

[3] The idea that decreasing food prices can lead to lower wages is not explicitly stated in a single theory but can be inferred from several economic frameworks. Classical economists like[72] argued that wages gravitate toward the subsistence level, meaning if food prices fall, the cost of living decreases, potentially leading to wage reductions. Similarly,[73] suggested that wages are tied to the cost of reproducing labor power, including food, so lower food prices could reduce wages. Historical examples, such as the Great Depression[74], show that deflationary periods with falling food prices often coincided with wage cuts. Modern labor economics also highlights how globalization and cheap food imports can suppress wages, particularly in agricultural economies[75]. These frameworks collectively suggest that declining food prices can contribute to stagnant or lower wages, especially in labor markets with weak bargaining power or surplus labor.

[4] In the very same textbook from where this example is drawn this formula is abbreviated to a version where there is no trace of N, natural resources: Q=f[L,K]

[5] At the system level, cheapness/lowering production costs refers to the concrete processes that contribute to make sure that money (M) is transformed temporarily into commodities (C) in a way that can be later transformed into a higher quantity of money (M'); cycle that Marx described as M-C-M', the general cycle of capital.

[6] This fictionalization can also be conceptualized as the outcome of the reified "non-identity of nature and society" that results from the "alienation of human beings from nature, themselves, their species and other humans"[30].

[7] I.e. outsourcing labor from territories where rights are not in place: in Egypt, 1905, by then a British colony, hundreds of thousands of children began to be conscripted annually in cotton worm campaigns to eradicate cotton-eating caterpillars[76].

[8] An apt illustration of this point is the pro-free trade argument put forward in a British parliamentary debate in 1846 on the benefits of abolishing the protectionist Corn Laws: "foreign nations would become valuable colonies to us, without imposing on us the responsibility of governing them" (cit. in[36]:64).

[9] Bones were dissolved in sulphuric acid "in shifts often lasting over 12 hours, they worked with sulfuric acid which dissolved their clothes and burned their flesh. The workers were mostly European

immigrants who had no ability to protest conditions, and to strike was to take your life into your hands."[29].

[10] An indicative value: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en, accessed August, 2024.

[11] Political backing for this kind of subsidies can nonetheless be well intentioned and ecologically minded. The Heinrich-Böll-Stiftung, a German think tank affiliated with the German Green Party, puts it in a way that represents a lot sensible requests for subsidizing farmers for services of nature conservation and carbon management: https://eu.boell.org/en/2024/03/20/eu-sustainable-food-system

[12] The successive expansion of suffrage made the "let the poor starve" a less palatable policy proposal.

References

1. ^*FAO, IFAD, UNICEF, W. and W. (2022). "Food Security and Nutrition around the world". In: The State of Food Security and Nutrition in the World 2022.*
2. ^*Herforth A, Bai Y, Venkat A, Mahrt K, Ebel A, Masters WA. (2020). "Cost and affordability of healthy di ets across and within countries." In Cost and affordability of healthy diets across and within countries. d oi:10.4060/cb2431en.*
3. ^*World Business Council for Sustainable Development. (2022). Food Affordability - How can the food in dustry provide affordable, nutritious foods to support healthy and sustainable diets?*
4. a, b, c, d, e, f, g, h, i, j*Harvey D (1974). "Population, Resources and the Ideology of Science". Economic Geo graphy. 50(3): 256–277. doi:10.2307/142863.*
5. a, b, c, d, e, f*EC- European Commission. (2020). A Farm to Fork Strategy for a fair, healthy and environm entally-friendly food system. https://agridata.ec.europa.eu/Qlik_Downloads/Jobs-Growth-sources.htm*
6. ^*Fairclough I (2014). A dialectical profile for the evaluation of practical arguments. 1–12.*
7. ^*Fairclough N (2003). Analysing Discourse: Textual Analysis for Social Research. Taylor & Francis Routl edge.*
8. a, b*Walton D. (1996). Argumentation Schemes for Presumptive Reasoning (1st ed.). Routledge. doi:10.43 24/9780203811160.*
9. a, b, c, d*Moore JW. (2015b). "Nature in the Limits to Capital (and vice versa)." Radical Philosophy. 9–19.*

10. a, b, c, d, e *Fairclough I, Fairclough N (2012). Political Discourse Analysis. A method for advanced student s. Routledge.*
11. ^ *Araghi, Farshad. (2010). The end of “cheap ecology” and the crisis of “long Keynesianism.” Economic and Political Weekly, 45(4), 39–41.*
12. a, b *Moore JW. (2015a). "Cheap food and bad climate: From surplus value to negative value in the capital ist world-ecology." Critical Historical Studies. 2(1): 1–43. doi:10.1086/681007.*
13. a, b *Moore JW. (2016). The Rise of Cheap Nature. https://orb.binghamton.edu/sociology_fac.*
14. a, b *Patel R, Moore JW. (2018). A History of the World in Seven Cheap Things. doi:10.1525/978052096637 6.*
15. ^ *Fairclough N (2013). "Critical discourse analysis and critical policy studies". Critical Policy Studies. 7 (2): 177–197. doi:10.1080/19460171.2013.798239.*
16. ^ *Blair JA (2012). "Walton’s Argumentation Schemes for Presumptive Reasoning: A Critique and Develop ment". Argumentation Library. 21: 137–146. doi:10.1007/978-94-007-2363-4_11.*
17. a, b *EC - European Commission. (2021). INCEPTION IMPACT ASSESSMENT - Sustainable food system fr amework initiative. Proposal for a Regulation of the European Parliament and the Council. https://ipbe s.net/global-assessment.*
18. ^ *Benton T, Bieg C, Harwatt H, Pudassaini R, Wellesley L (2021). "Food system impacts on biodiversity lo ss Three levers for food". In: Energy, Environment and Resources Programme. Issue February.*
19. a, b *Wesseler J. The EU’s farm-to-fork strategy: An assessment from the perspective of agricultural econo mics. Applied Economic Perspectives and Policy. 44(4): 1826–1843. doi:10.1002/aepp.13239.*
20. a, b *FAO. (2021). "OECD-FAO Agricultural Outlook 2021–2030". In: OECD-FAO Agricultural Outlook 202 1–2030. http://dx.doi.org/10.1787/agr-outl-data-%0Ahttp://www.fao.org/documents/card/en/c/cb533 2en*
21. a, b *Snyder F. CAP. In: Jones E, Menon A, Weatherill S, editors. The Oxford Handbook of the European Uni on. Oxford University Press; 2013. doi:9780199546282.013.0034.*
22. ^ *Klingensmith JZ. (2019). Introduction to Microeconomics. Affordable Course Transformation: The Pen nsylvania State University.*
23. ^ *Polanyi K. (2002). The Great Transformation - The Political and Economic Origins of Our Time (2nd e d.). Beacon Press.*
24. a, b, c *Araghi F (2003). "Food regimes and the production of value: Some methodological issues". The Jo urnal of Peasant Studies. 30(2): 41–70. doi:10.1080/03066150412331311129.*

25. ^ *Bernstein H (2001). ""The Peasantry" in Global Capitalism: Who, Where and Why?". Socialist Register. 37.*

26. ^ *Freeden M (1996). Ideologies and Political Theory. A Conceptual Approach. Clarendon Press.*

27. a, b, c, d, e, f *Molina MG de, Petersen PF, Peña FG, Caporal FR. (2019). Political Agroecology: Advancing th e Transition to Sustainable Food Systems (1st ed.). CRC Press. doi:10.1201/9780429428821.*

28. ^ *Moore JW. (2010). "The End of the Road? Agricultural World-Ecology, 1450–2010." Journal of Agraria n Change. 10(3): 389–413.*

29. a, b, c, d, e, f, g *Stone GD. (2022). The Agricultural Dilemma: How not to Feed the World (1st ed.). Routledg e.*

30. a, b *Napoletano BM, Urquijo PS, Paneque-gálvez J, Clark B, York R, Franch-pardo I, Méndez-lemus Y, Vi eyra A. (2018). "Has (even Marxist) political ecology really transcended the metabolic rift?" Geoforum. 92(March): 92–95.*

31. ^ *Moore JW. (2014). "The End of Cheap Nature. Or How I Learned to Stop Worrying about "The" Environ ment and Love the Crisis of Capitalism." In Structures of the World Political Economy and the Future of Global Conflict and Cooperation (pp. 285–314).*

32. ^ *Einzenberger R (2018). "Frontier capitalism and politics of dispossession in Myanmar: The case of the Mwetaung (Gullu Mual) nickel mine in Chin State". Austrian Journal of South-East Asian Studies. 11(1): 13–34. doi:10.14764/10.ASEAS-2018.1-2.*

33. ^ *Laungaramsri P. (2012). "Frontier capitalism and the expansion of rubber plantations in southern Lao s." Journal of Southeast Asian Studies. 43(3): 463–477. doi:10.1017/S0022463412000343.*

34. ^ *Tsing AL. Resources Natural and Capitalist Frontiers. Economic And Political Weekly. 38(48): 5100–51 06.*

35. ^ *Marx K. (1973). Grundrisse. Penguin Books.*

36. a, b, c *Perelman M. (2000). The Invention of Capitalism - Classical Political Economy and the Secret Hist ory of Primitive Accumulation. Duke University Press.*

37. ^ *Jessop B. (2015). "The symptomatology of crises, reading crises and learning from them: Some critical r ealist reflections." Journal of Critical Realism. 14(3): 238–271. doi:10.1179/1572513815Y.0000000001.*

38. a, b *Bendell, J. (2023). Beyond Fed Up: six hard trends that lead to food system breakdown. 10. www.iflas. info*

39. ^ *Taylor CA, Rising J. Tipping point dynamics in global land use. Environmental Research Letters. 16(12). doi:10.1088/1748-9326/ac3c6d.*

40. ^IPBES. (2019). The Global Assessmente Report on Biodiversity and Ecosystem Services. https://www.ipbes.net/global-assessment.

41. ^Hughes JD. (2014). Environmental Problems of the Greeks and Romans - Ecology in the Ancient Mediterranean. Johns Hopkins University Press.

42. ^Fairclough N, Jessop B, Sayer A (2002b). "Critical Realism and Semiosis". Alethia. 5(1): 2–10. doi:10.1558/aleth.v5i1.2.

43. ^Zhou X, Helmers M, Al-Kaisi M, Hanna M. Cost-effectiveness and cost-benefit analysis of conservation management practices for sediment reduction in an Iowa agricultural watershed. Journal of Soil and Water Conservation. 64(5): 314–323. doi:10.2489/jswc.64.5.314.

44. ^Garbach K, Milder JC, Declerck FAJ, Montenegro M, Wit D, Driscoll L, Gemmill-herren B, Garbach K, Milder JC, Declerck FAJ, Montenegro M (2016). Examining multi-functionality for crop yield and ecosystem services in five systems of agroecological intensification. 5903(May). doi:10.1080/14735903.2016.1174810.

45. a, b, cMolina MG de, Soto Fernández D, Guzmán Casado G, Infante-Amate J, Aguilera Fernández E, Vila Traver J, García Ruiz R. (2020). "The Social Metabolism of Spanish Agriculture 1900-2008." In Environmental History (Vol. 10). doi:10.1007/978-3-030-20900-1_2.

46. ^Sombart W. (2019). Modern Capitalism - The Pre-Capitalist Economy: A Systematic Historical Depiction Of Pan-European Economic Life From Its Origins To The Present Day [1917] (K. Nitz (ed.)).

47. ^Keenleyside C, Allen B, Hart K, Menadue H, Stefanova V, Prazan J. (2011). Delivering environmental benefits through entry-level agri-environment schemes in the EU.

48. ^Hickel J, Kallis G. (2019). "Is Green Growth Possible?" New Political Economy. 25(4): 469–486. doi:10.1080/13563467.2019.1598964.

49. ^Parrique T, Barth J, Briens F, Kerschner C, Kraus-Polk A, Kuokkanen A, Spangenberg JH. (2019). Decoupling Debunked - Evidence and arguments against growth as sole strategy for sustainability.

50. ^Ward JD, Sutton PC, Werner AD, Costanza R, Mohr SH, Simmons CT. Is decoupling GDP growth from environmental impact possible? PLoS ONE. 11(10): 1–14. doi:10.1371/journal.pone.0164733.

51. ^Chambers CL (2020). "A critique of the “socio - ecological fix ” and towards revolutionary rupture". Area. May: 1–8. doi:10.1111/area.12668.

52. ^Ekers M, Prudham S (2017b). "The Socioecological Fix: Fixed Capital, Metabolism, and Hegemony". Annals of the American Association of Geographers. 108(1): 17–34.

53. ^Ekers M, Prudham S (2017a). "The Metabolism of Socioecological Fixes: Capital Switching, Spatial Fixes, and the Production of Nature". Annals of the American Association of Geographers. 107(6): 1370–1388.

54. ^Harvey D. (2003). The New Imperialism. Oxford University.

55. ^Jessop B. (2012). "Narratives of Crisis and Crisis Response: Perspectives from North and South." In P. Uting, Razavi S., & R. V. Buchholz (Eds.), The Global Crisis and Transformative Social Change (pp. 23–42). Palgrave Macmillan. doi:10.1057/9781137002501_2.

56. ^Jessop B, Brenner N, Jones M. (2008). "Theorizing sociospatial relations." Environment and Planning D: Society and Space. 26(3): 389–401. doi:10.1068/d9107.

57. ^Harvey D. (2001). "Globalization and the "spatial fix"." Geographische Revue. 3(2): 909–916. doi:10.1115/1.2911900.

58. ^Rockström J, Steffen W, Noone K, Persson Å, Chapin FS, Lambin EF, Lenton TM, Scheffer M, Folke C, Schellnhuber HJ, Nykvist B, De Wit CA, Hughes T, Van Der Leeuw S, Rodhe H, Sörlin S, Snyder PK, Costanza R, Svedin U, ... Foley JA. A safe operating space for humanity. Nature. 461(7263): 472–475. doi:10.1038/461472a.

59. ^Steffen W, Richardson K, Rockström J, Cornell SE, Fetzer I, Bennett EM, Biggs R, Carpenter SR, De Vries W, De Wit CA, Folke C, Gerten D, Heinke J, Mace GM, Persson LM, Ramanathan V, Reyers B, Sörlin S. Planetary boundaries: Guiding human development on a changing planet. Science. 347(6223). doi:10.1126/science.1259855.

60. ^Moore JW. (2011). "Transcending the metabolic rift: a theory of crises in the capitalist world-ecology." The Journal of Peasant Studies. 38(1): 1–46. http://www.informaworld.com.

61. ^Fairclough N, Jessop B, Sayer A (2002a). "Critical Realism and Semiosis". Alethia. 5(1): 2–10. doi:10.1558/aleth.v5i1.2.

62. ^Darmon N, Drewnowski A (2008). "Does social class predict diet quality?". The American Journal of Clinical Nutrition. 87(5): 1107–1117. doi:10.1093/ajcn/87.5.1107.

63. ^Domański H, Karpiński Z, Przybysz D, Straczuk J (2015). "Social Stratification and Eating". Ask -Research & Methods. 24: 3–18.

64. ^Friedmann H (2005). "From Colonialism to Green Capitalism: Social Movements and Emergence of Food Regimes". New Directions in the Sociology of Global Development. 11(05): 227–264. doi:10.1016/S1057-1922(05)11009-9.

65. ^McMichael P. (2009). "A food regime genealogy." Journal of Peasant Studies. 36(1): 139–169. doi:10.1080/03066150902820354.
66. ^Acemoglu D, Naidu S, Restrepo P, Robinson JA (2015). "Democracy, Redistribution, and Inequality". In: Atkinson AB, Bourguignon F, editors. Handbook of Income Distribution. Elsevier B.V.; p. 1885–1966. doi:10.1016/b978-0-444-59429-7.00022-4.
67. ^Acemoglu D, Robinson JA (2006). Economic Origins of Dictatorship and Democracy. Cambridge University Press. doi:10.1017/cbo9780511510809.
68. ^Przeworski A, Wallerstein M. The Structure of Class Conflict in Democratic Capitalist Societies. The American Political Science Review. 76(2): 215–238.
69. ^Cayley D (2021). Ivan Illich: An intelectual journey. Pensylvania State University Press.
70. ^Jessop B. (2017). "Varieties of academic capitalism and entrepreneurial universities: On past research and three thought experiments." Higher Education. 73(6): 853–870. doi:10.1007/s10734-017-0120-6.
71. ^Jessop B. (2018). "On academic capitalism." Critical Policy Studies. 12(1): 104–109. doi:10.1080/19460171.2017.1403342.
72. ^Ricardo D. (2001). On the Principles of Political Economy and Taxation. [1817] (P. Sraffa & M. H. Dobb. (eds.)). Cambridge: Cambridge University Press.
73. ^Marx K. (1990). Capital - a Critique of Political Economy [1867]. Penguin Classics.
74. ^Bernanke B (2000). "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression". In: Essays on the Great Depression. Princeton University Press.
75. ^Rodrik D. (1997). Has Globalization Gone Too Far. Institute for International Economics.
76. ^Jakes A. (2016). "Boom, Bugs, Bust: Egypt's Ecology of Interest, 1882–1914." Antipode. 49(4): 1035–1059. doi:10.1111/anti.12216.

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