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# Market Dependency as Prohibitive of Agroecology and Food Sovereignty—A Case Study of the Agrarian Transition in the Scottish Highlands

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**Abstract:** While there have been calls amongst the more 'political' or 'radical' agroecology and food sovereignty advocates for a break from capitalist food systems, conceptualisations of capitalism, and thus counter-capitalism, vary widely. The movements have largely presented small-scale producers and peasants as alternatives to industrial food systems, and have focused on reducing input dependency as a path towards autonomy of producers and the realisation of agroecological food systems. An alternative to this approach is presented here through applying Ellen M. Wood's conceptualisation of capitalism as characterised by 'market dependency' to the case of the agrarian transition in the Scottish Highlands. This article demonstrates the specific ways in which market dependency, including for agricultural outputs, not just inputs, leads to a divergence from agroecological food systems. It argues that identifying 'market dependency' as a defining characteristic of capitalism could strengthen and refine the focus of agroecology and food sovereignty movements.

**Keywords:** agroecology; food sovereignty; capitalism; peasants; agrarian transition; market dependency



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## 1. Introduction

The concept of agroecology has rapidly entered mainstream food and agricultural discourse in recent decades. It has been incorporated into the work of the UN Food and Agriculture Organisation [1], advocated by the UN Special Rapporteur on the Right to Food [2], and acknowledged in the 2009 International Assessment of Knowledge, Science and Technology for Development [3]. The Food Sovereignty movement, which is considered to be one of the most significant transnational social movements in the world, has recently adopted agroecology as part of the 'path to food sovereignty' [4–9]. Yet interpretations of both agroecology and food sovereignty vary widely. This arguably stems from different understandings of the root causes of unsustainability and social inequity in food systems.

Definitions of agroecology can range from farm-level practices to food system-level transformations. At the farm level, agroecology refers to principles of agricultural production practices, which enhance, rather than degrade, ecological systems. These include recycling nutrients on farms, enhancing soils, maximising interactions between different farm components (e.g., integrating animals and crops, interplanting of companion crops), and increasing biodiversity [10]. While these practices have arguably been undertaken for thousands of years by indigenous communities [11], and while a number of scholars and political figures have pointed to the unsustainability of agricultural practices since the 18th century [12,13], the agroecology movement as it emerged from the 1960s onwards developed largely in opposition to the use of agrichemical inputs (e.g., pesticides and inorganic fertilisers), mechanisation and monocultures, as these practices are found to deplete soils, reduce agrobiodiversity, pollute waterways and cause other environmental damages [14–16].

A food systems lens to agroecology has been growing since the early 2000s, and incorporates the social aspects of food and agriculture, including dietary diversity for consumers, equities in food distribution, control over resources and other key issues related to how to construct agroecological food systems [17–21]. In short, a food systems lens to agroecology seeks to not only ensure that production is ecologically sustainable, but also that food systems are more socially just (i.e., that food is more equitably accessed and producers are compensated appropriately), and thus aligns with the aims of the food sovereignty movement.

Some of those advocating a 'food systems' approach to agroecology and the realisation of food sovereignty propose strategies which sit comfortably within capitalism, such as promoting economic diversification, local markets and using innovations to shift food retail, consumption and production practices (see [18,21]). However, a number of agroecological proponents have expressed concern that the incorporation or cooptation of agroecological principles into capitalist structures will not result in the transformations needed to ensure that food systems are ecologically sustainable while fulfilling human dietary, social and cultural needs, but instead will result in a 'greenwashed' capitalism [22] (p. 548), [23] (p. 16), [24]. These scholars, practitioners and advocates could be said to be promoting a 'political' or 'radical' approach to changing food systems, based on the premise that agroecology cannot be simply mainstreamed but requires a departure from capitalist social relations in order to be realised [8,22,25,26]. Yet details are lacking about what this would actually entail, aside from general proposals of degrowth in the West [24], decommodification of food in the commoning movement [27] and general support for small-scale producers [28]. Perhaps stemming from this lack of coherence and specificity, the notion of what is capitalist and what is counter-capitalist among the political agroecology and food sovereignty movements has enlivened debates about agrarian transitions and the role of the peasantry.

In general, the agroecology movement has often prioritised and privileged small-scale and peasant producers, and at times, implicitly or explicitly equated such producers with the practice of ecological farming [29] (p. 588), [30] (p. 127), [31] (p. 92), [32,33]. In the food sovereignty movement, small-scale and peasant producers comprise the majority of the membership of La Via Campesina (which literally translates to 'the peasant way') [6] (p. 607). Chayanov-inspired van der Ploeg [28,34–36] has framed peasants as antithetical to capitalism and to industrial food systems. Van der Ploeg focuses on reducing 'input dependency' to enable producers to operate in ways which are antithetical to industrial, high-input and globalised corporate agriculture. Van der Ploeg also proposes that peasants are highly productive and can easily feed the world [35].

Scholars following a fairly orthodox Marxist tradition (e.g., Bernstein [37], Brass [38]) have largely dismissed the food sovereignty and agroecology movements on the basis of the conflation of class interests within the movements. They have also pointed out that many of the demands of the food sovereignty movement are a backlash to neoliberalism, and not capitalism per se. As Jansen states, 'the food sovereignty movement does not result from, or reveal, a crisis in agrarian capitalism, but reflects a crisis of those who are unable to participate in this agrarian capitalism' [39] (p. 219). Such scholars have also expressed concern about the ability for small-scale and/or peasant producers to adequately feed the world's population, and instead have praised capitalism for its high productivity [37,39].

By contrast, 'critical friends' of the food sovereignty and agroecology movements have pointed out the conflicts of class interest and blind spots within the movements but have also recognised the potential of and need for the movements to address the social inequities and ecological precarities of the capitalist food systems [40–42]. There have also been a number of critical assessments of productivity which indicate the possibilities for agroecological production to meet humanity's food needs, provided that production is oriented towards society's food needs, rather than capitalist imperatives [43,44]. My stance is that improving clarity about capitalism (and related issues such as class differentiation) among the influential movements of food sovereignty and agroecology could help support

much-needed agrarian transformations to facilitate the realisation of more ecologically viable and socially equitable food and farming systems.

To that end, this paper proposes that a framework of 'market dependency', drawing on the work of Wood [45,46] as a defining characteristic of capitalism, can help to go beyond the stalemate between the Chayanovian and orthodox Marxist scholars and can clarify potential pathways towards the realisation of counter-capitalist food systems and thus the desiderata of political agroecology and food sovereignty. The 'market dependency' framework does not only consider the commodification agricultural *inputs* in defining agricultural production approaches, as is common in Chayanovian and other pro-peasant agroecology discourse, but also the compulsion, or necessity, of engaging in markets for the sale of agricultural *outputs*. In so doing, it has a strong focus on *what* is produced by farmers and arguably, therefore, a stronger food systems lens. In this way, it sharpens the distinction between peasants and producers which are affected by capitalist imperatives and also addresses the concerns of orthodox Marxists about the potentialities for agroecological production to meet global food needs. It argues that when producers are dependent on selling their outputs into markets (even local, small-scale ones), market imperatives affect not only how foods are produced (i.e., production practices) but also which foods are produced and how they are distributed.

In this paper, the 'market dependency' framework is applied in the form of a case study of food system changes which resulted from the agrarian transition (i.e., transition to capitalism) in the Scottish Highlands. The Scottish Highlands provide a rich case study in that the pre-capitalist food systems arguably embodied many of the principles of agroecological food systems, generating a diverse and adequate diet while enhancing and maintaining biodiverse ecosystems. Following the agrarian transition, however, the area came to be seen as inherently incapable of providing any agricultural products apart from livestock. This remains the case today: agricultural policies on the majority (86 percent) of Scotland's agricultural land support livestock production (primarily for consumption outside of Scotland) on the basis of its maintenance of cultural and landscape 'heritages' [44,47]. Meanwhile, most of the local diet is generated from beyond Scottish borders, in what is arguably an exportation of the ecological and social costs of feeding Scotland. The agricultural policies supporting this strategy are not unique to Scotland, but currently cover more than 50 percent of the agricultural land of Europe, which is similarly deemed to be 'less favoured' or 'naturally constrained' in relation to agricultural production [48].

This case study seeks to show how market dependency, even when lessened by today's agricultural subsidies in the Global North, results in the dedication of vast areas of agricultural land to the production of commodities which are not aligned with human dietary needs. In the context of a limited amount of agricultural land globally, I argue that this has significant implications for the ability for agroecological production to adequately and equitably feed the human population. This helps to demonstrate how the requirement to sell agricultural outputs into markets is an important defining feature of capitalist, non-agroecological food systems. As such, it highlights that the agroecological movement's focus on input dependency is inadequate for delineating capitalist or industrial food systems and that the concept of market dependency for outputs would help to refine the focus of the agroecology and food sovereignty movements. While this case study is focused in a country of the Global North, it is of relevance to the Global South in that during the 18th and 19th centuries, the Scottish Highlands can be considered to be a 'periphery', providing goods to the 'core' of capitalist England and lowland Scotland [49] (p. 10), [50], and thus shares some similarities with today's Global South which is seen as a 'periphery' to the 'core' Western countries within globalised capitalism [51]. Through its empirical analysis, this study seeks to concretise and nuance the concept of agroecological food systems and the framework of 'market dependency' specifically, and thus is situated within a small but growing number of geographically situated, historically formed analyses within the literature on agroecology (see, e.g., [52,53]).

The Scottish Highland case study is analysed through applying a critical realist political ecology lens to historical source material to provide a reinterpretation of secondary historical texts. It views as a dialectic the relationship between the biophysical and the social, with the latter significantly shaping our understanding of the former [54] (p. 23), [55] (p. 767). This study also acknowledges that there are properties of each realm which are indeed independent of the other [42] (p. 28). As such, this study is based on a premise that the ability of ecosystems to support human populations is neither fixed nor limitless, but highly dependent on social organisation [56] (p. 79), [57] (p. 202). With this grounding, this case study analyses the food systems pre- and post-agrarian transition, based on the 'food systems' interpretation of agroecology. While there has yet to be consensus about the definition of an agroecological food system, taking together the principles of both 'political' agroecology and food sovereignty, this study considers (a) agricultural production practices and their ecological impacts, and (b) the ability for food systems to support nutritious diets for the local population, including considerations of equity.

This paper is structured as follows. The next section provides more detail about the debates related to the definition and roles of the peasantry in food systems, including considerations of productivity. The following section provides an account of the food systems before and after the agrarian transition in the Scottish Highlands. The final section provides a discussion and concluding remarks about the implications of this case study in the Scottish and European context and for the agroecology and food sovereignty movements more widely.

## 2. Debates about Peasantry, Productivity and Land Use

In this section, I will discuss the two main opposing views of the role of small-scale producers in food systems: that of the neo-Chayanovian perspective (van der Ploeg, et al.) and that of the orthodox Marxist perspective (Bernstein, et al.), and present an alternative framing of 'market dependency' as relevant to debates about productivity, land use and diets, and thus also the aims of the agroecology and food sovereignty movements.

In an attempt to rectify the tendency to conflate all small-scale producers with peasants, van der Ploeg has developed a tripartite typology of producers. Van der Ploeg asserts that there are overlaps between these categories and that producers can shift from one category to another. In van der Ploeg's typology, the commodification of resources used to make products (i.e., control over the means of production) appears to be one of the most decisive characteristics distinguishing peasants from other producers. His three categories can broadly be summarised as follows:

- Peasants: Autonomous, pluriactive producers who strive to reduce dependency on input markets. Van der Ploeg considers peasants to be synonymous with Petty Commodity Producers, 'producing for the downstream markets but grounded on low levels of commoditisation of the main resources' [35] (p. 1004). Elsewhere, he specifies that peasants tend to be 'partly market-oriented but also partly oriented to the reproduction of the farm unit and the family' [36] (p. 2). Foods produced for markets by such peasants are seen to embody 'cultural capital' (van der Ploeg, 2008:280) and/or be considered foods with 'distinction', such as Texel Lamb from New Zealand, Parmesan from Italy and even organically certified foods [36] (p. 209–211).
- Entrepreneurs: Highly dependent on input markets. Van der Ploeg considers entrepreneurs to be Simple Commodity Producers, 'grounded on far reaching commoditisation of the main resources, but not the labour force' [35] (p. 1004).
- Capitalist farmers: Full commodification of all of the resources used for production, including the labour force [35] (p. 1004).

Van der Ploeg advocates removing constraints to the 'peasant way' as a pathway to agroecology and food sovereignty. He further argues that peasants can be embedded within capitalism but still contribute to the realisation of agroecology and food sovereignty [35] (p.1004). In sum, van der Ploeg asserts that producers can be considered as peasants (and thus contribute to the realisation of agroecology and food sovereignty) if their products are

commoditised, so long as the means of production are limited in their commodification. As will be discussed, this raises some potentially problematic issues related to the realisation of agroecological food systems, including consideration of both equity and productivity.

By contrast, Bernstein argues that what van der Ploeg considers to be peasants, i.e., Petty Commodity Producers, are actually engaged in a 'relentless microcapitalism' because they have internalised commodity relations. As such, he argues that 'there are no 'peasants' in the world of contemporary capitalist globalisation' [35] (p. 1044), thus negating the potentials for a 'peasant way' towards more ecological farming, much less a break from capitalism itself. He critiques examples of the 'cultural capital' products of peasants such as Parmesan cheese and other foods with protected designations of origin, arguing that these products represent specialised commodity production and thus contradict many of the 'virtues' that are associated with peasantry, including 'their vision of autonomy, diversity and cooperation' and their 'radically different episteme to that centred in market relations' [35] (pp. 1041, 1049). In addition to these concerns, Bernstein also appears to negate the need for the food sovereignty movement, by proclaiming that capitalist agriculture has resulted in an 'extraordinary development of productivity', while questioning the extent to which so-called peasants are capable of producing a surplus for the non-farming population [35] (pp. 1051–1052).

I agree with Bernstein that producers who engage in specialised commodity production are not necessarily aligned with the principles of agroecological food systems or radical food sovereignty. However, I disagree with Bernstein's [37] and Brass' [38] praise of capitalist productivity. Despite productivity gains, a significant proportion of the human population is inadequately nourished: 800 million experience chronic hunger and malnutrition [58,59], and dietary disease rates are high and rising, leading to 650 million obese and 255 disability adjusted life years (DALYs) [60,61]. Meanwhile, the biophysical realm on which we depend for food is being severely degraded [62–71].

It is in response to these failings of food systems to adequately feed the population in ways that can be sustained in the long term that the concept of 'market dependency' is relevant. Again, market dependency, as defined by Wood [45], includes a dependency on markets for inputs (i.e., the 'means of production') and/or outputs (i.e., the sale of products) for one's social reproduction. In this way, it differs from van der Ploeg's focus primarily on input market autonomy [36] (pp. 55–56). Wood does not indicate that *all* engagement with markets is indicative of capitalist dynamics but rather distinguishes the 'compulsion' or 'necessity' of engaging with markets from viewing engagement with markets as an 'opportunity.' Symptoms of market dependency, according to Wood, include selling goods even when prices are low, and, importantly, competing even when prices are high [46]. On this basis, Tilzey [42] (p. 170) proposes that van der Ploeg has conflated Petty Commodity Producers with peasant producers in his typology. He argues that producers which are dependent on capitalist output markets, even if they do not employ or commodify wage labour (i.e., in their input markets), should be considered entrepreneurial producers, not peasants.

Arguably, producers which depend wholly or partially on the sale of their products into markets will operate in ways that are different from producers who do not *need* to produce for a market [25,42,45,46]. In relation to agroecology and food sovereignty specifically, I argue that market dependency, as defined by Wood, can cause a divergence from agroecological food systems and food sovereignty in two main ways: downward pressure on the costs of production, and a prioritisation of products with high economic returns. As we shall see, these are distinct but interlinked.

The first, that market competition results in a downward pressure on the costs of production, is the most obvious, and notoriously results in ecological and social compromises. Cost savings are often made through substituting agrichemical inputs for labour inputs (e.g., the use of insecticides instead of more labour-intensive approaches to pest management such as manual removal) [72] or for ecological processes (e.g., insecticide use instead of cultivating or maintaining habitats for natural predators of pests), resulting in clear di-

vergences from agroecological production principles. Cost-cutting through reducing labour requirements can also include mechanisation, which in turn favours uniformity. Or, in the case of the Scottish Highlands, as we shall see, labour cost savings can be achieved through extensive livestock farming. Cost pressures also impact on labour conditions and on labour–capital ratios, encouraging downward pressure on workers' wages and/or minimisation of paid labour, such as by using volunteers and self-exploitation [42,73–75]. Additionally, producers often respond to downward pressure on their costs of production (and the pressure to prioritise products with higher exchange values) through simplifying their outputs and focusing on a small number of products, which in turn reduces agroecosystem diversity. This was a key dynamic in Highland Scotland, as will be discussed.

Tilzey (2018) argues that these downward pressures can even occur for producers which are producing 'local', 'ecological' and 'quality' foods: the same products which van der Ploeg believes to embody the 'cultural capital' which is 'intrinsic to the peasant principle' [34] (pp. 279–280). While some scholars have defined producers of this sort as 'post-productivist' and counter to corporate and industrial food interests (see [76–78]), Tilzey argues that their dependency on 'economies of scope' and niche markets only provides a temporary relief from the pressures of competition [42] (p. 169). As more producers enter a market, be it organic, geographically protected, etc., competition leads to the downward pressures on biophysical and social resources already noted.

The second effect, which is arguably as important but much less recognised by the agroecological literature, is the prioritisation of products with a higher 'exchange value' over the production of products with a higher 'societal use value' [45]. This can, and does, result in biophysical and social resources being diverted away from human society's dietary needs, in favour of commodity production. In other words, resources become dedicated to the production of, for example, 'discretionary' and 'niche' foods and drinks, along with other products which fail to contribute to healthy diets (e.g., animal feed and biofuels). Discretionary foods and drinks counteract, rather than contribute to, healthy diets and include sugary drinks, ultra-processed cakes and confectionary, tea, coffee, alcohol, crisps, 'instant' noodles, ultra-processed meats, etc. Niche foods are, by definition, exclusive, and their access is typically limited to affluent or educated consumers. Some niche foods might be discretionary (e.g., jams) while others could contribute to healthy diets (e.g., high-quality meat in moderation and salad leaves). Even when niche foods are generated using ecological approaches, however, they fail to contribute to equitable diets and thus represent a divergence from the more 'political' aims of agroecology and food sovereignty, which focus on social equity.

Some agroecology advocates call for government support to enable lower-income consumers to access ecologically produced foods and thus make them less 'niche.' McMichael [79], for example, highlights the efforts in Brazil and in Detroit to enable low-income consumers access to local, ecological foods which would otherwise be exclusive to affluent consumers. Yet this approach does not acknowledge or address the problems stemming from the widespread use of biophysical and social agrarian resources to produce foods (and non-foods) which are not needed by our society.

Many scholars insist that in order to meet growing food demands and avoid encroaching on non-agricultural habitats, there is a need to intensify production [80–82], and again, orthodox Marxists have expressed concern about the ability for agroecological production, which is typically seen as extensive, to feed the world. By contrast, a recent study [43] demonstrates that by focusing its agricultural production on the foods required for a healthy diet, rather than prioritising commodity foods which are unrelated to human dietary needs, Europe could convert from a food-deficit (i.e., importing) territory to a food-sufficient territory, while reducing the amount of European land area under agricultural use and also using less productive organic approaches. At a global level, modelling has indicated that orienting food production towards dietary guidelines would enable global agriculture to significantly exceed the needs of the projected population in 2050 [83].

Other evidence further confirms the significant land savings to be had from shifting away from commodity production. A study of the Dutch diet found that land required for the country's 'discretionary' beverages alone (wine, beer, tea and coffee) comprised 12 percent of the total land required to feed the country [84]. This does not include the land required to produce other 'discretionary' foods, such as sugar, refined flours and highly processed foods which do not fit into healthy dietary guidelines. Across Europe, ultra-processed foods contribute to 33.9 percent of total purchased dietary energy, and in the UK, this figure is 50.4 percent [85]. While there are no studies to date which estimate the total biophysical and social resources dedicated to the production of 'discretionary' foods and drinks, the studies noted here indicate that the land area, energy (i.e., for processing, packaging and transport) and labour resources should be serious considerations in any discussion about agriculture's ability to meet global dietary needs. Further, a significant amount of agricultural land is now allocated to the production of biofuels [86,87] and reducing this could also alleviate the pressure to maximise yields in agriculture in order to allow for less productive approaches to be undertaken and supported.

Arguably, the majority of agroecology advocates have focused primarily on *how* things are produced and to a limited extent on how products can be made affordable to low-income consumers. However, there has yet to be a clear focus on *what* is produced and the implications of this for the capacity for agroecological approaches to 'feed the world.' In Gliessman's reiteration of his agroecology handbook to include a 'food systems' approach, there is no discussion of potential trade-offs resulting from the widespread production of coffee or other discretionary commodities. Similarly, while van der Ploeg [28,34,36] identifies ecological sustainability as one of the qualities of peasant production, his consideration of food outputs arguably fails to adequately consider equitable access and societal dietary needs. I propose that many of the foods he cites as embodying 'cultural capital' (e.g., Parmesan and Texel lamb) are not only largely exclusive to affluent and educated consumers (i.e., 'niche'), but could also be considered as 'discretionary.' As such, their production comes at the expense of producing the foods necessary for all people to have a healthy diet. Thus, while van der Ploeg primarily focuses on autonomy from 'upstream' (i.e., input) markets, I argue that the prioritisation of 'exchange value' over 'societal use value', which stems from dependency on 'downstream' markets, leads to inequalities in the food system and reduces the biophysical resources available for meeting society's dietary needs.

It is possible that the lack of consideration of what is produced among advocates of agroecology and food sovereignty stems in part from an assumption that agroecological small-scale production yields more per hectare than conventional farming (see, e.g., [35,88,89]), therefore allowing scope for discretionary commodities to be widely produced in addition to foods needed for a healthy diet. However, there have been a number of studies showing that ecological farming practices have lower yields than conventional practices [90,91]. My understanding is that productivity studies are somewhat inconclusive, in part due to the difficulties of comparing conventional and agroecological production, the tendency to conflate organic production with agroecological production, and differences in comparing productivity across different context (e.g., the Global North and Global South) [29,91]. In light of these uncertainties, I argue that ensuring that agrarian resources are used for society's food needs (rather than economic exchange values) is essential for supporting the realisation of agroecological and food sovereignty principles. Taking into account growing calls for 'rewilding' and ecological conservation in the Global North [92,93], concerns about the potentially negative effects of climate change on global agricultural productivity [94,95], and chronically high levels of malnutrition and dietary diseases further strengthens this argument.

In sum, I propose that when producers are subject to market dependency, as defined by Wood [45,46], they cannot contribute fully to the realisation of agroecology and food sovereignty principles. This is because of both downward competitive pressures which affect production practices, and because of their need to prioritise 'exchange value' over 'societal use value.' which results in a significant divergence of biophysical and social

capacities away from the production of healthy diets. The next section applies these theoretical concepts to the case of the Scottish Highlands and demonstrates how the shift to market dependency during the agrarian transition resulted in a divergence from a food systems interpretation of agroecology.

## 3. Analysis of the Agrarian Transition in the Scottish Highlands

### *3.1. What and Where Are the Highlands*

In the 14th century, Scotland was roughly divided between the Gaelic-speaking 'Highlands', or '*Gàidhealtachd*', and the English-speaking 'Lowlands' [49] (pp. 3–4). While the distinction was somewhat abstract and did not entail firm boundaries, the Highlands were roughly considered to lie north and west of the Highland Boundary Fault Line [49,96]. This area corresponds to the location of the majority of what is today considered to be 'upland' land, with the exception of the 'Southern Uplands' (in today's areas of the Borders and Dumfries and Galloway) and the Shetland and Orkney Islands (which were not part of *Gàidhealtachd* but have, at times, been included in the classification of the Highlands). The land considered to be 'upland' today comprises 86% of Scotland's agricultural land [47]. The agrarian transition in the Highlands occurred later than that of the rest of Scotland, and as such, it has been more extensively documented [49,97,98]. For this reason and given the overlap between the Highlands and the uplands, this paper focuses on the agrarian transition in the Highlands. It is anticipated that this analysis could provide insights about the agricultural potentials of the remainder of the Scottish uplands and possibly also upland areas in the EU.

The term 'uplands' refers variously to agricultural characteristics as well as socio-political designations [99,100]. In terms of agriculture, the uplands in Scotland tend to be defined as being above the upper limits of cultivated farmland, and by their use for the production of 'store lambs' (store lambs are sold for fattening on farms with better pasture) and ewes for cross-breeding on other farms, though some areas of the uplands are used for fattening store lambs as well [101]. The uplands are alternately defined as agricultural areas above 180 m and/or areas which are steeply sloped, and which are categorised as 'Less Favoured Areas' (LFAs) in the European Union's Common Agricultural Policy [100]. In the Scottish Highlands, subsidies in LFAs are justified on the premise that a continuation of livestock farming is important for protecting 'cultural heritage' and 'semi-natural' habitats [102,103]. Thus, livestock farming is considered the only viable agricultural activity in the uplands, by definition, and its continuation is supported through government subsidies.

However, from a point of view of political ecology, defining the uplands based on what is produced agriculturally on the land is problematic in that agricultural land use is not solely determined by environmental variables, but rather by the dialectic between environmental and political factors [104,105]. Indeed, a number of outlier farms producing a wide diversity of fruits, vegetables and non-livestock animal products demonstrate that the ecological potential of upland farming systems is not limited to livestock alone. Yet, less than a dozen of such farms have been identified by relevant organisations [106] and Scottish Government statistics indicate that only two to four percent of upland agricultural land is used for non-livestock agriculture [107].

While the outliers are few, they indicate that the agrarian potential of the uplands could be better aligned with the dietary needs of the human population. Overall, Scotland's agricultural production is highly dissociated from what is required for healthy diets. While livestock farming of course produces food, the majority of livestock products are consumed in England or abroad. The minority of livestock which is consumed in Scotland is sold through niche, high-value markets [108]. Further, nutritional and public health research indicates that what is most needed in Western diets is a reduction in the consumption of animal products and an increase in the consumption of vegetables, fruits and whole grains [43,60,109–112]. In Scotland, however, only 8.3 percent of agricultural land is dedicated to the production of grains, and very little of these grains contribute to healthy

diets. Instead, grain production feeds into the production of biscuits, whisky, animal feed and biofuels [107,113,114]. Fruit and vegetables are produced on only 0.38% of agricultural land [107]. In sum, very little Scottish agricultural land contributes to healthy diets, and thus, the majority of vegetables, fruits, grains and legumes consumed in Scotland must come from elsewhere. A policy researcher commented on this food strategy at the level of the UK by saying, 'Britain imports good things for public health and exports death' [115]. Other commentators have added, however, that Scotland also imports a significant amount of unhealthy food, as summarised by one activist who stated that Scotland 'exports its potatoes and imports Walkers crisps' [116].

In addition to today's outlier food producers, an analysis of historical land use and food systems also indicates that Scotland's agricultural production could be significantly different than it is today. The next section details the food and farming systems which existed in pre-capitalist clanship society in the Highlands. Subsequently, the agrarian transition and its effects on farming and food systems is detailed.

### *3.2. The Food Systems in Clanship Highland Scotland Prior to the Agrarian Transition*

#### 3.2.1. Clanship Social Property Relations

The Highlands, prior to transitioning to capitalism, were governed via a clan-based system, in which clan chiefs and elites (referred to as the *fine*) were responsible for securing the wellbeing of the clan [106], and ensuring that the clans were 'socially unified and militarily effective' [117] (pp. 10–11). The clan chiefs and *fine* acted as the 'protectors' of the clansmen and guaranteed 'secure possession of land in return for allegiance, military service, tribute and rental' (*Ibid.*). While there is no exact translation to English, the responsibilities of the clan chiefs and *fine* were referred to as *duthchas*, which roughly translates to the exercise of trusteeship [96] (p. 3). Clansmen, in turn, were considered to be part of an extended family, and an essential virtue of chiefship was compassion and ability to support those in need (*Ibid*).

In relation to agriculture, the chiefs and *fine* were required to ensure that clansmen had access to sufficient land and resources in order to produce adequate food for themselves, and some surplus to be redistributed for communal needs, such as provide for the minority of clan members who did not fully engage in agriculture (e.g., the chief, bard, and recently arrived families.) and supplying clan feasts, where everyone dined together [118] (p. 287), [119]. With the focus of clan organisation on cohesion and military needs, and in the context of low agricultural prices, agricultural production and rent paid on land were organised for sufficiency, rather than maximisation [96,120,121] (p. 23). Specifically, agriculture aimed to provide '*beathachadh boidheach*', or 'comfortable sufficiency for the clan as a whole, not just the *fine* in particular' [96] (p. 18).

The *duthchas* or trusteeship of the chiefs and *fine* was complemented with the concept of *oighreachd*, or the jurisdiction over clan land. This was based on customary agreements and personal trust, rather than formal law [96] (p. 6). Clansmen, in turn, did not have legally formalised tenures but possessed customary rights to tenancy once they, or their kin within four degrees, had inhabited the land for three generations [118].

Agricultural land was organised around *bailes*, or settlements, comprising four to 16 families, and was divided between in-bye, outfield, and shieling areas. Each of these areas entailed a combination of arable and livestock production and hosted a mosaic of ecosystem types. According to the theory of island biogeography [122,123], recent agroecologists argue that landscape mosaics are essential for supporting biodiversity in that they allow for populations of organisms to migrate to different 'islands' (i.e., areas of a landscape) in order to thrive as a species [69,124].

#### 3.2.2. Clanship Agricultural and Food Systems

In-bye (alternatively referred to as 'in-field') land was located closest to the settlement and tended to consist predominantly of arable land which was cultivated every year (rather than left to remain fallow during certain years). To ensure its continued fertility, clansmen

added manure, seaweed, turf, old thatch, bedding material, shell sand, peat and other organic matter to the soil [96,98] (p. 107), [118] (p. 159). Land in the in-bye was allocated in strips (run rigs), which were reassigned every few years to ensure equitable distribution of various qualities of farmland (i.e., wet or dry, near or far from dwelling, etc.) [96] (p. 17). The use of the 'foot plough' (known as the *cas-chrom* or *cascrome*) facilitated cultivation on rocky soils and smaller spaces (i.e., between boulders) which were unsuitable to larger ploughs [96,98,125] (p. 19). The cultivation of rocky soils was also managed through building 'lazy beds' or mounds of soil, manure and seaweed (*Ibid*), akin to what we might today refer to as 'raised beds.' Livestock inhabited in-bye and outfield areas during autumn, winter and spring. In in-fields, they grazed crop stubble and the permanent pasture which existed between the rigs. Infield areas also included some woodland and scrub (i.e., areas with sparse trees, mature heather and/or bilberry, etc.), in which livestock also grazed during winter months [126] (p. 22).

Outfield areas were larger, comprising up to hundreds of acres, and were used for arable and grazing in rotation, and were also regularly left to fallow. To prepare a portion of the outfields for cultivation, a process called 'tathing' was used in which livestock were enclosed or 'folded' on a patch of land in order to graze it and concentrate manure during the summer. The following spring this patch would be cultivated [98] (p. 107), [127]. Grazing in the outfields was communally managed, and not subdivided as in-bye land. Given the absence of historical data indicating otherwise, it is presumed that arable cultivation in outfields was distributed similarly to the cultivated areas of in-bye land. Outfield habitats included semi-permanent grasslands and heathlands, pockets of cultivation, and woodland and scrub [126].

Shieling areas, which some consider to be part of outfields, were the site of transhumance or seasonal settlements. Following the spring sowing of crops, people moved to the shielings with their livestock to prevent crops from being grazed during the vulnerable stage of establishment. There is also evidence that cultivations occurred in sheiling sites, and occasionally, shielings were converted to new permanent settlements or *bailes* [98] (p. 107). The areas near shieling sites and beyond consisted primarily of heathland, scrub and montane woodland ecosystems and at times, cultivated ecosystems.

Grazing was regulated through local courts and livestock were taken in from shieling areas and extended areas of the outfields to graze in infields and areas of outfields (i.e., those within the dyke) from autumn harvest (early August to late September) until crops were planted in early summer (June) [126] (pp. 24–25). In outfield areas, livestock grazed in folds and in woodland areas, consuming both 'under grass' and young branches of trees [98] (pp. 121–123). It is possible that livestock also consumed saplings and stripped bark in a way that may have somewhat prevented woodlands from regenerating, though evidence of this dates from the late 18th century and appears to be primarily associated with goats. Further, the use of saplings for watling (i.e., in the construction of houses and fences) is estimated to have been much more impactful on woodlands than livestock [126] (pp. 25–26). If damage to woodland had occurred, it was likely to have been primarily near to dwellings rather than in the hillier pastures where livestock had more abundant choice (*Ibid*). While Dodgshon and Olsson suggest that the availability of winter fodder limited the number of livestock which could be kept [126] (p. 22), the orientation towards sufficiency rather than maximisation would have also limited the stocking of livestock.

Overall, the amount of land cultivated or used for arable production per township in the Highlands between the 11th and 18th centuries has been estimated to be comparable to that of fertile areas of the lowlands [128] (p. 681). Arable was generally prioritised over livestock, though because ample land was available for livestock, there was limited competition between the two types of production. Indeed, as shown with rotations, livestock and arable production were complementary to one another. The widespread cultivation of crops in the uplands is noteworthy given today's discourse and practices which suggest that food production in the uplands is limited to grazing.

The main arable crops produced were oats and barley [96] (p. 19), [125,129]. Peas and rye were also cultivated but were less significant [128], and as they did not comprise rent payments, they are often overlooked in historical analyses, as discussed further below. The main livestock kept were cattle, horses, goats and sheep [130] (pp. 163–197), and dairy products such as cheese, butter and milk were regularly consumed [131] (p. 23). Evidence indicates that a wide variety of plants were also foraged, including in areas of crop production. While people visiting the Highlands perceived the cropping practices of the Gaels as poor due to what they considered a prevalence of 'weeds' (see, e.g., Survey of Tiree in 1737 [118]), later research, based on documentation from botanist explorations during the 18th century, and a review of folklore and poetry, has indicated that these 'weeds' formed a significant part of the diet, in addition to helping to cushion any potential instances of low harvests and gaps between harvests. These plants included the following:

- Silverweed (Potentilla anserina),
- Wild carrot (Daucus carota),
- Sorrel (Rumex acetosa),
- Wild spinach (Chenopodium album),
- Mugwort (Artemisia vulgaris),
- Ground elder (Aegopodium podagraria),
- Cow parsley (Anthriscus Sylvestris),
- Scotch parsley (also known as 'lovage' or 'Scots lovage') (Levisticum officinale),
- Common white blite (Chenopodium album),
- Burdock (Arctium minus, Arctium lappa) (Dodgshon does not specify whether greater or lesser burdock but other sources indicate both are prevalent in Highland Scotland),
- Nettles (Urtica dioica), and
- Common thistle (Cirsium vulgare) [98,132].

Records indicate that silverweed in particular was a significant part of the diet, and not just during times of scarcity [132] (p. 49). Rather, according to folklorist Carmichael, silverweed, whose roots were ground into flour, was considered one of the 'seven breads of the Gael' (*Ibid*). Seaweeds were also frequently collected and eaten in coastal areas, particularly dulse (*Palmaria palmata*) carrageen (*Chondrus crispus*) and sloke (*Porphyra laciniata*) [129]. Scurvy grass (*Cochlearia*), and Scots lovage (*Levisticum officinale*) were additional coastal plants which were widely consumed (*Ibid*). In woodland areas, historical evidence indicates that nuts such as hazels were widely consumed and mushrooms were also foraged and eaten [132] (pp. 32, 40–42).

The prevalence of what agronomists would later consider to be weeds not only points to the diversity and resilience of the Gaelic diet, but also the embodiment of the agroecological principle of fostering and maintaining biodiversity. Recent research has indicated that the presence of 'weeds', or non-cultivated plant species, is ecologically beneficial in that it supports a wide variety of insects and birds which, in turn, are beneficial to agriculture [133,134].

As might be expected, uncultivated meat, fish and seafood were also significant contributors to the clanship diet. In coastal areas, Martin's reports indicate that coastal foods included cod, ling, shellfish, whale, and even seals and otters [129]. Martin also indicates that the freshwater lakes (lochs) in the Western Isles provided trout and eels, and that rivers provided salmon and black mussels. While similar documentation is not available for the mainland Highlands, the large number of inland lochs and rivers indicates that such food collection would have occurred throughout the Highlands. Social property relations of clanship allowed clansmen to hunt, forage and fish for their self-sufficiency, with some regulation to ensure sustainability of resources [135] (p. 139).

The above indicates that while the production of food in the Highlands is today perceived as ecologically limited to sheep and cattle (which are also perceived as 'traditional'), a review of the clanship food system indicates that food production, foraging and hunting yielded a wide variety of plant and animal foods, providing a diverse diet. In terms of adequacy, many accounts indicate that clanship agriculture was 'backwards', and low

yielding, particularly in comparison with the lowlands [136] (p. 125). Yet other accounts have directly contradicted this perception. A report in 1630 indicated that the majority of the Highlands was 'very fertile and profitable' and that deficiencies in production in any given locality were made up by the transfer of surplus from townships and districts *within* the Highlands, and not by imported grains from lowland markets [96] (p. 70). Yields of oats and barley were three and four-fold, respectively [96] (p. 19), which is the same as those reported for the eastern areas and lowlands during the same time [137] (pp. 74–79). Some instances of famine and dearth are recorded in the Highlands at various points in medieval history, though this is reported throughout Scotland and was not confined to the Highlands in particular [120,137]. In relation to the effects of the 1690s Maunder Minimum (Little Ice Age) in the Highlands, Cullen [138] asserts that the famine was more severe in Highland Scotland than in the lowlands. However, Cullen makes this claim based on an extrapolation of dearth recorded in the Southern Uplands, the eastern areas of the uplands (Montquhitter), and in Orkney and Shetland Islands (pp. 49–52), none of which were under clanship social property relations at the time. Only one mention is made of an area of the Highlands which would have then been governed under clanship: Glenorchy. In contrast, according to Smout and Fenton [120] (p. 75), the poor weather during the Little Ice Age did not appear to have affected the Highlands in the same way as it did the lowland areas, reporting that glut was often complained of, rather than dearth. Other reports indicate that the *baile* system had prevented hunger in the Highlands during this time [96,127,129,139]. While records are limited and population information is not available from that era [140], there is little to suggest that the Highlands were less productive or less resilient than the lowlands, and some convincing evidence that clanship social property relations in fact led to higher resilience in the Highlands than in the lowlands.

In sum, the agrarian system under clanship appears to have embodied the principles of agroecology in its food systems interpretation. Namely, production (a) fostered and maintained high levels of both agricultural- and landscape-level biodiversity (including through the maintenance of ecological mosaics), (b) built soil and fertility through additions of organic matter, (c) maximised interactions between animals and crops through rotations, tathing, undergrazing, etc., and (d) sufficiently met the food needs of society on a fairly equitable basis, by orienting agrarian resources towards dietary needs and redistributing resources within the clan. While monetary exchange and trade were highly limited, they were not non-existent, and occasionally goods were sold or traded within the Highlands or other areas of Scotland [118]. However, producers were not dependent on markets for their social reproduction—their ability to continue to meet their basic needs was separate from any engagement in markets.

### *3.3. The Highland Food System Post-Agrarian Transition*

The clanship system was in decline from the 17th century through the 18th century, due to a variety of factors which are still debated today, but including efforts on behalf of the Crown and the Scottish central government to 'pacify' the area [96,97,117]. In terms of social property relations, a significant factor leading to their change was the Crown's demand, from the early to mid-17th century, for leases and charters to be formalised. This institutionalised the chief and *fine* as lairds, or landed classes, and emphasised the 'finite and revocable' terms of tenancies. While customary security of possession continued for some time, it was with increased rents and shortened leases [96] (p. 69). Land tax (formally imposed in 1667 in Scotland) further contributed to a change in the way in which chiefs treated land [96,117]. Compounding this, a number of measures were enacted by the Scottish central government and the Crown to influence the values of clan *fine* away from clanship and in favour individualism [49] (p. 6), [96] (p. 74), [141].

The agricultural 'improvement' movement further accelerated changes to social property relations in the Highlands. Considered to be part of the effort to assert political control over the Highlands, the improvements aimed to stimulate economic growth in order to make the clanship way of life less appealing to people in the Highlands [49] (pp. 58–59).

The improvement movement began as early as the mid-17th century but gained momentum after the Union of Parliaments in 1707 (*Ibid*). Strategies used in the improvement movement included subdividing open fields, levelling run rigs, draining peatland areas, encouraging specialisation and creating a network of transport to facilitate access to markets [120]. While the improvements are often cited as a set of agricultural techniques to ostensibly improve productivity, they were only feasible where land ownership was privatised and individualised, rather than held in common, and thus their imposition required associated changes to land tenure [120,142] (p. 414).

While there continue to be debates about the motivations of the improvers and the exact causes of clanship's decline, this paper focuses on the consequences of the agrarian transition from clanship to capitalism in relation to agrarian and food systems, discussed in the following sections.

#### 3.3.1. Capitalist Social Property Relations

The privatisation of land in the Highlands was considered to be the marketing of the chiefs' *duthchas* [96] and was arguably the beginning of capitalist social property relations. Instead of ensuring that all clan members had access to sufficient land and resources, land instead was leased or sold to individuals who could provide the greatest return from the commodification of surpluses. This drastic shift in social property relations has been summarised as follows:

'that land should . . . be allocated, not as a token of kinship, as a reward for allegiance or as a means of maintaining a following, but in response to the operation of competitive bidding' [143] (p.118).

This change in social property relations primarily took place during the 1760s and 1770s, though the earliest change recorded was in 1710, undertaken by the House of Argyll in Kintyre, which had been one of the largest holdings in the Highlands [49] (p. 8). The estates 'forfeited' by Jacobite supporters also became early examples of privatised holdings. From 1715, the Forfeited Annexed Estates Commission individualised land tenure on these estates, changed rotation systems and established 'colonies' of former soldiers and sailors (which may have inspired a later policy of 'wasteland colonisation') [49,144]. By 1790, nearly all clan holdings had been converted into private, individualised holdings [49,97,117]. With land tenure based on competition, the Highland population became dependent on markets. Landlords were dependent on a new class of capitalist tenant farmers for rent payments, tenants were dependent on the sale of commodities to pay rent (and purchase food and other necessities), and a class of labourers (either landless or with small plots or 'crofts') was created, which was dependent on the sale of their labour into markets to pay rent and purchase food and other necessities. Thus, the advent of private land ownership led to a situation of market compulsion or the ubiquitous dependency on markets for people's respective social reproduction. As such, the utilisation of agricultural resources shifted from providing societal use value to providing exchange value.

#### 3.3.2. Capitalist Agricultural and Food Systems

In the context of high prices for wool, under capitalist social property relations, sheep farming spread drastically in the 19th and 20th centuries. While sheep farming was relatively unknown in many parts of the Highlands in 1803, the majority of Highland land was used for sheep farms by 1840 [145] (pp. 10, 50) This change was praised by Sir John Sinclair, architect of the improvements, particularly in relation to the fact that fewer people could work the same amount of land [145] (pp. 132–133). These lower labour to land ratios created what was seen to be a 'surplus' population, which needed to be relocated or 'cleared.' While some people emigrated, the majority of the Highland population was forcibly relocated to individualised plots on the margins of estates, typically on low-quality land in coastal areas and in moorlands. These plots were specifically designed to require people to sell their labour for a minimum of 200 days per year [117] (pp. 47–48). While Sinclair was strongly opposed to communal land management, enclosing grazing areas associated with these

plots would lessen their value. The result was a 'quasi-privatised' system of crofting (i.e., private crofts and communal grazings) which still exists today [146] (p. 287).

This system had the benefit of holding population on the land as a 'labour pool' for the labour-intensive industries of fishing and kelping [96] (p. 223), and indeed, immigration was purposefully deterred and restricted in order to ensure this semi-proletarianisation [97] (p. 21). The size of plots combined with the labour requirements for kelping and fishing limited the population's ability to dedicate their time to subsistence activities. Kelping corresponded with cultivation times and thus prevented people from tending their crops [97] (p. 3). Further, seaweed, which had previously been used to build fertility of cultivated land, was commoditised and people were prevented from collecting it for use on their fields (*Ibid*). Woodland had also been enclosed (to protect landlords' financial benefits from timber) and thus local residents were unable to forage or hunt in these areas. Nor could they use the woodlands for grazing and sheltering their livestock during winter months. These enclosures also made a clear distinction between woodland and pasture, which had previously been more fluid [126] (p. 26).

Stocking levels increased from the mid-18th century onwards, and English breeds of sheep—the Blackface and the Cheviot—intensified the effect of grazing by an estimated eight-fold, in part due to their ability to stay in the hill areas for more of the year [126] (p. 29). Combined, this led to a decline in woody scrub and heather in what had once been outfield and shieling areas. Eventually, high grazing levels led to the conversion of these hill areas to grass, which was considered at the time to be an 'improvement' of pastures [126] (p. 30).

With these changes in agrarian practices came changes to diets. Consumption of meat and dairy decreased and the consumption of starches increased. Potatoes, which were introduced in 1743, became ubiquitous. Their cultivation was favoured in the context of small land parcels, given that more calories could be produced per land area from potatoes than from grains. They were also promoted by the improvers, particularly as they facilitated further subdivision of land and population increases, the latter serving the interests of business-owning landlords [117,145].

The kelping sector experienced a significant decline following the end of the Napoleonic wars in 1815, when European sources of alkali became available again. The effects of the slump in the kelping sector were intensified by a post-war recession in Britain. This led to a further dependence on sheep farming in the area and additional 'removals' or clearances of tenants to accommodate the sheep [97] (p. 48), [117] (p. 52). Tenants, on the other hand, suffered the loss of wages, and thus experienced poverty which further eroded their resilience [97] (pp. 51–53). This poverty was perceived, however, not to be a result of the contextual factors compounding the social property relations in the area, but rather a result of overpopulation, ignorance, laziness and lack of entrepreneurship (a narrative not uncommon in other colonised territories throughout the world). With this logic, immigration was encouraged and several strategies (such as delaying marriages) were followed to reduce the population [97] (pp. 42–43).

In ecological terms, the changes to agrarian practices largely contradicted agroecological principles. Agricultural diversity was drastically reduced, and the majority of land was used for two main products: sheep and potatoes. Non-agricultural biodiversity also declined, and the widespread and intensive farming of sheep resulted in a loss of woodland, scrub and heather habitats, as well as mixed farming ecosystems (i.e., those of the runrigs). The loss of rotations, fallow, soil building activities and integration of crops with animals contributed to a degradation of agricultural land. In addition, the composition of livestock changed from a combination of cattle, goats, horses and sheep to primarily sheep, in what could be considered a shift to 'mono-grazing', which particularly intensified from the mid-19th century onwards [126] (pp. 31–34). Sheep are selective graziers: they eat the young plants most nutritious to them, leading to the spread of plant species which are not grazed by sheep or even cattle [147–149]. While this change to the composition of plant species in the Highlands received attention from the late 19th century onwards because of

its impacts on profitability, ecologically speaking it also resulted in a decline in biodiversity and wildlife habitats and a significant increase in soil erosion and runoff [150–156]. On top of this, widespread drainage projects were undertaken to make way for more sheep. This not only resulted in the destruction of peat bogs but also changed the biochemistry, hydrology and sediment load of the ecosystems receiving the drained water [155,157,158].

Further, the export of sheep could be considered a 'metabolic rift' and a significant departure from nutrient cycling in the area [12]. Arguably, the initial success of high intensity sheep grazing could be attributed in part to the fertility which had accumulated during the clanship system through the strategic addition of organic matter to soils. By the 1880s, in the absence of nutrient cycling and soil building, and as a result of other effects on soil and biodiversity, the carrying capacity of the land significantly declined (Dodgshon and Olsson, 2006:30).

In relation to food diversity and availability, the diet had become drastically less diverse, and with this decrease in diversity also came a decrease in resilience, compounded by the orientation of the majority of agricultural land to an exported commodity. With the spread of potato blights in 1837 and most significantly in 1846, hunger, disease and destitution were rife. The loss of potato harvests—up to 67% in the north western islands [159] had a severe effect given that potatoes constituted a significant portion of the diet, wages had significantly declined, and cheaper foodstuffs were not available.

With a population unable to work or pay rent, and following the Poor Law of 1846 which made it more expensive for landlords to keep tenants on their properties, the push for emigration intensified, and was framed as being in the best interest of tenants and a 'solution' for progress [97] (pp. 73–86). The removals were further justified by the improvement movement, which, at the time, saw 'the departure of the redundant part of the population [as] indispensable to every kind if improvement' [97] (p. 74). It was also claimed that the land freed up from emigration would allow for larger landholdings for those who remained. However, the land which came available following evictions was not allocated for meeting the subsistence needs of the impoverished and malnourished population that remained but rather was used to enlarge sheep farms [97] (pp. 74), [80,83]. It is noteworthy that prices for wool, mutton and lamb were increasing during this time, which is likely to have strengthened the cause for evictions, while stocking densities increased by as much as 50 percent [126] (p 32), [160,161] (p. 201).

From the 1880s, sheep stocking declined as the prices for sheep products plummeted, in part due to liberalised trade. Unfortunately, this did not result in a change towards more sustainable and diverse food systems for the local population. Rather, in the context of the romantic movement, many sheep farming estates were converted to sporting and leisure estates, some of which still held (and hold) flocks of sheep to prevent the re-emergence of woodland and allow for better hunting conditions, though at lower stocking densities so as to encourage the growth of heather habitats for grouse and deer [117] (p. 64), [162,163] (p. 245).

As has been well documented, the late 19th century saw the establishment of crofting tenure in parts of what had been the Gaelic Highlands, with the 1886 Crofters Holdings Act and subsequent legislation largely lauded as protecting a 'traditional' and 'ecological' way of life through primarily through introducing security of tenancies, protecting the right to common grazing areas, and allowing crofters to collect seaweed, peat and heather [97,146,162,164]. However, land continues to be owned by private individuals (often in large estates of thousands of hectares), and security of tenure was and is today, not absolute: ultimately, tenants must pay rent to maintain their holdings. While rent is somewhat controlled, crofters are still dependent on markets for their social reproduction through either selling their labour, or the products of their labour (e.g., in the form of sheep grazed in common grazings) for their social reproduction. As such, the primary farming output that they produce is sheep, which continues to be low on labour inputs, allowing crofters to engage in other income generating opportunities [165].

Unfortunately, the agricultural production and associated ecologies of post-clanship Highlands came to be perceived as 'traditional', despite being largely shaped by capitalist

social property relations. As discussed, prior to capitalism, the Highlands were home to a mosaic of ecosystems, including woodland, scrub, heathland, grassland and mixed farming (i.e., arable and pasture) ecosystems. The losses of permanent and temporary areas of cultivation (with the exception of small in-byes of newly formed crofts) as well as woodland and scrub represent a reduction in diversity previously present in the clanship landscape 'mosaic.' Government grant schemes have since been introduced to support the restoration and protection of heather moors and species rich grasslands, which are now revered as a 'cultural landscape', supported by and supporting livestock [166] (p. 224). This support, however, ignores the fact that widespread heather moors and grassland occurred within a trajectory of ecological succession stemming from the prioritisation of exchange value over societal use value, and that the re-emergence of woodland, scrub and arable cultivation ecologies would enhance the diversity of the landscape mosaic.

There are some small movements which have sought to advocate that there is scope within the uplands for more diverse food production in alignment with agroecological production principles (see, e.g., [167–169]). However, it is difficult to imagine a widespread change in upland food systems without a significant departure from capitalist social property relations, including via a change in governance. At present, Scotland's ability to import relatively cheap foods from outside of its borders makes it difficult for producers to make a livelihood from agriculture without focusing on niche, high-value markets, again at the expense of social equity and widespread changes (i.e., niche farms must stay niche to stay in business). With the hegemony of neoliberalism and neomercantilism in Scottish (and UK) agricultural and trade policies, it does not appear as though the Scottish Government will change its agricultural policies to support local food systems in the near future [44,170]. The predominance of these ideologies across European states, which can be seen as a 'condensation' of class relations [171] likely prevents much of the 'Less Favoured Areas' of Europe from being used in ways that support agroecological food systems, and unsurprisingly leads to the majority of agroecological advocates proposing less than radical strategies for their food systems [8,172].

This section has demonstrated that the advent of capitalist social property relations led to a drastic departure from agroecological food systems. However, I argue that in the absence of widespread market dependency, high wool prices and the introduction of different breeds of sheep would have been unlikely to cause such a drastic change in land use patterns in the Highlands. Rather, it is only in the context of market dependency that local populations were driven to maximise surplus value creation, leading to over-specialisation and unsustainable intensification.

## 4. Discussion and Conclusions

The advent of market dependency in the Scottish Highlands led to a shift in local food systems from diverse, adequate, and ecologically sustainable food production, foraging and hunting, to one of low agrarian and dietary diversity, food scarcity and ecological degradation. In economic terms, sheep farming was much more 'productive' than the previous clanship food systems, but productivity gains were only made in the yields of specific, marketable commodities (primarily wool but also mutton and lamb) through reducing the ratio of labour input to output. In other words, market dependency did not result in an increase in the 'use value' of agrarian resources, but rather the opposite, as producers were not only incentivised but required to produce what would offer sufficient exchange value in order to maintain their social reproduction. In the 18th and 19th centuries, market dependency led to an inability for the local population to access diverse, adequate diets as the majority and the best land was used for sheep.

In Scotland, continued market dependency, combined with an erroneous assumption about the ecological potential of the Highlands and a lack of political priority for local food sufficiency has meant that livestock farming predominates on 85% of Scotland's agricultural land. While livestock products are not considered 'discretionary' in the same way as ultra-processed foods, there is widespread acknowledgement that what is needed

is a reduction in meat consumption in Western diets, so the use of most of Scotland's agrarian resources to produce red meat indicates a gross departure from 'societal use value' of land. Now that Scotland is able to readily import cheap foods as a 'core' country in global capitalism, its lack of local food self-sufficiency may appear irrelevant. Yet dietary inequities and inadequacies abound in Scotland today [173] and imported foods are likely produced using methods which are also contrary to agroecological principles [174]. Such trade-offs between exchange value and use value can be seen in most agrarian settings where producers are dependent on markets for their social reproduction. This is not only seen with the production of discretionary commodities (e.g., tea, sugar, coffee, chocolate, alcohol, biscuits, and ultra-processed foods) but also in the general misalignment between production and dietary need. In England and in lowland Scotland for example, in the production of grains for animals, alcohol or ultra-processed foods offers higher returns than the production of grains for direct human consumption, the latter having higher requirements for quality [113,175]. While seemingly benign in itself, on an aggregate level, what this means is that significant areas of farmland and associated resources are not used for meeting society's food needs. Again, amidst uncertainty about agroecological yields, climate change impacts on productivity and in a context of increasing ecological degradation, orienting farmland towards society's food needs appears to be an essential (though certainly not sufficient) component to the realisation of food sovereignty and political agroecology desiderata.

As discussed, some advocates equate peasants and small-scale producers with agroecological practices, and/or define such producers based on their use (or lack thereof) of commodified inputs. However, sheep farming is relatively low on inputs and, when practiced extensively such as in the uplands, has been framed by some actors (typically producer organisations) as an agroecological or 'green' farming practice, and a welcome alternative to industrial food production [102,176], in addition to being seen as supporting a 'cultural landscape.' Sheep farming is also practiced ubiquitously by crofters, small-scale producers with secure tenancies who receive, at least in discourse, strong support to continue with what is seen to be both an ecologically and culturally important practice [30,177–179]. While sheep farming per se is not intrinsically antithetical to agroecology, and indeed sheep was one of many types of animals reared during clanship times, this paper has shown that its widespread practice as it emerged under capitalist social property relations (characterised in this study as 'market dependency') went against agroecological principles. While the intensity of sheep farming has decreased from its peak in the 19th century, thus reducing to an extent its environmental impacts such as soil erosion, it has nonetheless precluded other ecosystems, including arable ones, from existing. The dedication of the majority of farmland to just one agricultural output also diverges from agroecology's principle of maximising agricultural and dietary biodiversity.

With regards to the relationship between commodification and the realisation of agroecological food systems, it is important to stress the element of 'dependency' or 'compulsion' in Wood's framework of 'market dependency.' While some products were sold into markets under clanship (in what would have been some form of commodification), the social reproduction of the population was not *dependent* on such sales. However, following the agrarian transition, landlords, tenants and semi-proletariat alike were dependent on markets for their social reproduction and thus were driven to prioritise exchange value over use value and face downward pressures in production practices. Again, while subsidies and secure tenancies were later introduced which to a certain extent *reduced* market dependency, they have not eliminated it, and producers in the Scottish uplands continue to face these difficult trade-offs. Linking back to van der Ploeg's typology, control over the means of production may not necessarily eliminate market dependency and thus may miss such important departures from agroecological food systems. As such, I argue that focusing on market dependency provides a more refined lens when analysing pathways to agroecological food systems than considering the means of production alone.

In summary, this paper argues that understanding capitalism as market dependency is of great relevance to agroecology and food sovereignty debates, which, to date, have been unclear and ambiguous about what capitalism entails and therefore what departures from it look like. It is hoped that this interpretation of capitalism might serve to clarify and strengthen the movements working towards the realisation of agroecological food systems.

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## References

1. Food and Agriculture Organisation. *FAO's Work on Agroecology: A Pathway to Achieving the SDGs*; Food and Agriculture Organisation of the United Nations: Rome, Italy, 2018.
2. De Schutter, O. *Report Submitted by the Special Rapporteur on the Right to Food*; United Nations General Assembly: New York, NY, USA, 2010.
3. International Assessment of Agricultural Knowledge, Science and Technology for Development. *Synthesis Report with Executive Summary: A Synthesis of the Global and Sub-Global IAASTD Reports*; International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD): Washington, DC, USA, 2009.
4. Borras, S.M., Jr.; Franco, J.C. Transnational agrarian movements struggling for land and citizenship rights. *Inst. Dev. Stud.* **2009**, *2009*, 1–44. [CrossRef]
5. Martínez-Torres, M.E.; Rosset, P.M. La Vía Campesina: The birth and evolution of a transnational social movement. *J. Peasant Stud.* **2010**, *37*, 149–175. [CrossRef]
6. Borras, S.M.; Franco, J.C.; Suárez, S.M. Land and food sovereignty. *Third World Q.* **2015**, *36*, 600–617. [CrossRef]
7. Desmarais, A.A. The power of peasants: Reflections on the meanings of La Vía Campesina. *J. Rural Stud.* **2008**, *24*, 138–149. [CrossRef]
8. Holt Giménez, E.; Shattuck, A. Food crises, food regimes and food movements: Rumblings of reform or tides of transformation? *J. Peasant Stud.* **2011**, *38*, 109–144. [CrossRef] [PubMed]
9. La Via Campesina. Declaration of the International Forum for Agroecology, Nyéléni, Mali: 27 February 2015. *Development* **2015**, *58*, 163–168. [CrossRef]
10. Gliessman, S. *Agroecology: Ecological Processes in Sustainable Agriculture*; Lewis Publishers: Washington, DC, USA, 1998.
11. Altieri, M. *Agroecology: The Science of Sustainable Agriculture*; Westview Press: Boulder, CO, USA, 1995.
12. Foster, J.B. Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology. *Am. J. Sociol.* **1999**, *105*, 366–405. [CrossRef]
13. Foster, J.B.; Magdoff, F. Liebig, Marx, and the depletion of soil fertility: Relevance for today's agriculture. In *Hungry for Profit*; Foster, J.B., Magdoff, F., Buttel, F.H., Eds.; NYU Press: New York, NY, USA, 2000; pp. 43–60.
14. Gomiero, T.; Pimentel, D.; Paoletti, M.G. Is There a Need for a More Sustainable Agriculture? *Crit. Rev. Plant Sci.* **2011**, *30*, 6–23. [CrossRef]
15. Pimentel, D. Soil Erosion: A Food and Environmental Threat. *Environ. Dev. Sustain.* **2006**, *8*, 119–137. [CrossRef]
16. Pimentel, D.; Houser, J.; Preiss, E.; White, O.; Fang, H.; Mesnick, L.; Barsky, T.; Tariche, S.; Schreck, J.; Alpert, S. Water Resources: Agriculture, the Environment, and Society. *BioScience* **1997**, *47*, 97–106. [CrossRef]
17. Gliessman, S. *Agroecology: The Ecology of Sustainable Food Systems*, 3rd ed.; CRC Press: Boca Raton, FL, USA, 2014.
18. Francis, C.; Lieblein, G.; Gliessman, S.; Breland, T.A.; Creamer, N.; Harwood, R.; Salomonsson, L.; Helenius, J.; Rickerl, D.; Salvador, R.; et al. Agroecology: The Ecology of Food Systems. *J. Sustain. Agric.* **2003**, *22*, 99–118. [CrossRef]
19. Rosset, P.M.; Altieri, M.A. *Agroecology: Science and Politics*; Fernwood Publishing: Halifax, NS, Canada, 2017.
20. Pimbert, M.; Lemke, S. Using agroecology to enhance dietary diversity. *UNSCN News Food Environ.* **2018**, *43*, 33–42.
21. Wezel, A.; Herren, B.G.; Kerr, R.B.; Barrios, E.; Gonçalves, A.L.R.; Sinclair, F. Agroecological principles and elements and their implications for transitioning to sustainable food systems. A review. *Agron. Sustain. Dev.* **2020**, *40*, 40. [CrossRef]

22. Giraldo, O.F.; Rosset, P.M. Agroecology as a territory in dispute: Between institutionality and social movements. *J. Peasant Stud.* **2018**, *45*, 545–564. [CrossRef]
23. Rivera-Ferre, M.G. The resignification process of Agroecology: Competing narratives from governments, civil society and intergovernmental organizations. *Agroecol. Sustain. Food Syst.* **2018**, *42*, 666–685. [CrossRef]
24. Gonzalez de Molina, M. Agroecology and Politics. How to Get Sustainability? About the Necessity for a Political Agroecology. *Agroecol. Sustain. Food Syst.* **2013**, *37*, 45–59.
25. Tilzey, M. Reintegrating economy, society, and environment for cooperative futures: Polanyi, Marx, and food sovereignty. *J. Rural Stud.* **2017**, *53*, 317–334. [CrossRef]
26. Lamine, C.; Dawson, J. The agroecology of food systems: Reconnecting agriculture, food, and the environment. *Agroecol. Sustain. Food Syst.* **2018**, *42*, 629–636. [CrossRef]
27. Holt Giménez, E.; van Lammeren, I. Can food as a commons advance food sovereignty? In *Routledge Handbook of Food as a Commons*; Vivero-Pol, L., Ferrando, T., De Schutter, O., Mattei, U., Eds.; Routledge: Oxford, UK, 2019.
28. Van der Ploeg, J.D. *Peasants and the Art of Farming: A Chayanovian Manifesto*; Practical Action Publishing, Ltd.: Rugby, UK, 2014.
29. Altieri, M.A.; Toledo, V.M. The agroecological revolution in Latin America: Rescuing nature, ensuring food sovereignty and empowering peasants. *J. Peasant Stud.* **2011**, *38*, 587–612. [CrossRef]
30. Scottish Crofting Federation. *SCF Post-Brexit Position*; Scottish Crofting Federation: Kyle, UK, 2018.
31. Holt-Giménez, E.; Altieri, M.A. Agroecology, Food Sovereignty, and the New Green Revolution. *J. Sustain. Agric.* **2013**, *37*, 90–102.
32. Parmentier, S. *Scaling-Up Agroecoogical Approaches: What, Why and How?* Food and Agriculture Organisation of the United Nations, 2014. Available online: http://www.fao.org/fileadmin/templates/agphome/scpi/Agroecology/Agroecology_Scaling-up_agroecology_what_why_and_how_-OxfamSol-FINAL.pdf (accessed on 8 January 2021).
33. Ebel, R. Are Small Farms Sustainable by Nature?—Review of an Ongoing Misunderstanding in Agroecology. *Chall. Sustain.* **2020**, *8*, 17–29. [CrossRef]
34. Van der Ploeg, J.D. *The New Peasantries: Struggles for Autonomy and Sustainability in an Era of Empire and Globalization*; Earthscan: London, UK, 2008.
35. Van der Ploeg, J.D. Peasant-driven agricultural growth and food sovereignty. *J. Peasant Stud.* **2014**, *41*, 999–1030. [CrossRef]
36. Van der Ploeg, J.D. *The New Peasantries: Rural Development in Times of Globalization*, 2nd ed.; Routledge: London, UK, 2018.
37. Bernstein, H. Food sovereignty via the 'peasant way': A sceptical view. *J. Peasant Stud.* **2014**, *41*, 1031–1063. [CrossRef]
38. Brass, T. Peasants, academics, populists: Forward to the past? *Crit. Anthropol.* **2015**, *35*, 187–204. [CrossRef]
39. Jansen, K. The debate on food sovereignty theory: Agrarian capitalism, dispossession and agroecology. *J. Peasant Stud.* **2014**, *42*, 213–232. [CrossRef]
40. Agarwal, B. Food sovereignty, food security and democratic choice: Critical contradictions, difficult conciliations. *J. Peasant Stud.* **2014**, *41*, 1247–1268. [CrossRef]
41. Patel, R. Food sovereignty. *J. Peasant Stud.* **2009**, *36*, 663–706. [CrossRef]
42. Tilzey, M. *Political Ecology, Food Regimes, and Food Sovereignty: Crisis, Resistance and Resilience*; Palgrave Macmillan: London, UK, 2018.
43. Poux, X.; Aubert, P.M. *An Agroecological Europe in 2050: Multifunctional Agriculture for Healthy Eating*; IDDRI: Paris, France, 2018.
44. Wach, E. The Potentials for food Sovereignty and Agroecology in the Scottish Uplands. Ph.D. Thesis, Coventry University, Coventry, UK, December 2019.
45. Wood, E.M. *The Origin of Capitalism: A Longer View*; Verso: London, UK, 2002.
46. Wood, E.M. The Question of Market Dependence. *J. Agrar. Chang.* **2002**, *2*, 50–87. [CrossRef]
47. Scottish Government. *Scotland Rural Development Programme 2007–2013: Rural Development Regulation (EC) No 1698-2005*; Scottish Government: Edinburgh, UK, 2010.
48. European Commission. Less Favoured Areas Scheme. Available online: https://ec.europa.eu/agriculture/rural-development-previous/2007-2013/less-favoured-areas-scheme_en (accessed on 15 January 2021).
49. Withers, C. *Gaelic Scotland: The Transformation of a Culture Region*; Routledge: London, UK, 1988.
50. Hechter, M. *Internal Colonialism: The Celtic Fringe in British National Development 1536–1966*; Transaction Publishers: NJ, USA, 1999.
51. Amin, S. *Unequal Development: An Essay on the Social Formation of Peripheral Capitalism*; The Harvester Press: Hassocks, UK, 1976.
52. Rivera-Núñez, T.; Fargher, L.; Nigh, R. Toward an Historical Agroecology: An academic approach in which time and space matter. *Agroecol. Sustain. Food Syst.* **2020**, *44*, 975–1011. [CrossRef]
53. Isgren, I. Between Nature and Modernity: Agroecology as an Alternative Development Pathway: The Case of Uganda. Ph.D. Thesis, Lund University, Lund, Sweden, February 2018.
54. Marsden, T.; Banks, J.; Bristow, G. Food Supply Chain Approaches: Exploring their Role in Rural Development. *Sociol. Rural.* **2000**, *40*, 424–438. [CrossRef]
55. Nygren, A.; Rikoon, S. Political Ecology Revisited: Integration of Politics and Ecology Does Matter. *Soc. Nat. Resour.* **2008**, *21*, 767–782. [CrossRef]
56. Benton, T. Marxism and natural limits: An ecological critique and reconstruction. *New Left Rev.* **1989**, *178*, 51.
57. FitzSimmons, M.; Goodman, D. Incorporating nature: Environmental narratives and the reproduction of food. In *Remaking Reality: Nature at the Millennium*; Braun, B., Castree, N., Eds.; Routledge: London, UK, 1998.

58. Traore, M.; Thompson, B.; Thomas, G. *Sustainable Nutrition Security: Restoring the Bridge between Agriculture and Health.*; FAO: Rome, Italy, 2012.
59. Food and Agriculture Organisation. *FAO Statistical Yearbook 2012*; Food and Agriculture Organisation of the United Nations: Rome, Italy, 2012.
60. World Health Organization. *Global Status Report on Noncommunicable Diseases 2010: Description of the Global Burden of NCDs, Their Risk Factors and Determinants*; World Health Organization of the United Nations: Geneva, Switzerland, 2011.
61. Afshin, A.; Sur, P.J.; Fay, K.A.; Cornaby, L.; Ferrara, G.; Salama, J.S.; Mullany, E.C.; Abate, K.H.; Abbafati, C.; Abebe, Z.; et al. Health effects of dietary risks in 195 countries, 1990–2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet* **2019**, *393*, 1958–1972. [CrossRef]
62. Daniel, T.C.; Sharpley, A.N.; Lemunyon, J.L. Agricultural Phosphorus and Eutrophication: A Symposium Overview. *J. Environ. Qual.* **1998**, *27*, 251–257. [CrossRef]
63. Sims, J.T.; Simard, R.R.; Joern, B.C. Phosphorus loss in agricultural drainage: Historical perspective and current research. *J. Environ. Qual.* **1998**, *27*, 277–292. [CrossRef]
64. Newbould, P. The use of nitrogen fertiliser in agriculture. Where do we go practically and ecologically? *Plant Soil* **1989**, *115*, 297–311. [CrossRef]
65. Chalmers, A.; Kershaw, C.; Leech, P. Fertilizer Use on Farm Crops in Great Britain: Results from the Survey of Fertilizer Practice, 1969–1988. *Outlook Agric.* **1990**, *19*, 269–278. [CrossRef]
66. Robinson, R.A.; Sutherland, W.J. Post-war changes in arable farming and biodiversity in Great Britain. *J. Appl. Ecol.* **2002**, *39*, 157–176. [CrossRef]
67. Economics of Land Degradation Initiative. *The Value of Land: Prosperous Lands and Positive Rewards through Sustainable Land Management*; Economics of Land Degradation Initiative, 2015. Available online: www.eld-initiative.org (accessed on 15 January 2021).
68. Potts, S.G.; Biesmeijer, J.C.; Kremen, C.; Neumann, P.; Schweigr, O.; Kunin, W.E. Global pollinator declines: Trends, impacts and drivers. *Trends Ecol. Evol.* **2010**, *25*, 345–353. [CrossRef]
69. Perfecto, I.; Vandermeer, J.H.; Wright, A.L. *Nature's Matrix: Linking Agriculture, Conservation and Food Sovereignty*; Earthscan: London, UK, 2009.
70. Berry, P.M.; Kindred, D.R.; Paveley, N.D. Quantifying the effects of fungicides and disease resistance on greenhouse gas emissions associated with wheat production. *Plant Pathol.* **2008**, *57*, 1000–1008. [CrossRef]
71. Kindred, D.; Berry, P.; Burch, O.; Sylvester-Bradley, R. Effects of nitrogen fertiliser use on green house gas emissions and land use change. *Asp. Appl. Biol.* **2008**, *88*, 1–4.
72. Goodman, D.; Sorj, B.; Wilkinson, J. *From Farming to Biotechnology: A Theory of Agro-Industrial Development*; Blackwell: Oxford, UK, 1987.
73. Ekers, M. The curious case of ecological farm interns: On the populism and political economy of agro-ecological farm work. *J. Peasant Stud.* **2019**, *46*, 21–43. [CrossRef]
74. Ekers, M.; Levkoe, C.Z.; Walker, S.; Dale, B. Will work for food: Agricultural interns, apprentices, volunteers, and the agrarian question. *Agric. Hum. Values* **2015**, *33*, 705–720. [CrossRef]
75. Akram-Lodhi, A.; Kay, C. The agrarian question: Peasants and rural change. In *Peasants and Globalization: Political Economy, Rural Transformation and the Agrarian Question*; Akram-Lodhi, A., Kay, C., Eds.; Routledge: London, UK, 2009.
76. Marsden, T. *The Condition of Rural Sustainability*; Royal van Gorcum: Assen, Netherlands, 2003.
77. Marsden, T.; Sonnino, R. Rural Development and Agri-Food Governance in Europe: Tracing the Development of Alternatives. In *Agricultural Governance: Globalization and the New Politics of Regulation*; Higgins, V., Lawrence, G., Eds.; Routledge: London, UK, 2005.
78. Morgan, K.; Marsden, T.; Murdoch, J. *Worlds of Food: Place, Power and Provenance in the Food Chain*; Oxford University Press: Oxford, UK, 2006.
79. McMichael, P. Historicizing food sovereignty. *J. Peasant Stud.* **2014**, *41*, 933–957. [CrossRef]
80. Godfray, H.C.J.; Beddington, J.R.; Crute, I.R.; Haddad, L.; Lawrence, D.; Muir, J.F.; Pretty, J.; Robinson, S.; Thomas, S.M.; Toulmin, C. Food Security: The Challenge of Feeding 9 Billion People. *Science* **2010**, *327*, 812–818. [CrossRef] [PubMed]
81. Foresight. *The Future of Food and Farming, Final Project Report*; The Government Office for Science: London, UK, 2011.
82. Foley, J. A five-step plan to feed the world. *Natl. Geogr.* **2018**, *225*, 26–58.
83. Berners-Lee, M.; Kennelly, C.; Watson, R.; Hewitt, C.N. Current global food production is sufficient to meet human nutritional needs in 2050 provided there is radical societal adaptation. *Elem. Sci. Anthr.* **2018**, *6*, 52. [CrossRef]
84. Gerbens-Leenes, P.W.; Nonhebel, S. Consumption patterns and their effects on land required for food. *Ecol. Econ.* **2002**, *42*, 185–199. [CrossRef]
85. Monteiro, C.; Moubarac, J.-C.; Levy, R.B.; Canella, D.S. Household availability of ultra-processed foods and obesity in nineteen European countries. *Public Health Nutr.* **2017**, *21*, 18–26. [CrossRef] [PubMed]
86. Molony, T.; Smith, J. Biofuels, food security, and Africa. *Afr. Aff.* **2010**, *109*, 489–498. [CrossRef]
87. Harvey, M.; Pilgrim, S. The new competition for land: Food, energy, and climate change. *Food Policy* **2011**, *36*, S40–S51. [CrossRef]
88. Badgley, C.; Moghtader, J.; Quintero, E.; Zakem, E.; Chappell, M.J.; Avilés-Vázquez, K.; Samulon, A.; Perfecto, I. Organic agriculture and the global food supply. *Renew. Agric. Food Syst.* **2007**, *22*, 86–108. [CrossRef]

89. Pretty, J.N.; Morison, J.I.L.; Hine, R.E. Reducing food poverty by increasing agricultural sustainability in developing countries. *Agric. Ecosyst. Environ.* **2003**, *95*, 217–234. [CrossRef]
90. De Ponti, T.; Rijk, B.; van Ittersum, M.K. The crop yield gap between organic and conventional agriculture. *Agric. Syst.* **2012**, *108*, 1–9. [CrossRef]
91. Seufert, V.; Ramankutty, N.; Foley, J.A. Comparing the yields of organic and conventional agriculture. *Nature* **2012**, *485*, 229–232. [CrossRef] [PubMed]
92. Jepson, P. A rewilding agenda for Europe: Creating a network of experimental reserves. *Ecography* **2016**, *39*. [CrossRef]
93. Navarro, L.M.; Pereira, H.M. Rewilding Abandoned Landscapes in Europe. In *Rewilding European Landscapes*; Pereira, H.M., Navarro, L.M., Eds.; Springer International Publishing: Cham, Switzerland, 2015; pp. 3–23.
94. Gaupp, F.; Hall, J.; Mitchell, D.; Dadson, S. Increasing risks of multiple breadbasket failure under 1.5 and 2 °C global warming. *Agric. Syst.* **2019**, *175*, 34–45. [CrossRef]
95. Trnka, M.; Rötter, R.P.; Ruiz-Ramos, M.; Kersebaum, K.C.; Olesen, J.E.; Žalud, Z.; Semenov, M.A. Adverse weather conditions for European wheat production will become more frequent with climate change. *Nat. Clim. Chang.* **2014**, *4*, 637–643. [CrossRef]
96. Macinnes, A. *Clanship, Commerce and the House of Stuart 1603–1788*; Tuckwell Press: East Linton, UK, 1996.
97. Hunter, J. *The Making of the Crofting Community*; John Donald Publishers: Edinburgh, UK, 1976.
98. Dodgshon, R.A. *No Stone Unturned: A History of Farming, Landscape and Environment in the Scottish Highlands and Islands*; Edinburgh University Press: Edinburgh, UK, 2015.
99. Mansfield, L. *Upland Agriculture and the Environment*; Badger Press: Bowness-on-Windermere, UK, 2011.
100. Glass, J.; Price, M.F.; Warren, C.R.; Scott, A. Sustainability in the Uplands: Introducing key concepts. In *Lairds, Land and Sustainability*; Glass, J., Price, M.F., Warren, C.R., Scott, A., Eds.; Edinburgh University Press Ltd.: Edinburgh, UK, 2013.
101. Holland, J.P.; Morgan-Davies, C.; Waterhouse, T.; Thomson, S.; Midgley, A.; Barnes, A. *An Analysis of the Impact on the Natural Heritage of the Decline in Hill Farming in Scotland*; Commissioned Report No. 454; Scottish Natural Heritage: Inverness, UK, 2011.
102. National Sheep Association. *The Complementary Role of Sheep in Upland and Hill Areas*; National Sheep Association: Malvern: UK, 2016.
103. Scottish Government. *Developing High Nature Value Farming and Forestry Indicators for the Scotland Rural Development Programme*; Summary Report of the Technical Working Group on High Nature Value Farming and Forestry Indicators; Rural Analytical Unit, Rural and Environment Science and Analytical Services Edinburgh; Scottish Government: Edinburgh, UK, 2011.
104. Blaikie, P.; Brookfield, H.C. *Land Degradation and Society*; Methuen: London, UK, 1987.
105. Robbins, P. *Political Ecology: A Critical Introduction*; Blackwell Publishing: Oxford, UK, 2004.
106. Permaculture Scotland ScotLAND Centres. Available online: https://scotland.permaculture.org.uk/scotland-centres (accessed on 15 January 2021).
107. Scottish Government. Economic Report on Scottish Agriculture: Section C Time Series, Number of Holdings with Crops and Grass and Area of Crops and Grass by Regional Grouping and Region, June 2001 and 2011 to 2017; Agriculture, Fisheries and Rural. 2017. Available online: https://www.gov.scot/publications/economic-report-on-scottish-agriculture-2017-edition/ (accessed on 15 January 2021).
108. Quality Meat Scotland. *The Scottish Red Meat Industry Profile*; Quality Meat Scotland: Newbridge, UK, 2017.
109. Westhoek, H.; Lesschen, J.P.; Rood, T.; Wagner, S.; De Marco, A.; Murphy-Bokern, D.; Leip, A.; van Grinsven, H.; Sutton, M.A.; Oenema, O. Food choices, health and environment: Effects of cutting Europe's meat and dairy intake. *Glob. Environ. Chang.* **2014**, *26*, 196–205. [CrossRef]
110. Friel, S.; Dangour, A.D.; Garnett, T.; Lock, K.; Chalabi, Z.; Roberts, I.; Butler, A.; Butler, C.D.; Waage, J.; McMichael, A.J.; et al. Public health benefits of strategies to reduce greenhouse-gas emissions: Food and agriculture. *Lancet* **2009**, *374*, 2016–2025. [CrossRef]
111. World Health Organization. *A Framework to Monitor and Evaluate Implementation: Global Strategy on Diet, Physical Activity and Health*; World Health Organization of the United Nations: Geneva, Switzerland, 2008.
112. World Health Organization. *Diet, Nutrition and the Prevention of Chronic Diseases, Report of a Joint WHO/FAO Expert Consultation*; World Health Organization of the United Nations: Geneva, Switzerland, 2003.
113. NFUS. What We Produce. Available online: https://www.nfus.org.uk/farming-facts/what-we-produce.aspx (accessed on 15 January 2021).
114. Scottish Government. Farmland Use—Cereals and Other Combine Crops. Available online: https://www.webarchive.org.uk/wayback/archive/20150219045120/http://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/agritopics/CerealsCombine (accessed on 8 February 2021).
115. Lang, T. How Brexit threatens Britain's food security. In *Brexit Food Thinkers Seminar*; City University Centre for Food Policy: London, UK, 2016.
116. Ritchie, P. Land Workers' Alliance Scotland Gathering. Glasgow, UK. Personal Communication, 2018.
117. Devine, T. *Clanship to Crofters War: The Social Transformation of the Scottish Highlands*; Manchester University Press: Manchester, UK, 1994.
118. Dodgshon, R.A. *Land and Society in Early Scotland*; Oxford University Press: Oxford, UK, 1981.
119. Johnston, T. *The History of the Working Classes in Scotland*; EP Publishing, Ltd.: Glasgow, UK, 1974.
120. Smout, T.C.; Fenton, A. Scottish Agriculture before the Improvers—An Exploration. *Agric. Hist. Rev.* **1965**, *13*, 73–93.

121. Gray, M. *The Highland Economy 1750–1850*; Oliver and Boyd: Edinburgh, UK, 1957.
122. MacArthur, R.H.; Wilson, E.O. *The Theory of Island Biogeography*; Princeton University Press: Princeton, NJ, USA, 1967.
123. Diamond, J.M. The island dilemma: Lessons of modern biogeographic studies for the design of natural reserves. *Biol. Conserv.* **1975**, *7*, 129–146. [CrossRef]
124. Vandermeer, J.; Perfecto, I. The Agricultural Matrix and a Future Paradigm for Conservation. *Conserv. Biol.* **2007**, *21*, 274–277. [CrossRef]
125. Whyte, D. Economy: Primary Sector: Agriculture to 1770s. In *The Oxford Companion to Scottish History*; Lynch, M., Ed.; Oxford University Press: Oxford, UK, 2001.
126. Dodgshon, R.A.; Olsson, G.A. Heather moorland in the Scottish Highlands: The history of a cultural landscape, 1600–1880. *J. Hist. Geogr.* **2006**, *32*, 21–37. [CrossRef]
127. Bil, A. *The Shieling 1600–1840: The Case of the Central Scottish Highlands*; John Donald Publishers Ltd.: Edinburgh, UK, 1990.
128. Dodgshon, R.A. Strategies of Farming in the Western Highlands and Islands of Scotland Prior to Crofting and the Clearances. *Econ. Hist. Rev.* **1993**, *46*, 679–701. [CrossRef]
129. Martin, M. *A Description of the Western Islands of Scotland: Containing a Full Account of Their Situation*; Birlinn Ltd.: Edinburgh, UK, 2018; p. 1703.
130. Dodgshon, R.A. Livestock Production in the Scottish Highlands Before and After the Clearances. *Rural Hist.* **1998**, *9*, 19–42. [CrossRef]
131. Johnson, S. *A Journey to the Western Isles of Scotland, Reprinted 2005*, 2005th ed.; Undiscovered Scotland: Livingston, UK; p. 1775. Available online: https://www.undiscoveredscotland.co.uk/usebooks/johnson-westernisles/index.html (accessed on 15 January 2021).
132. Milliken, W.; Bridgewater, S. *Flora Celtica: Plants and People in Scotland*; Birlinn Ltd.: Edinburgh, UK, 2004.
133. Marshall, E.J.; Brown, V.K.; Boatman, N.; Lutman, P.J.W.; Squire, G.R.; Ward, L.K. The role of weeds in supporting biological diversity within crop fields. *Weed Res.* **2003**, *43*, 77–89. [CrossRef]
134. Barberi, P.; Burgio, G.; Dinelli, G.; Moonen, A.C.; Otto, S.; Vazzana, C.; Zannin, G. Functional biodiversity in the agricultural landscape: Relationships between weeds and arthropod fauna. *Weed Res.* **2010**, *50*, 388–401. [CrossRef]
135. Smout, T.C.; MacDonald, A.R.; Watson, F. *A History of the Native Woodlands of Scotland, 1500–1920*; Edinburgh University Press: Edinburgh, UK, 2005.
136. Smout, T.C. Land and sea: The environment. In *The Oxford Handbook of Modern Scottish History*; Devine, T.M., Wormald, J., Eds.; Oxford University Press: Oxford, UK, 2012.
137. Whyte, I. *Agriculture and Society in Seventeenth-Century Scotland*; John Donald: Edinburgh, UK, 1979.
138. Cullen, K.J. *Famine in Scotland—The 'Ill Years' of the 1690s*; Edinburgh University Press: Edinburgh, UK, 2010.
139. Youngson, A.J. *After the Forty-Five: Economic Impact on the Scottish Highlands*; Edinburgh University Press: Edinburgh, UK, 1973.
140. Flinn, M.W. Malthus, Emigration and Potatoes in the Scottish North-West 1770–1870. In *Comparative Aspects of Scottish and Irish Economic and Social History 1600–1900*; Cullen, L.M., Smout, T.C., Eds.; Edinburgh, UK, 1977.
141. MacGregor, M. The Statutes of Iona: Text and context. *Innes Rev.* **2006**, *57*, 111–181. [CrossRef]
142. Davidson, N. The Scottish Path to Capitalist Agriculture 2: The Capitalist Offensive (1747–1815). *J. Agrar. Chang.* **2004**, *4*, 411–460. [CrossRef]
143. Cregeen, E.R. The Tacksmen and thier Successors: A study of Tenurial Reorganisation in Mull, Morvern and Tiree in the Early Eighteenth Century. *Scott. Stud.* **1969**, *13*, 93–145.
144. MacKinnon, I. Colonialism and the Highland Clearances. *North. Scotl.* **2017**, *8*, 22–48. [CrossRef]
145. Richards, E. *Debating the Highland Clearances*; Edinburgh University Press: Edinburgh, UK, 2007.
146. MacKinnon, I. 'Decommonising the mind': Historical impacts of British imperialism on indigenous tenure systems and self-understanding in the Highlands and Islands of Scotland. *Int. J. Commons* **2018**, *12*, 278–300. [CrossRef]
147. Mather, A.S. The alleged deterioration in hill grazings in the Scottish Highlands. *Biol. Conserv.* **1978**, *14*, 181–195. [CrossRef]
148. Armstrong, H.M.; Milne, J.A. The effects of grazing on vegetation species composition. In *Heaths and Moorland: Cultural Landscapes*; Thompson, B., Usher, M.B., Eds.; Stationery Office Books: London, UK, 1995.
149. Grant, S.A.; Torvell, L.; Smith, H.K.; Suckling, D.E.; Forbes, T.D.A.; Hodgson, J. Comparative studies of diet selection by sheep and cattle: Blanket bog and heather moor. *J. Ecol.* **1987**, *75*, 947–960. [CrossRef]
150. Fenton, E.W. The Influence of Sheep on the Vegetation of Hill Grazings in Scotland. *J. Ecol.* **1937**, *25*, 424–430. [CrossRef]
151. MacVean, D.N.; Lockie, J.D. *Ecology and Land Use in Upland Scotland*; Edinburgh University Press: Edinburgh, UK, 1969.
152. Boyd, J.M. Land-use planning for wildlife and natural resources in the north-west Highlands. In *The Biotic Effects of Public Pressures on the Environment*; Dufey, E., Ed.; Monks Wood Experiential Station Symposium No. 3; The Nature Conservancy: Abbotts Ripton, UK, 1967.
153. Tivy, J. Rough grazings. In *The Organic Resources of Scotland*; Tivey, J., Ed.; Oliver and Boyd: Edinburgh, UK, 1973.
154. Sansom, A.L. Upland vegetation management: The impacts of overstocking. *Water Sci. Technol.* **1999**, *39*, 85–92. [CrossRef]
155. Ramchunder, S.J.; Brown, L.E.; Holden, J. Environmental effects of drainage, drain-blocking and prescribed vegetation burning in UK upland peatlands. *Prog. Phys. Geogr. Earth Environ.* **2009**, *33*, 49–79. [CrossRef]
156. Innes, J.L. Landuse changes in the Scottish highlands during the 19th century: The role of pasture degeneration. *Scott. Geogr. Mag.* **1983**, *99*, 141–149. [CrossRef]

157. Ramchunder, S.J.; Brown, L.E.; Holden, J. Catchment-scale peatland restoration benefits stream ecosystem biodiversity. *J. Appl. Ecol.* **2012**, *49*, 182–191. [CrossRef]
158. Holden, J.; Burt, T.P. Hydraulic conductivity in upland blanket peat: Measurement and variability. *Hydrol. Process.* **2003**, *17*, 1227–1237. [CrossRef]
159. Devine, T. *The Great Highland Famine: Hunger, Emigration and the Scottish Highlands in the Nineteenth Century*; John DOnald: Edinburgh, UK, 1988.
160. MacDonald, W. Agriculture of the County of Sutherland. *Trans. Highl. Agric. Soc. Scotl.* **1880**, *12*, 83–85.
161. Hunter, J. Sheep and deer: Highland sheep farming, 1850–1900. *North. Scotl.* **1972**, *1*, 199–222. [CrossRef]
162. Hunter, J. *On the Other Side of Sorrow*; Birlinn Ltd.: Edinburgh, UK, 2014.
163. Bonn, A.; Allott, T.; Hubacek, K.; Stewart, J. *Drivers of Environmental Change in Uplands*; Routledge: London, UK, 2009.
164. MacCuish, D.J.; Flyn, D. *Crofting Law*; Butterworths/Law Society of Scotland: Edinburgh, UK, 1990.
165. Vipond, J.; Hill, G. The economic reality of farming in the hills. In *Farming's Retreat from the Hills*; Renwick, A., Waterhouse, T., Eds.; Scotland's Agricultural College (SAC) Rural Policy Centre: Edinburgh, UK, 2008.
166. Gimingham, C.H. Heaths and moorlands: An overview of ecological change. In *Heaths and Moorlands: Cultural Landscapes*; Thompson, H., Usher, M.B., Eds.; Stationery Office Books: London, UK, 1995.
167. Knox, O.G.G.; Marsden, T.J.; Warnick, S.; Birch, G.; Scherbatskoy, M.N.; Wilson, D.B.; Harvie, B.A. Improved sustainability and ecosystem services from seaweed additions to an old agricultural production system. *J. Ecol. Environ. Sci.* **2015**, *3*, 28–37.
168. Murdie, D. Donald's Hortiblog. *The Crofter*. December 2019. Available online: https://www.crofting.org/wp-content/uploads/2020/03/crofter119.pdf (accessed on 10 February 2021).
169. Blackland Centre Agricultural Research and Practice in the Outer Hebrides. Available online: https://www.blacklandcentre.org/the-question/approach/ (accessed on 15 January 2021).
170. Tilzey, M.; Potter, C. Neo-liberalism, Neo-mercantilism and Multifunctionality: Contested Political Discourses in European Post-Fordist Rural Governance. In *International Perspectives on Rural Governance: New Power Relations in Rural Economies and Societies*; Cheshire, L., Higgins, V., Lawrence, G., Eds.; Routledge: London, UK, 2007; pp. 115–129.
171. Bieler, A.; Morton, A.D. A critical theory route to hegemony, world order and historical change: Neo-Gramscian perspectives in international relations. *Cap. Class* **2004**, *28*, 85–113. [CrossRef]
172. Tilzey, M. Peasant Counter-Hegemony towards post-capitalist food sovereignty: Facing Rural and Urban Precarity. In *Resourcing an Agroecological Urbanism: Political, Transformational and Territorial Dimensions*; Tornaghi, C., Dehaene, M., Eds.; Routledge: Abingdon, UK, 2021.
173. IHME Global Burden of Disease Compare. Available online: https://vizhub.healthdata.org/gbd-compare/ (accessed on 8 February 2021).
174. Raynolds, L. The Globalization of Organic Agro-Food Networks. *World Dev.* **2004**, *32*, 725–743. [CrossRef]
175. Tiffen, H. *Crop Gaps Report: An Exploration of How Agricultural Practices of the Past Can Assist Re-Localising the Totnes Food System for the Future*; Food Link: Totnes, UK, 2013.
176. Scottish Crofting Federation. *SCF Response to 'Stability and Simplicity: Proposals for a Rural Funding Transition Period'*; Scottish Government Consultation; Scottish Crofting Federation: Kyle, UK, 2018.
177. Hunter, J. *The Claim of Crofting: The Scottish Highlands and Islands, 1930–1990*; Mainstream Publishing Company Ltd.: Edinburgh, UK, 1991.
178. Mackenzie, F. The Contribution of Crofting in the 21st Century: A Paper Commissioned by the Committee of Inquiry on Crofting. 2007. Available online: www.croftinginquiry.org (accessed on 15 January 2021).
179. Committee of Inquiry on Crofting. Crofting Inquiry Final Report. Available online: https://consult.gov.scot/agriculture-and-rural-communities/crofting-consultation-2017/supporting_documents/Shucksmith%20Report.pdf (accessed on 15 January 2021).