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Review

Agri-Food Markets towards Sustainable Patterns

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Abstract: In recent decades, the confluence of different global and domestic drivers has led to progressive and unpredictable changes in the functioning and structure of agri-food markets worldwide. Given the unsustainability of the current agri-food production, processing, distribution and consumption patterns, and the inadequate governance of the whole food system, the transition to sustainable agriculture and food systems has become crucial to effectively manage a global agri-food market able in supporting expected population growth and ensuring universal access to sufficient, safe, and nutritious food for all. Based on a critical review of the existing international literature, the paper seeks to understand the evolutionary paths of sustainability issues within agri-food markets by analyzing their drivers and trends. An extensive analysis was conducted highlighting the development and importance of the body of knowledge on the most important sustainability transition frameworks, focusing mainly on the relationship between markets, trade, food and nutrition security, and other emerging issues within agri-food markets. Finally, the study makes suggestions to extend the research in order to improve basic knowledge and to identify opportunities to design meaningful actions that can shape agri-food markets and foster their transition to sustainability.

Keywords: sustainability transitions; short food supply chains; alternative food networks; food systems; food security; nutrition; food policy; globalization; liberalization

1. Introduction

Markets can be viewed as the "*collective devices that allow compromises to be reached, not only on the nature of goods to produce and distribute but also on the value to be given to them*" [1] (p. 1229). The main function of markets is the exchange of value based on context-specific rules that are shaped by public regulations, cultural customs, civic norms and/or private contracts [2]. In particular, agri-food markets aggregate demand and supply across space and time throughout the entire food system from input supply to farm production, collection, processing, packaging, transportation, including the final consumption of retail food products [3,4]. Summarizing, agri-food markets concern the totality of the complex production, transformation and distribution activities making it possible for a crop to be consumed by eaters [5,6]. Therefore, they perform multiple fundamental functions and play a crucial role in the process of economic development [3].

Nowadays, agri-food systems and markets are under unprecedented confluence of different pressures [7]. Indeed, they are at the center of an interconnection of global environmental, economic, and social problems, and are critical in dealing with various sustainability challenges such as climate change, population growth, food insecurity and malnutrition, resource scarcity, ecosystem degradation, and biodiversity loss [7–19].

The importance of markets—in general and in the agri-food system in particular—in achieving sustainable development is demonstrated by the fact that they are mentioned in the framework of

the 2030 Agenda for Sustainable Development [20]. In particular, three targets of the Sustainable Development Goal (SDG) 2 'Zero Hunger' deal with agri-food markets and their functioning:

- Target 2.3: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.
- Target 2.b: Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round.
- Target 2.c: Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility.

The achievement of these targets (as well as of others in different SDGs) in order to meet universal human standards calls for a radical rethinking of worldwide food production and consumption patterns. Gerten et al. [21] state that "*If planetary boundaries were maintained ceteris paribus (without concurrent transition towards more sustainable production and consumption), present agricultural practices could sustain only 3.4 billion people*" (p. 3). Moreover, they argue that "*redirecting global food production and consumption onto more sustainable pathways could [. . .] increase [. . .] food supply to a level sufficient for 10.2 billion people*" [21] (p. 3). Therefore, agri-food sectors have to increase their production—as food production must be increased (by 60%–110% from 2005) to meet the expected increase in global population and food demand by 2050 [22,23]—while simultaneously decreasing the negative impact of this production and distribution [24–27].

In the context of the new development agenda, the relationship between markets, trade, food security, and nutrition is attracting increased attention. Facing the significantly growing global food demand and the changes in overall nutritional needs, meeting higher quality standards (safety, environment, welfare and ethics) and keeping food affordable are key challenges to the world [25,28,29].

This review takes part to the current debate on the sustainability of modern agri-food markets and their development by addressing issues and topics covered by the existing international literature. In particular, the review provides a framework about some recent advancements in literature regarding most prominent sustainability transition frameworks with a focus on implications for trade, food security and other emerging issues within agri-food markets, that are likely to shape the direction of future research in this area.

2. Drivers of and Trends in Agri-Food Markets

Agri-food markets have been transforming rapidly in the past decades under the confluence of several factors. These include globalization, trade liberalization, population growth, urbanization, incomes increase, policy change, shifts in food consumption patterns and diets, technological changes and environmental degradation. Global drivers have created certain meta-trends that have significantly affected the agri-food sector worldwide [30,31] resulting in implications in terms of the functioning and structure of agri-food markets as well as their contribution to food and nutrition security and agri-food systems sustainability. For a deep understanding of the evolution of agri-food markets, it is hence necessary to analyze global and domestic drivers (i.e., factors causing change) as well as trends (i.e., directions of change) [32].

Globalization is one of the most significant processes that have affected the development of agri-food markets worldwide, in developed and developing countries alike. Globalization is synonymous with the creation of a single global market, which has no protectionist barriers and is fostered by the growth of relations and trade among various countries of the world. Several authors have argued that globalization should have had a positive effect on food security by reducing the risk of a global supply shock [33], food prices in real terms [34], and their volatility [35]. Distefano et

al. [36] put that "*The expansion of global food markets brings benefits but also risks, such as shock transmission within the global network of trade relations*". Actually, in the agri-food sector, globalization has widened the gap between rich and poor countries [37] and exacerbated problems related to world hunger [38]. Grasping the opportunities offered by the global market requires physical (roads, railways, ports), intangible (telecommunication networks, vocational education and training systems) and economic institutions [37]. The diversity in infrastructure and institutional endowment, and the change in the composition of international trade are among the determinants of the asymmetric effects of globalization [37,39]. However, it would be wrong to say that globalization is bad for developing countries. Indeed, globalization has been extremely positive for some countries, such as China and India, which have managed to govern it by adopting development policies specific to the context in which they were applied and flexible enough to evolve alongside their own socio-economic systems [37]. The process of globalization highlights very complex and interconnected problems which, given the irreversibility of the phenomenon, call for different management strategies. In general, the supporters of 'food sovereignty' [40,41] have a critical opinion towards markets and call for having more rights and power to control their own food systems—including their agri-food markets, production modes—in line with their food cultures. In fact, they argue that "*food [. . .] should be produced for people and not for (international) markets dominated by transnational corporations*" [42] (p. 4780). In this respect, globalization and internationalization of food markets contributed to the standardization of dietary patterns and the diffusion of some practices that might be detrimental to health. For instance, with reference to snacking, Twine [43] put that "*expanding markets have also allowed particular snacking practices to extend across space and to be performed transnationally*" (p. 1279). Another homogenizing effect of globalization is the worldwide influence of mores, habits and traditions exerted by fast-food restaurants, for which the sociologist Ritzer [44] coined the term 'McDonaldization'.

More recently, globalization has led to the segmentation and relocation of the different stages of production, with raw materials and semi-finished inputs travelling back and forth around the world through numerous commercial intermediaries and 'long circuits' (typically used by large-scale retail distribution). The industrialization and globalization of the agri-food sector have progressively shifted the final consumption phase away from production [45]; the most evident effect of these dynamics has been the progressive dependence of the agro-food sector on the distribution sector [46]. These profound changes have led to a rise of private food standards to regulate product safety and quality [47–49], comply with tightened public food regulations as well as reduce costs and risks in increasingly complicated food supply chains [50]. In the face of both the crisis of the globalization model based on multilateral liberalization ('free-market, free-trade, laissez-faire') and the growing neo-protectionist temptations advanced by populist and nationalist movements [51], the impasse between free trade and protectionism should be solved in a fair trade perspective [52,53]. According to an approach of pragmatic liberalism, it would be possible to trade without barriers and also exercise a cultural protectionism—albeit in non-excessive doses—to enhance the distinctiveness of own agri-food products [54].

Trade liberalization is a main driver of the economic dimension of globalization process. In particular, the inclusion of agriculture in the Uruguay Round negotiations in the framework of the General Agreement on Tariffs and Trade (GATT) implied the commitment by all countries to reform agricultural policies (including agricultural markets). Indeed, the Uruguay Round Agreement on Agriculture (URAA) laid out obligations, for both developed and developing countries, concerning domestic agri-food markets and trade (e.g., reducing domestic agriculture support, decreasing export subventions). In addition to rules about agri-food trade liberalization, URAA also addressed issues relating to non-tariffs barriers, such as domestic measures on food safety and environmental protection [30].

The process of trade liberalization, initiated through the URAA, has opened up the rural economy to new opportunities and threats: it reduced government participation in agri-food markets, created new market opportunities, and relaxed controls on foreign investment, thus increasing inflows of

foreign direct investment [55]. The liberalization of the economy has had significant effects on the prices of agri-food products and their volatility [56]. In this respect, Narayanan and Gulati [30] argue that "*the direct impact of trade liberalization is usually through change in prices of commodities that have been liberalized—or the impact effect. However, it also triggers a whole range of second-round effects through factor prices, income, investment, employment and demand linkages*". Additionally, the level of the transmission of global prices to domestic agri-food markets depends on how much the latter are integrated in international markets; in fact, local conditions are important for price transmission and can even result more significant than trade for some agri-food products [57]. According to FAO [58], "*measures such as import duties, export taxes, non-tariff barriers or domestic policy such as support, all influence the extent to which price changes in domestic markets mirror those on international markets*".

The increased trade liberalization influenced in different ways the agri-food markets worldwide, thus changing their organization and structure. Regarding structure change, agri-food value chains moved from local and fragmented chains to geographically longer and more integrated ones. In the meantime, the importance of modern logistics and urban wholesale markets increased while that of traditional, rural traders decreased [59]. As for changes in the conduct and functioning of agri-food markets, these were induced by different factors including changes in technology (e.g., ICT), increased use of contracts in market transactions as well as the diffusion of private standards [59]. Indeed, food quality and safety standards have meaningfully shaped global agri-food value chains over the last decades [60,61].

Modern agri-food markets and value chains are characterized by a high level of vertical coordination/integration and the dominance of multinational corporations and companies [62–64]. Altenburg [65] puts that "*liberalization of global markets increases competitive pressure and enhances the role of economies of scale. This has furthered concentration processes, e.g., in manufacturing and retailing*" (p. 23). Vermeulen et al. [32] argue that "*liberalization has contributed to concentration of market power through expanding horizontal and vertical integration by market players*". In many developing countries, structural adjustment programs—promoted by the World Bank (WB) and the International Monetary Fund (IMF)—resulted in the liberalization of agri-food market which facilitated the rise of buyer-driven agri-food value chains [66] and the shift of power in favor of modern retailers and supermarkets, both in advanced economies and developing nations [47,50,63]. Some scholars argue that the liberalization of global agri-food markets created a 'food regime' dominated by transnational corporations [67] and in which consolidated market power is in the hands of a few actors that govern and control the whole value chain [68,69]. Nowadays, what distinguishes modern agri-food markets from traditional ones are: specialized logistics and centralized sourcing/procurement to achieve more supply reliability in quality/quantity terms; product traceability, quality and food safety as main drivers of vertical integration; centrality of private standards; diffusion of formalized contracts; increasing interest in Corporate Social Responsibility (CSR) [32].

There were different phases in the expansion and transformation of agri-food markets; first, there was a proliferation of small- and medium-sized enterprises (SMEs) then processes of concentration (especially in distribution/retail i.e., 'supermarket revolution'), consolidation and 'multi-nationalization' in market segments and along the agri-food supply chain (downstream, midstream, and upstream) [59]. These changes deeply influenced the whole food supply chain, from agriculture/food production to processing, transport and distribution, remodeling its structure into the shape of an hourglass: at the bottom many atomistic farmers, a few larger food processors in the middle, and at the top a huge number of various distributers [70,71]. These patterns are particularly evident in the developed countries such as those of the European Union (EU) [72] (Figure 1).

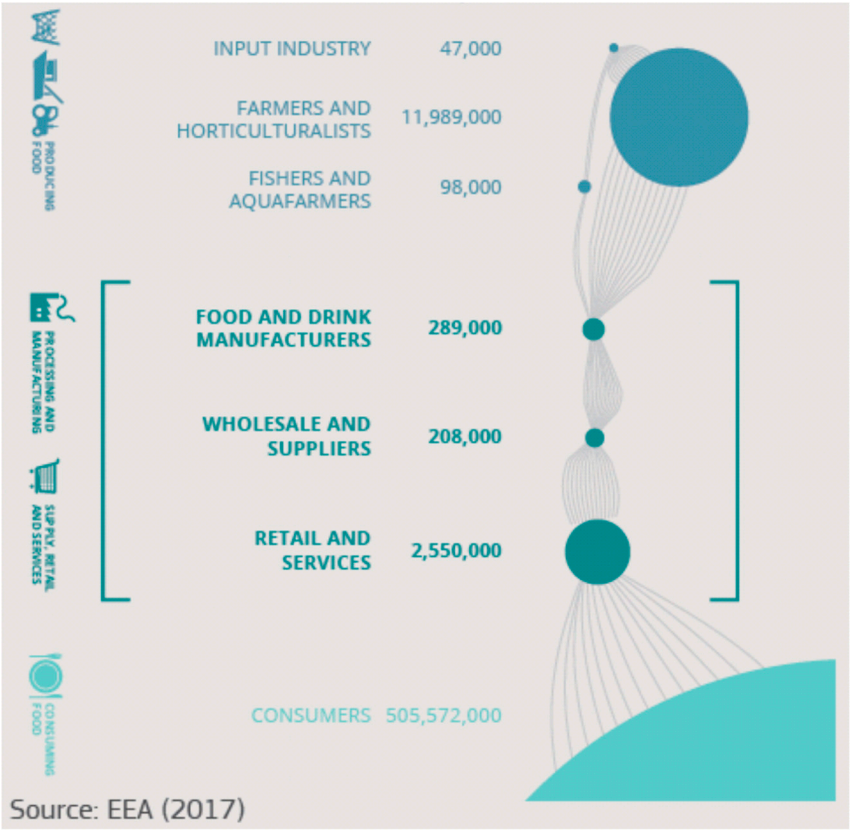

Figure 1. Actors and their relative weights in the agri-food market of the EU. Source: EEA [72].

Narayanan and Gulati [30] highlight that liberalized, globalized agri-food markets raised several issues such as access by the poor to market information, inputs and financial services (e.g., credit, insurance). Hazell [73] puts that "*the small farmer is increasingly being asked to compete in markets that are much more demanding in terms of quality and food safety, and which are much more concentrated and integrated. These changes offer new opportunities to small farmers who can successfully access and compete in these transformed markets, but they are also serious threats to those who cannot*" (p. 105). Market failures, compounded with failures in public policies, can impede the active participation of the poor and smallholders in the agri-food market [74]. Indeed, Narayanan and Gulati [30] "... *have highlighted structural and institutional factors that result in high transactions costs often constraining the smallholder from exploiting opportunities opened by trade or intensify the adverse impacts*" (p. 43). Anyway, there is rather a mixed evidence on the effects of the modernization of agri-food value chains and markets on smallholders [75]; supermarkets (cf. modern markets) also buy from small-scale farmers when they represent the best market option. For example, supermarkets and exporters might opt for contracting with smallholders in case of small economies of scale and labor-intensive crops (e.g., horticultural crops, such as vegetables) [76]. Furthermore, some researchers show income gains for smallholders in developing countries selling to large agro-processors or supermarkets/retailers [59]. One way to compete effectively in modern agri-food markets, thus exploiting new opportunities, is the creation of producer organizations. They are a good mechanism to link smallholders to markets [32] and can enhance the quality of produce, timeliness of delivery, and improve the access of small-scale producers to services (e.g., credit extensions) [73]. They also offer potential for economies of scale thus reducing transaction costs and financial risk, and secure producers' voice in the policy arena [77].

IFAD [59] suggests that changes in policy and dietary patterns were the main drivers of agri-food markets transformation over the past decades. Changes in policy relate to privatization and liberalization processes that decreased the control of states over agri-food markets as well as public investments in market structures and infrastructure. In the meantime, urbanization, the emergence of

modern consumption patterns, new trends in international trade and income increases have modified consumer demand and induced dietary changes, especially in emerging and developing countries. Urbanization generated an increase in the demand for highly processed and quality agri-food products in urban areas [59,64], thus contributing, together with the expansion of the middle class of the emerging areas and the increase in per capita income [38], to bring the consumption choices of large portions of the world population closer to the food styles of the richest areas of the planet (cf. 'convergence of dietary habits'). It is expected that 68% of the world's population will live in urban areas by 2050 compared to the current 55%. Most of the urban growth will be in Africa and Asia [78]. With 70% of all food already destined for consumption in urban areas [38], cities are becoming critical hotspots for the sustainability of global food systems [79,80] and in efforts for the mitigation of and/or adaptation to climate change [81,82].

3. Policies Shaping Agri-Food Markets

Agri-food markets, which are embedded in wider production systems, are affected by different general policies (e.g., technology, competition, human capital, taxes, SMEs) that affect, among others, transaction costs, investment conditions, availability of production factors, production costs, etc. The environment created by these policies affects the behavior of the market actors. Furthermore, the functioning of agri-food markets as well as their inclusiveness is influenced by policy coordination and coherence; sectoral policies can have trade-offs or synergies. Thus, it is vital to take into account the interfaces among the different policy interventions [65]. In fact, while making reference to the South African context, Thow et al. [83] argue that "*Opportunities to strengthen policy coherence across the food supply for food security and nutrition include: specific changes to economic policy relating to the food supply that achieve both food security/nutrition and economic objectives; creating links between producers and consumers, through markets and fiscal incentives that make healthy / fresh foods more accessible and affordable* . . . " (p. 1105).

Policies include trade policies (e.g., border control/protection measures, import restrictions, export subsidies) as well as many other policies that regulate domestic markets, such as [84]:

- Producer-oriented policies: producer support (e.g., input subsidies and production subsidies); market management measures (e.g., interventions to fix minimum and maximum prices for agri-food products such as food staples).
- Consumer-oriented policies: market management measures (e.g., food stocks and price controls); social protection measures (e.g., school feeding and food-for-work programs, food subsidies and cash transfers); nutrition assistance measures (e.g., food fortification/supplementation).

Governments and states regulate and govern agriculture and agri-food markets. Nevertheless, instruments and tools of market regulation depend on the goals [85]. Especially, policy instruments for agri-food trade and markets regulation vary among food-importing countries and food-exporting ones [86]. In this respect, various factors should be taken into account for the design of effective trade policies and interventions that enhance food security; these include the way food markets work [61]. Therefore, Timmer [87] puts that "*ending hunger requires that each society find the right balance of market forces and government interventions to drive a process of economic growth that reaches the poor and ensures that food supplies are readily, and reliably, available and accessible to even the poorest households*". Away from domestic policies, agri-food trade and markets are shaped by bilateral and multilateral agreements, for example, those within the current World Trade Organization (WTO) agreement (Figure 2). In fact, FAO [61] argues that "*trade and food security concerns can be better articulated in the multilateral trading system through improvements to the World Trade Organization's Agreement on Agriculture. However, the right balance needs to be struck between the benefits of collective action brought through disciplines on the use of trade policy, and the policy space required by developing countries, the identification of which needs to be informed by specific country-level needs*" (p. 2). Erokhin [88] argues that "*food security is increasingly influenced by foreign trade policies implemented by national governments*" (p. 28) and suggests devoting more attention

to trade policies to mitigate the negative impacts of distortions in agri-food trade by finding the right balance between policies for trade protection and those for trade liberalization to achieve sustainable food security.

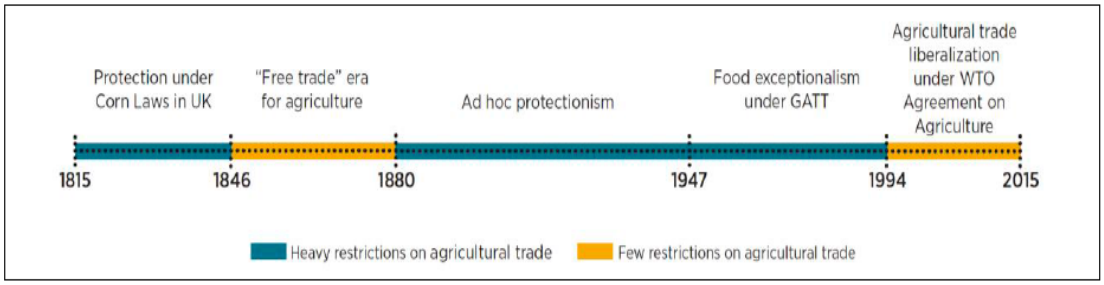

Figure 2. Agri-food trade agreements and norms between 1815 and 2015. Source: Clapp [89].

The role of governments (cf. institutions and policies) is vital through investment in market structures and infrastructure as well as the improvement of market-related services [32].

Governments in both developing and industrialized countries have always adopted the practice of granting direct and indirect subsidies and support for agricultural production, despite the fact that they distorted markets and were a high cost to taxpayers [90–92]. In general, subsidies can be a useful and beneficial tool to provide incentives to achieve goals that governments consider economically or socially desirable [93]. At the same time, public intervention in agriculture affects production and consumption patterns, as well as trade flows, with potentially significant effects on prices volatility, poverty, food security, nutrition and other sustainability issues such as climate change, changes in land use decisions and biodiversity [92]. The movement towards more open and market-oriented economies, free trade and budgetary austerity in different countries around the world has led to some changes and decreases in public subsidies. At the WTO Doha Round in 2001, many developing nations (including Brazil, China, and India) opposed agricultural subsidies in the US and EU, arguing that high subsidies were artificially lowering global crop prices, unfairly weakening small farmers in importing countries and maintaining poverty in many developing countries [91]. Currently, support to agriculture provided by governments in large emerging economies (particularly China, India, Indonesia, and Turkey) to boost domestic supply or support small farmers' incomes is rapidly approaching the levels of support provided by OECD countries [94]. The policy objectives pursued vary considerably from one country to another, reflecting differences in natural resource allocations, socio-economic conditions, political considerations or, more generally, society's preferences. For example, addressing price and harvest risks while allowing the poorest segments of society to buy food at affordable prices is at the heart of the US approach [95]. In the EU, by contrast, the main rationale for supporting agriculture is to support the income of a fragmented agricultural sector with relatively small farms, while moving to address some of the environmental challenges associated with intensive agriculture [96,97]. At the opposite, supporting the livelihoods of small farmers while providing access to cheap food for poor consumers remain India's main objectives [98,99], while China focuses on reducing income disparities between rural and urban areas and meeting growing demand for food [100–102]. Brazil's main priority is to reduce disparities between smallholders and large commercial farmers while maintaining high productivity and protecting poor consumers [92,100]. Other countries, such as Japan, have focused on maintaining farmers' income levels, improving food self-sufficiency rates and safeguarding the role of agriculture in preserving the environment [92,98].

Many of today's subsidies encourage economically perverse or trade-distorting or ecologically destructive and socially unfair practices [94,103]. For example, CAP subsidies end up supporting the so-called 'corporate farms', almost always prone to an intensive and industrial form of agriculture, of a different nature from those that have traditionally characterized the European agricultural landscape [104,105]. In this context, it is clear that medium and, especially, small farms, which

have always represented the majority in terms of spread and workforce in EU, have been gradually marginalized, also compromising the economic, social and environmental sustainability of the sector; the direct payments system is accused of having led to the degradation of hundreds of thousands of hectares of natural places throughout EU, contributing significantly to the decline of historical landscape features as well as of genetic biodiversity [100,106,107].

The various reforms of the CAP, undertaken since the 1990s, have introduced numerous measures (protection of High Nature Value Farmland areas, agri-environmental measures, organic farming, multifunctional agriculture, rural development, social inclusion, etc.) aimed at financing the production of healthy food, environmental protection, contrasting and mitigating climate change and biodiversity decline as well as the protection of small and medium-sized farms and the development of entrepreneurship among young people and women, but their impact is undermined by the limited funds allocated to them over the years.

There is, therefore, a huge potential for redistributing existing resources to provide positive incentives and support for sustainable development, while at the same time improving the economic efficiency and competitiveness of the primary sector. In a recent report on policy response from an EU perspective to megatrends in the agri-food sector, Ferreira et al. [108] highlight numerous policy options to achieve 'Sustainability for all' scenario:

- providing incentives under the CAP to move to new farming practices and adapt production to new healthy dietary patterns;
- fostering uptake and knowledge-sharing of technology and digitalization in agricultural production;
- supporting global initiatives to reduce GHG emissions (e.g., Paris Agreement on climate change) and biodiversity losses, and ensuring that all bilateral trade agreements duly consider environmental protection;
- increasing CAP spending for farmers with environmentally friendly practices and production adapted to new diets (e.g., vegetal-based proteins);
- establishing minimum thresholds for Member States to support investments with high degree of innovation and technology uptake;
- monitoring food safety and quality standards and making sure that they are necessary, proportionate and consistent with other policy objectives;
- increasing support and investment in education regarding environmental protection, obesity and undernutrition to achieve adoption of healthier lifestyle and diets.

Governments' provision of the needed resources, assets and infrastructure to decrease transaction costs, that might constrain smallholders, as well as an enabling legal/legislative environment are essential to increase their involvement in the agri-food sector [30,109,110]. In this respect, IFAD [59] provides a review of three types of strategies/policies to increase the inclusiveness of modern agri-food value chains and markets. The focus of the first strategy in on enhancing equity and fairness within the value chain and it encompasses organic farming, fair trade (Appendix A) and short supply chains (e.g., direct selling). These three types of alternative markets (Fairtrade, organics, short supply chains) often offer fairer and more favorable trade and commercial conditions for small-scale producers [111].

Meanwhile, the aim of the second strategy is to link smallholders with large companies, either domestic or multinational/international, mainly through contracts between small-scale farmers and large food retailers/agri-food processing companies [59]. Indeed, contract-farming schemes with multinational corporations and/or domestic exporters can bring the benefits of modern agri-food value chains, especially agri-food export, to smallholders in developing countries [76]. Cases of this second strategy comprise, among others, the UTZ Certified label; the *Alianzas Productivas* (Productive Alliances) approach in Latin America; Grow Africa initiative; IFAD's "Four Ps" program (Public-Private-Producer Partnerships in agricultural value chains). The focus of the third strategy is on utilizing public policy (including public investment) to enhance the asset base of smallholders thus allowing them

to be involved more actively in modern domestic markets. Actions of this strategy comprise public procurement. For the success of this strategy, it is vital to improve transparency and decrease transaction costs on domestic markets, and enhance market infrastructure [59].

Besides focus on smallholders, another important issue to be addressed by policies is the inclusiveness of agri-food markets for women. In this regard, Ngomane and Sebola [112] formulate various recommendations to improve the participation of women in agri-food markets: promoting more gender-sensitive market information systems; improving women's access to agricultural and rural extension and advisory services; promoting formalization of the informal businesses of women; and monitoring/evaluating gender-disaggregated data in agri-food value chains.

4. Markets, Food Security and Nutrition

FAO and WHO [113] suggest that "*Trade is inextricably linked to food security, nutrition and food safety. Trade affects a wide number of economic and social variables, including market structures, the productivity and composition of agricultural output, the variety, quality and safety of food products, and the composition of diets*" (p. 11).

Over last decades, alongside the polarization of views on how to attain food security, trade, and consequently markets, has been seen either as a threat or as an opportunity. The 'trade as opportunity' narrative calls for trade openness as a means to enhance market efficiencies and to reduce distortions, while highlighting the unjustified trade protection costs [61]. The supporters of this narrative point out the benefits of trade liberalization [114–117] such as improving domestic food security and enhancing the productivity and competitiveness of the agricultural sector (Figure 3). Many studies show that participation in markets affects positively farmers' food security [118–120]. In the framework of this narrative, food security is seen to rely on the forces of the 'free' market to bring about more efficiency in resources allocation and, hence, to enhance food production/agriculture efficiency that, in turn, supports economic growth, employment and incomes (in agriculture and through 'spillovers' in other economic sectors) and, consequently, enhances availability of and access to food. In this context, the role of public policies and interventions is considered important, but would be confined to correcting eventual market failures [61] such as externalization of environmental costs and over-exploitation of the commons (e.g., public goods).

Figure 3. Trade as opportunity narrative: comparative advantage, trade and food security. Source: Adapted by Clapp [89] from FAO [121] and Lamy [122].

Contrarily, the '*trade as threat*' narrative supports that a higher integration in agri-food markets is not a synonym of an enhanced food security. For example, in their investigation of the relation between the prices of maize in many developing countries and the development of the ethanol market in the USA, Hao et al. [123] "*suggest that countries more dependent on food imports and/or receiving U.S. food aid are at a higher risk of being affected by such shocks*" (p. 629). Bekkers et al. [124] suggest that although integration in agri-food markets matters, the most important factor that explains the variation among countries in prices pass-through is income per capita and put that "*far greater price transmission of food*

price shocks at the commodity level to final consumers in low-income countries than in high-income countries. The implication is that future swings in world food prices will in particular jeopardize food security in poor countries. Trade policy measures of market integration also affect the pass through significantly" (p. 216).

The narrative '*trade as threat*' highlights the 'exceptionalism' of agriculture, that is, agriculture is a provider of public goods besides being an economic sector. Indeed, the supporters of this narrative argue that markets alone are not able to provide public goods. For instance, Renting et al. [125] highlight the multiple crises generated by the liberalization of agri-food markets and call for increasing the involvement of local and regional governments as well as consumers and farmers in the governance of the agri-food system.

Therefore, this narrative supports an alternative vision built on the 'multi-functionality' of agriculture thus emphasizing smallholder, 'local' and biodiverse farming systems while advocating for the reduction in import dependency (cf. increasing domestic production and self-sufficiency) to achieve food security; this, in turn, is a clear endorsement for a central, strong role of the state in food policy and/or of 'food sovereignty' approach [61]. Referring to the food self-sufficiency–food security dichotomy, Erokhin [114] argues that trade restrictions decrease food security while improving food self-sufficiency. Clapp [126] "*takes a closer look at the concept of food self-sufficiency and makes the case that policy choice on this issue is far from a straightforward binary choice between the extremes of relying solely on home-grown food and a fully open trade policy for foodstuffs*" (p. 88).

Indeed, each narrative (trade as threat vs. trade as opportunity) has weaknesses and discrepancies. On the whole, it appears that the impacts of trade and markets on food and nutrition security are mixed so that FAO [61] conclude that "*trade itself is neither an inherent threat to nor a panacea for improved food security and nutrition, but it poses challenges and risks that need to be considered in policy decision-making. General and unqualified assertions about trade 'hurting' or 'helping' food security should be considered with caution, and the nature of the variables and links behind these assertions must be scrutinized carefully*" (p. 17). Anyhow, markets and trade can affect all the four food security pillars [61,127]. Indeed, food security has four pillars/dimensions [128–132]: food availability (i.e., sufficient food supply on a constant basis); food access (i.e., food affordability and physical accessibility); food utilization/use (i.e., proper food use in line with good care and nutrition practices); and stability over time of food availability, access and use. Bearing in mind the suite of indicators on food security [133], the effects of markets are mainly important on domestic food price index (access pillar) and the volatility of domestic food price (stability pillar). Moreover, the relation between the degree of involvement in international trade and food security is affected, inter alia, by the functioning of agri-food markets [61]. Agri-food markets functioning as well as the level of their contribution to food (in)security are also influenced by the governance and structure of non-food markets, such as the energy market [134].

Some scholars link markets, trade and diets (cf. dietary diversity). Krishna Bahadur et al. [135] suggest that "*households that live in 'primary' cities that are large and well integrated into global markets also enjoyed higher levels of dietary diversity*" (p. 42) in urban Ghana and Cameroon and point out that "*for well-off households, integration into global markets is probably preferable as such households enjoy more diverse diets*" (p. 42). Similarly, Huang and Tian [136] argue that enhanced accessibility to food, thanks to the development of market, has improved dietary quality among Chinese people and note that "*the impact of food accessibility on dietary quality is stronger for those not engaged in agriculture production*" (p. 92). Weatherspoon et al. [137] investigate the linkages between food policy, markets and food security in the Rwandese context and argue that "*it is less clear if rural food markets are capable of supplying diverse and nutritious foods at affordable prices on a consistent basis, resulting in a lack of diversity and hence, low nutrient quality diets*". Erokhin [114] suggests that "*trade protectionism challenges the sustainability of food supply by decreasing food availability and quality of food products, causes dietary changes, and threatens the food security of the country*", referring to Russia. Similarly, Zanello et al. [138] point out that "*market aspects become important for dietary diversity specifically in the lean season*" in countries of the Global South such as Afghanistan. Likewise, Abay and Hirvonen [139] point out the positive effects of the nearness of households to markets, hence their easy access to market facilities, on children's nutritional status

in the North of Ethiopia but underline seasonality effect. Indeed, they argue that "*children located closer to food markets consume more diverse diets than those located farther away but the content of the diet varies across seasons*" (p. 1414). Krivonos and Kuhn [140] focus on 26 ex-communist countries (cf. Central Asia, Eastern Europe) and argue that "*trade barriers reduce variety of products available in domestic markets, in particular fruits and vegetables*". Nevertheless, there is a need for certain caution as Rupa et al. [141] denote that "*alone, policies which encourage 'food market modernization' are not enough to improve diet quality in urban Vietnam*" (p. 499). This is confirmed by the results of the research carried out by Umberger et al. [142] that, in their investigation of the association between supermarkets diffusion and over-nutrition (cf. overweight, obesity) in Indonesia, put that "*there is mixed evidence for a negative effect of supermarkets on child nutrition*" (p. 510).

Many authors investigated the connection between the development of agri-food markets (especially supermarkets) and 'nutrition transition' [143–147]. Baker and Friel [143] show that modern distribution channels and markets (super- and hyper-markets, convenience stores) are becoming dominant in Asia with an increase in 'market trans-nationalization' (i.e., share of agri-food market held by transnational corporations) and 'market concentration' (i.e., share of agri-food market held by leading companies) but note that "*market forces are likely to be significant but variable drivers of Asia's nutrition transition*". Likewise, Toiba et al. [145] analyze the relation between dietary transition and 'supermarket revolution' in Asia along with the associated health and nutritional implications; they highlight *a* "*negative and significant relation between the share of food expenditure at modern food retailers and the healthiness of consumer food purchases*" (p. 389). In their investigation of the relation between the 'food retail revolution', on the one hand, and health and diet in China, on the other hand, Zhou et al. [148] put that supermarkets brought about changes in processed food consumption patterns that may impact the prevalence of obesity in China. Rischke et al. [144] put that "*supermarket purchases increase the consumption of processed foods at the expense of unprocessed foods*" (p. 9) among Kenyans and argue that "*supermarkets contribute to dietary changes commonly associated with the nutrition transition*" (p. 9). Lobstein et al. [149] point out an increase in the incidence of overweight and obesity among children, both worldwide (including in developing countries) and in the United States, and put forward that to tackle this pandemics "*the governance of food supply and food markets should be improved and commercial activities subordinated to protect and promote children's health*" (p. 2510). Anyhow, evidence shows that the association between agri-food markets and nutrition is not straightforward so that Humphrey and Robinson [150] claim that "*a common set of constraints tends to inhibit markets from delivering nutrition and makes it difficult to reach populations at the 'bottom of the pyramid'*" (p. 59) thus suggesting that a renewed focus on the inherent complexity of market systems and on informal markets serving the poor are needed.

Markets and trade also represent a central element of the 'food environment' [151] that has been investigated over the last years for its impacts on overweight and obesity. In fact, some researches highlight that the lack of supermarkets in some geographical areas can lead to 'food deserts' [152,153] that are deemed harmful for food and nutrition security. For example, Sadler [152] argue that moving a farmers' market to a central site in Flint (Michigan, USA) improved accessibility to healthy agri-food products by low-income and mobility-constrained residents in isolated food deserts. Similarly, Lu and Qiu [153] ascertain two food deserts in Calgary (Canada) and put that "*farmers' markets provide surrounding neighborhoods with significant benefits*" (p. 267) but "*the overall alleviating effects on the lack of access to healthy food are limited*" (p. 267).

5. Markets in Agri-Food Sustainability Transitions Research Field

Agri-food systems are fundamental in the current discussion on paths toward sustainability. In this respect, 'transition' concept [154,155] has received increasing consideration so that a new inter-disciplinary academic community has been created in 2010, the Sustainability Transitions Research Network [156]. Meanwhile, more and more attention is devoted to transition studies not only in the academia [156–161] but also in policy [162–164]. Moreover, 'transition' notion has gained more

recognition also in the literature on agriculture and food systems [165–171] as well as the notion of 'sustainability transitions' [158,160]. Markard et al. [160] define sustainability transitions as "*long-term, multi-dimensional and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption*" (p. 956). Costa [172] puts that food sustainability transitions denote the processes of socio-technical transformation that drive food practices to sustainability. El Bilali [168] suggests that "*Agro-food sustainability transitions refer to fundamental changes necessary to move towards sustainable agriculture and food systems*" (p. 353). Spaargaren et al. [171] point out that food transitions refer to structural change processes that make possible the emergence and, consecutive, diffusion/dissemination of new, more sustainable practices and modes of food production and consumption. These structural transformation processes concern the whole food chain from food production (cf. agriculture) to processing, marketing/distribution and consumption.

5.1. Characterization of Agri-Food Sustainability Transitions Research Field

El Bilali [168] performed a systematic review of 111 articles dealing with sustainability transitions in agri-food systems and investigates whether and how these papers address the themes of the research agenda of the Sustainability Transitions Research Network [156]. He points out that the literature on agri-food sustainability transitions is diverse and addresses all the research agenda themes. Nonetheless, scholars do not devote the same attention to the various research themes. In fact, most of them focus on 'governing and managing transitions' (24.5% of 111 reviewed articles), 'transitions in practice and everyday life: sustainable consumption' (20.7% of papers) and 'power and politics in transitions' (18.9% of articles), while the research themes of 'modelling transitions' (10.8% of articles), 'civil society, culture and social movements in transitions' (9.9% of articles) and 'role of firms and industries in transitions' (6.3% of articles) are underserved. Numerous authors pointed out that there is a need to pay more attention to power and politics in the research field on sustainability transitions [158,160,166,173–175]. Nevertheless, the systematic review carried out by El Bilali [168] shows that power and politics are sufficiently addressed in the field. On the other hand, research regarding the role of agents (e.g., social movements and the civil society, industries and firms) is still marginal, which corroborates the criticism that the research field understates the role of agency in sustainability transitions processes [158,176–179]. In particular, it is difficult to explicate that the role of the social movements and civil society is not satisfactorily dealt with in the research field although community and grassroots initiatives represent the milestone of alternative agri-food systems and networks [180–182].

Different frameworks have been used in transition studies [158]. El Bilali [183] carried out a systematic review on the most prominent frameworks used in research on agri-food sustainability transitions (i.e., Multi-Level Perspective—MLP, Transition Management—TM, Strategic Niche Management—SNM, Social Practice Approach—SPA, Technological Innovation Systems—TIS). While reviewing the literature on sustainability transitions, it becomes evident that there are many challenges in using the present transition frameworks in agri-food systems [183]. Indeed, in agri-food systems, the diversity of spatial configurations and farms as well as agriculture multi-functionality—thus touching numerous socio-technical regimes—render it hard to determine system boundaries and transition processes [184]. Generally, the dynamics of agri-food systems are difficult to comprehend and grasp [185,186].

In a systematic review on the application of the MLP framework in research on sustainability transitions in agri-food systems, El Bilali [187] enumerated amid investigated *niches* agro-ecology [188–191], conservation agriculture [192], organic agriculture [193,194], permaculture [195], urban and peri-urban agriculture [196], integrated farming [197], care farming [198–200], AFNs [42,201–203]. Agroecology (Figure 4)—which is considered as a science, set of practices and social movement—is not only a prominent niche but also a promising alternative food system (AFS). In fact, the transformative potential of agroecology is now extensively recognized [204–207] and put forward as a means to redesign agri-food systems, from field to fork [169,208–210]. Today, instead of earlier focus on agriculture

industrialization, the thinking and scholarship on agro-ecology criticize the whole agri-food regime (i.e., not only intensive production but also unsustainable consumption patterns and inappropriate food system governance) [165,210–213].

Figure 4. Diversity of concepts and discourses associated with agroecology. Source: Biovision [214].

The fact that in 2018 about 820 million people (above 10% of the global population) were still hungry and over 2 billion people did not have a good food security status (when considering both hungry people as well as those suffering from moderate levels of food insecurity) [215,216] is a clear symptom of the unsustainability of the current agri-food systems and the failure of agri-food markets in ensuring universal access to sufficient, safe and nutritious food for all. What is even worse is that hunger is on the rise in Africa, Latin America, and Asia [215]. Moreover, the incidence of overweight and obesity is increasing worldwide; in 2016, about 40 million children under five were overweight while it was estimated that around 2 billion adults were overweight in 2018 [215]. In fact, modern agri-food systems failed in addressing food insecurity and malnutrition (under-nutrition, micronutrient deficiencies or hidden hunger, and over-nutrition and obesity) [8,15,17,133,215,217,218]. In this context, El Bilali [219] performed a systematic review to see whether and how the topics of food security and nutrition are dealt with in 120 research articles on agri-food sustainability transitions. He concludes that "*Food security and nutrition are still marginal topics in research on agro-food sustainability transitions. In fact, only 21.7% and 13.3% of articles on agro-food sustainability transitions address food security and nutrition, respectively. Meanwhile, only nine out of the 120 selected research articles address both food security and nutrition*" (p. 566). The perspectives used in the reviewed papers can be related to the four dimensions of food security: availability, access, use and stability. In general, it is assumed that sustainability transitions in agri-food systems affect, either negatively or positively, food availability/supply [188,220–225], food affordability/economic accessibility [201,222], food utilization [220,221,226,227], and/or agri-food system stability and resilience [175]. The debate on the connection between food security (as well as nutrition) and agri-food system sustainability often means scrutinizing the role played by innovation and/or emerging alternative, niche paradigms and models of agriculture and food systems, such as agroecology [225] or aquaponics [228–231]. Efforts to solve the problems of food insecurity and/or malnutrition may also encourage the adoption and/or further diffusion of agriculture forms that are more environmentally-benign such as organic agriculture [194]. Furthermore, transformations in other

economic sectors, such as energy [232]—and/or in the broader economy—for example. 'bio-economy' or 'circular economy' [221,223]—can also generate long-term food (in)security impacts.

5.2. Pathways to Sustainability in Agriculture and Food Systems

Garnett [16] suggests that there are three broad perspectives to achieve simultaneously food system sustainability and food security: efficiency increase, demand restraint and food system transformation. While making reference to these perspectives, El Bilali et al. [167] suggest that "*Different strategies can be pursued to foster sustainability transitions in food systems: efficiency increase (e.g., sustainable intensification), demand restraint (e.g., sustainable diets) and food systems transformation (e.g., alternative food systems)*".

Despite earlier successes of agricultural intensification (cf. Green Revolution) in increasing food production, modern trends emphasized uncertainties concerning the stability and steadiness of future food supply [10] also in relation to the positive demographic trend. In fact, meeting the growing food demand worldwide means huge challenges for both ecosystems integrity as well as agri-ecosystems and agri-food systems sustainability [19]. The concept of '*sustainable intensification*' is now widely utilized in policy and academia as a way of combining the imperatives of environmental sustainability in agriculture and food production with that of producing more food to meet the growing demand of the global population. In fact, the search of novel, original paradigms to sustain the emergent models of agricultural intensification has led to the appearance of numerous 'intensification' qualifiers, including 'sustainable' intensification [26,27,233,234], 'eco-functional' intensification [235] and 'ecological' intensification [236,237]. FAO [238] suggests that "*sustainable intensification refers to strategies aimed at simultaneously improving productivity and environmental sustainability, which can be achieved through increasing species diversity in cropping systems or ecosystem-based strategies*" (p. 15).

All dimensions of the food system need a transition towards sustainability [11,239], including shifts towards '*sustainable diets*' [240,241]. Diets changes over the last decades (that are referred to as 'nutrition transition') has important health and environmental impacts [15,213]. Thus, White [242] calls for transitioning from high-calorie, meat-based and resource-intensive diets to low-calorie, plant-based ones to decrease food-related environmental footprints. Similarly, WWF [243] argues that "*a dietary shift in high-income countries—through consuming less animal protein—and reducing waste along the food chain could contribute significantly to producing enough food within the boundaries of one planet*" (p. 14). Shifts to sustainable diets can slow down resource depletion and climate change, and reduce the prevalence of non-communicable diseases (NCDs) [244]. Consequently, sustainable diets are suggested as an important approach to support transition to sustainable food consumption patterns [167,245–251].

It might be claimed that the '*food system transformation*' is undoubtedly the most political perspective amid the three studied by Garnett [16]. The perspective highlights the need to change the functioning, structure and governance of agri-food systems. In fact, it assumes that attaining food security for all in the long term implies changing the market-driven power relations in the current agri-food systems [252,253]. In this respect, De Schutter [254] calls for democratizing the food system and argues that "*change can be expected neither from government action, nor from business initiatives alone, and grassroots innovations led by ordinary people have a limited impact. Only by connecting these different pathways for reform by food democracy can lasting food systems reform be achieved*". Therefore, it is probable that transitions in agri-food systems will reflect the diversity of places, contexts and approaches rather than a unique, obvious pathway [159,177,255].

Recently, scholars focused on alternative food systems (AFSs) and short food supply chains (SFSC) (i.e., farmers' markets, farm shops, fruits and vegetables boxes, pick-your-own food farms, community-supported agriculture, Internet sales through e-commerce operators, etc.) [182,256–263], and the opportunity they offer in increasing sustainability, by the reduction of food and package waste [264] and greenhouse gas (GHG) emissions [265–273] and in providing ecological, health and socio-economic benefits [274–278]. SFSC allow consumers to connect more directly with both farmers and food producers thus enhancing local and rural development [279,280], and are an effective strategy for the preservation and development of urban agriculture, thus addressing the issue of food quality

and security [268,281,282]. AFSs are put forward as concrete, tangible examples to achieve agri-food systems transformation. El Bilali et al. [283] suggest using time, space, integration and rules as narratives for sustainability transitions. They argue that "*the space attribute refers to the fact that AFSs tend to be more small-scaled, localized and horizontally integrated*" (p. 443). As for the 'rules' attribute, El Bilali et al. [283] put that AFSs "*attempt to change the rules and institutions that govern the interaction of value chain actors. Some initiatives (e.g., Fairtrade) have focused on the adaptation of trade linkages towards social justice and empowerment. Others, such as the food sovereignty movement promoted by La Via Campesina and local food cooperatives, are more radical and transformative*" (p. 443).

Although many advantages are associated with AFSs [260,264,284], there are doubts as to whether SFSCs deserve the reputation of being really environmentally sustainable [263,285]. Indeed, they can have sometimes adverse economic, environmental and social impacts. Short food systems are characterized by small businesses with limited resources in terms of finance and knowledge. SFSC need specific resources to effectively address, for example, the costs due to the small production scale, the logistics and the administrative burdens as well as the compliance with regulations and the difficulty to meet the requirements of customers in terms of quality [266,271,286]. Moreover, the limitation of distances is not always a factor of reduction of GHG emissions: small freights, empty returns of trucks, consumer purchasing trips to the direct sale point do not allow the short food systems to significantly reduce emissions [269,287–292]. These inefficiencies result primarily from a lack of economic, organizational and physical structures of the appropriate scale to deliver environmentally efficient logistics systems to reach consumers [269,271,293]. It is therefore essential for SFSCs to find ways to optimize logistics. Indeed, logistics is currently the main bottleneck for the development of efficient SFCs [294]. New direct delivery food logistics and business models and networks (e.g., based on agri-food e-supply chain, regional and local food hubs) have been proposed with the aim to improve transport and logistic organization and performance, and coordination between the actors of SFCs [265,266,271,293].

Concluding, in his analysis of how the three perspectives to achieve food system sustainability and food security are considered in the sustainability transitions literature, El Bilali [219] highlights that, generally, papers dealing with agriculture production adopt 'efficiency' perspective while those addressing consumption patterns and practices adopt 'demand-restraint' perspective. However, El Bilali [219] points out that the three perspectives of Garnett [16] are often used in the same paper, thus far from being mutually exclusive. Indeed, many scholars [222,295] highlight that it is essential to link consumption and production, and put forward that only an interactive, balanced relation between consumers and producers can foster agri-food sustainability transitions. Thus, they highpoint, at least tacitly, that it is important to adopt a 'food system' approach [175,220,222,259,296,297] when tackling issues such as food and nutrition security, and sustainability.

5.3. Markets in the Literature on Agri-Food Sustainability Transitions

Although "*Transition research conceives markets, technologies, political and social institutions, behavior and values as temporary, changeable outcomes of evolving long-term coevolutionary processes*" (p. 5) [156], there are different opinions among scholars about the role played by markets in transition towards sustainable agriculture and food systems. While some scholars argue that markets represent a valid instrument for transition by creating opportuning and incentives for alternative food networks and niches, others point out that the current 'market regime' hinders transition by maintaining the status quo. These differences might be due, among others, to different understandings and conceptualizations of markets. It is also obvious that the impacts of markets in terms of transition will depend not only on the structure and functioning of the market under analysis but also on the context and environment (cf. policies, institutions) in which transition processes take place. As Audet et al. [201] put, "*when looking at their broader environment, these tensions appear to be determined by the relationships which the markets maintain with networks and spaces, and which can be either supportive or detrimental to the markets' attempts at fostering a transition of the agri-food sector*" (p. 13).

In its mission statement and research agenda, the Sustainability Transitions Research Network [156] considers "*the economies of scale and markets of incumbent systems*" (p. 4) among the processes, which are part of the 'socio-technical regime', that tend to perpetuate existing socio-technical systems. Indeed, firms and businesses can use their assets and resources (e.g., financial capital, market contacts and relations, human capital, production units) to hinder change. Referring to the food arena in Finland, Kuokkanen et al. [222] put that "*the current food system is locked-in by three increasing returns processes that all reinforce each other. These processes occur in production, in agro-food policy and in the food supply chain*" (p. 937) so that a genuine agri-food transition "*implies changes in the inputs and farming practices used at farm level and regional levels, changes in the supply chain structures, and changes in the political and market institutions*" (p. 938). Referring to the first aspect, over the past decades, many agri-food organizations have incorporated sustainability into their business thinking [28,298–303] in order to address pressures from government legislation, international standards, and customers. Therefore, they improved their production activities performance related to the three pillars of sustainability—people, planet and profit (i.e., social equity, respect for the environment and economic growth)—namely by balancing business performance and economic gains with environmental and social issues.

Regarding the second aspect, the food supply chain (FSC) plays an important role in the sustainability performance of the whole sector. Indeed, the way in which food reaches consumers is complex and involves multiple agents and processes, ranging from production to manufacturing, logistics and retail activities, home preparation and waste management phases. It is a high profile component of global food systems' GHG emissions [304,305]. In developed countries, it accounts for 15%–28% of total GHG emissions (national studies between 2007 and 2010) [304]. Conversely, according to Poore and Nemecek [306], food processing, transport, packaging and retail account for 18% of food system emissions, the latter accounting for approximately 26% of global GHG emissions. In any case, reducing food system emissions requires a menu of different solutions: changes in diets, reduction of food waste, improvement of agricultural efficiency and performance of different processes through novel technologies, business process redesign, integrated supply chain models, technologies that preserve food quality and environmental sustainability and make accessible low-carbon food alternatives [21,28,304,305,307,308]. In this context, many different strategies for making food and agriculture sectors sustainable, including sustainability targets and indicators, have been established by more than 100 countries [24], but no globally accepted standards define what 'sustainable food production' essentially requires. FAO [24] puts that "*Neither a commonly accepted set of indicators that have to be taken into account when measuring sustainability performance, nor widely accepted definitions of the minimum requirements that would allow a company to qualify as 'sustainable', exist*" (p. 9). Moreover, various sustainability performance measurement systems have been proposed [267,309–312], and main internal and external factors and drivers pressuring towards sustainable operational practices have been recognized [267,300,313–316], with the aim to deliver a number of indicators and contribute to the definition of a framework for sustainability assessment that is useful for the whole agri-food sector, to secure a step-change in operational practices, which will improve the efficiency and sustainability of FSC.

Finally, with reference to the third aspect, transition processes are needed not only at different levels and stages of the food chain but also with the involvement of a wide range of actors and stakeholders, thus going beyond market actors. In fact, Vinnari and Vinnari [317] argue that "*it is quite evident that neither the markets nor traditional state control can achieve sustainability in industrial-scale animal agriculture, which is why governance activities involving a wide array of actors are required*" (p. 3). In this respect, strengthening local institutional infrastructure is crucial to enable access to markets by 'sustainable' farmers. Different institutional innovations can help in linking sustainable farming practices with markets (cf. consumers) and many practitioners and scholars argue that institutional innovations are as vital as technical innovations (e.g., agronomic practices and new technologies) in fostering transitions towards sustainability in agriculture. The pressures of policy to adopt sustainable agriculture practices and the increase of consumer demand for 'sustainable' agri-food products (e.g., fair

trade, organic) have helped in developing and/or expanding market outlets for sustainable food [318] and in the development of numerous forms of alternative agri-food networks [319]. This increase in demand for sustainable agri-food products created opportunities for some smallholders in developing countries to engage in global agri-food value chains [7].

The heuristic framework of Strategic Niche Management (SNM) [320] suggests that radical innovations/niches should be developed in 'protected spaces' (e.g., experiments, subsidized demonstration projects), which shield them from 'mainstream market selection'. This 'market selection' may explain why some "*sustainable technologies that fulfil important user requirements in terms of performance and price are most often not available on the market*" [320] (p. 175). In the case of the MLP, market is also often considered as an element of the socio-technical regime that should be changed to bring about transition. In this respect, sustainable food niches are seen as an instrument to "*bring about a sustainability transition in the mainstream, supermarket-driven food regime*" [321] (p. 410). Lutz and Schachinger [42] put that "*local food networks [niches] are constantly confronted with regime-inherent and landscape-induced market dynamics and legal structures*" (p. 4791). Indeed, the dominant market rules "*force local retailers and farmers to perform in specific market-conforming ways*" (p. 4791) thus discouraging farmers from joining local food networks and/or realizing alternatives to dominant market relations [321]. This becomes a serious problem when and in contexts where "*the food supply chain is strongly driven by market forces, for which issues related to sustainable food are not, at least yet, primary*" [222] (p. 941). In fact, Jehlička and Smith [322] note that "*while market-based alternative food systems have been heralded for their potential to promote environmental sustainability, the benefits of non-market practices such as household food self-provisioning and barter have been assumed rather than being the focus of research*" (p. 362). Some social scientists go even further and argue that alternative agri-food practices, that are in vogue today, too often operate with a 'market mentality' [323] or perpetuate a neoliberal rationality by locating solutions to problems within the market [324]. Furthermore, it is often price, so a market-related element, that determines how products are labelled, and consequently, marketed; for instance, Davidson et al. [325] conclude that "*rather, price determined how products were labeled, not produced: if conventional markets offered high prices, alternative producers would sell in conventional markets*" (p. 369).

Market reforms are considered by many economists as one of the strategies to address environmental problems, provided that negative external costs are internalized [156]. Indeed, this "*approach assumes that, if the prices are right, private actors (firms and consumers) will find individual optimal (profit or utility maximizing or cost-effective) solutions, which are supposed to lead to socially desirable outcomes. The government has a role to play by creating incentives and frame conditions (e.g., taxes, emissions trading), but should then let private initiative do the real work*" [156] (p. 4). In this context, firms and industries can develop markets that can help initiating and/or enabling sustainability transitions by, among others, supporting marketing campaigns or 'green' research and development (R&D).

The role of the market in sustainability transitions depends on the used transition approach. For instance, the Technological Innovation System (TIS) approach [326] considers 'market formation' as one of the seven functions [327]—ranging from entrepreneurial experimentation to the creation of legitimacy—that should be positively fulfilled for the successful development of a new technology/innovation. Furthermore, markets are considered central for the development of many emerging niches (cf. MLP) in the context of alternative economies (cf. circular, green, blue, sharing economy). Indeed, the formation of local markets facilitates the engagement of end-users/consumers on emergent niches and can also provide early testing grounds for their acceptance and wider diffusion [328]. Markets are understood as rules that govern transactions and/or as places where such transactions take place. Referring to the latter understanding of markets, Audet et al. [201] suggest that "*seasonal markets end up reconfiguring social and material relations and providing solutions for food security and a more sustainable food system*" (p. 1). Indeed, "*seasonal markets are real market places that sell fresh fruits and vegetables directly to consumers in areas where food security is considered a problem*" [201] (p. 2) and they have many other goals such as equitable food access, reconnecting producers to consumers, social and food justice, health and sustainability [329].

The divergence of opinions about the role of markets in agri-food sustainability transitions can be also due to the tension between grassroots movements (with their emergent agri-food niches) and capitalist agri-food corporations. However, this distinction between the two sectors (private vs. civil society) is often no more clear-cut. For instance, there is a shift towards 'green capitalism' [330] so that supermarket-led agri-food capitals create and/or support 'localized' foods and food networks, through different private standards (e.g., global GAP). However, niche markets are not synonyms of sustainability, especially in the agri-food systems. In this regard, Lutz and Schachinger [42] put that "*researchers argue that the terms 'local', 'alternative', 'regional', 'specialty', or 'sustainable' should not be used interchangeably as local specialty and niche market food products are often colonized by the conventional food system and thus might not foster food sovereignty*" (p. 4780). Cleff and Rennings [331] argue that the importance of market depends on the type of innovation and suggest that the influence of market is significant for product innovations while environmental regulations (cf. state) are more determinant for process innovations. FAO and INRA [318] suggest that markets can motivate producers/farmers to adopt more sustainable farming practices thus playing a pivotal role in agricultural sustainability transition.

6. Conclusions

The SDGs, adopted by the Member States of the United Nations in September 2015, show that transition towards sustainability of the current agriculture and food systems, including agri-food markets, is essential to achieve sustainable food and nutrition security. Different drivers (at global, domestic and local levels) have changed the structure and functioning of agri-food markets. The ongoing transformation of agri-food markets means both challenges and opportunities for the actors of the agri-food value chains. It also has implications in terms of food security and nutrition. Indeed, the functioning of agri-food markets affects food security, but it is especially significant in defining both access of producers to agri-food markets and access of consumers to food. Therefore, attaining long-term food and nutrition security means understanding the dynamics of global agri-food trade as well as the governance and functioning of domestic agri-food markets. Markets and trade can also have an essential role in the adaptation of the global agri-food system to climate change. Nevertheless, it is essential to make sure that the ongoing modernization and expansion of agri-food markets does not work against the eradication of food insecurity, hunger and malnutrition in all its forms. In fact, agri-food markets ought to be managed to increase the advantages of widened access to markets while mitigating the risks related to higher exposure to international competition and market volatility, especially by smallholders and vulnerable groups (e.g., women) in developing countries, and more generally in all depressed agricultural areas (with disadvantages or development problems) worldwide. It is also imperative to devote more consideration to the impacts of market expansion and 'supermarketization' on nutrition, particularly with regard to obesity that is determined by the ongoing 'nutrition transition'. Therefore, the challenge ahead is to develop efficient, competitive, accessible, nutrition-sensitive and inclusive agri-food markets that contribute to sustainability transitions in agri-food systems. In this respect, multi-disciplinary, transdisciplinary and forward-looking research has an important role to play to steering agri-food markets on the path towards sustainable patterns.

By reviewing the literature, several research direction propositions emerge, and which will contribute to shed light on different dimensions of the relationships between agri-food markets, food security and sustainability. A field of research foresees investigations in the agricultural production phase in order to obtain sustainable food products and ensure global self-sufficiency, by redistributing cultivated land, combining intensive agriculture with high standards of environmental performance, and focusing on integrated and organic farming, precision agriculture, conservative and agro-ecological farming systems. In this respect, further new farming systems and practices will need to be investigated regarding responsible management of water, pesticides and fertilizers/nutrients. For organizations operating along the agri-food supply chain, it would be interesting to analyze their socially responsible behavior and define a globally accepted framework for assessing sustainability performance. Another research direction proposition is the investigation of technological solutions to be applied along the

FSC, new modes of FSC sustainability governance and new models of multi-stakeholder collaboration as a solution to decreasing the complexity of the network of food distribution and also its externalities. Within this context, the examination of the performance of local compared to global logistics networks in terms of food loss and waste as well as the identification of the role of packaging in the reduction of food waste and GHG emissions could help agri-food markets in achieving targets of food security, environmental sustainability and economic development. Another topic of great interest is to survey the economic and social connections between local and global agri-food markets. A last research path is to study, on the one hand, the food needs and relative satisfaction of consumers in developing countries and, on the other hand, the consumers behavior in developed countries in order to understand their propensity to shifting food consumption and diet models towards healthy, sustainable dietary patterns and their willingness to pay for agri-food products obtained in a sustainable way. Science as usual points the way, but change is first and foremost in the hands of each person.

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Appendix A

Focus on organic farming and Fairtrade

Organic and Fairtrade markets play an important role in agricultural development (and consequently rural development and poverty reduction) in the Global South; indeed, organic and Fairtrade markets account for about 3.1 million farms in developing countries [59]. However, both Fairtrade and organics face the risk of 'cooptation' [332] that is to say their 'mainstreaming' that, paradoxically, reduces or eliminates their transformational potential [333–335].

Fairtrade has emerged in global food systems to create a greater balance between the price of food and the cost of producing it [335–340]. It is about decent working conditions, better prices and fair terms of trade for farmers and workers in the developing world [341,342]. The Fairtrade Foundation [342] puts that "By requiring companies to pay sustainable prices (which must never fall lower than the market price), Fairtrade addresses the injustices of conventional trade, which traditionally discriminates against the poorest, weakest producers. It enables them to improve their position and have more control over their lives". Indeed, thanks to Fairtrade producers have greater control over the conditions of trade and garner a greater fraction of the sale price [333,338–342]. Like organics, Fairtrade relies on transparency in the flow of information [343]. Well-known examples of Fairtrade commodities are coffee, tea, cocoa, cane sugar, seed cotton and bananas [341]. The Fairtrade agri-food market has been mainly shaped by the World Fair Trade Organization (WFTO; former International Federation of Alternative Trade—IFAT). In 2012, a new Guarantee System was developed to assure the compliance of WFTO Members with the WFTO Standard. According to IFAD [59], there are 1.4 million Fairtrade farmers in the world, of which 80% are small-scale farmers. More recent data show that, as of 2017, 1,520,110 farmers and 193,007 workers benefited from Fairtrade [341].

Organic farming is an important alternative to conventional farming and has great potential to help achieving the SDGs, in particular Goal 2 (Zero hunger) and Goal 12 (Responsible consumption and production), thus fulfilling a dual function: responding to consumer demand for healthy and safe food, and providing public goods that contribute to environmental protection, animal welfare and rural development. Over the last thirty years, due to the growing awareness of consumers and the increasing demand for organic products, the number of organic producers and the extent of organically farmed areas have increased considerably. Recent data show that in 2018 organic farming is practiced in 186 countries, reaching 71.5 million hectares of organic agricultural land, managed by approximately

2.8 million farmers mainly in Asia and Africa. The global sales of organic food and drink reached more than 96 billion euros in 2018 [344]. These figures undermine the old conviction that organic farming is an elitist form of farming.

There is ample scientific evidence on the positive effects per unit area of organic farming practices compared to conventional agriculture, not only in terms of reducing pollution and environmental degradation, and of safeguarding biodiversity and soil conservation [345–349], but also in terms of lower ammonia and nitrogen oxide emissions [350,351] and lower water and energy consumption [351,352], as well as restoring the capacity to provide ecosystem services to the community [353,354]. In addition, organic farming, in compliance with its original principles, generates greater benefits in terms of social and economic equity [355] and, in terms of nutritional value, leads to a superiority of the products obtained [356], especially for those of animal origin such as milk, meat and eggs [357].

Nevertheless, some studies show that organic systems often produce an average yield about 20%–25% lower than conventional agriculture [351,353,358] and that the latter is therefore preferable to the organic method to achieve food security because of its higher productivity per unit area [358–360]. This is in contrast to the official definition of food security of the FAO [361] " *. . . all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life*". Actually, organic farming may require more land in some countries to provide the same amount of food [362] and often requires more labour instead of purchased fertilizers, pesticides and animal health products [363]. However, these considerations differ across world regions. In fact, organic farming plays a fundamental role in developing countries, especially in areas characterized by scarcity of resources, small family units linked to traditional land management and lack of alternative employment opportunities. Organic farming is more efficient in these areas, not only for the lower production costs, but also for yields equal and higher than conventional agriculture in the long term, as a result of the restoration of soil organic matter, which can also reduce drought impact and combat desertification [355,364–368].

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