UNIVERSITAT DE BARCELONA

Exploring Food System Transformations in Spain (1980-2021)

Noelia Parajuá Carpintero

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PhD in Economic History | Exploring the Food System Transformations in Spain (1980-2021) | Noelia Parajuá Carpintero 2023

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PhD Thesis
In Economic History

Title:

Exploring the Food System Transformations in Spain (1980-2021)

PhD candidate: Noelia Parajuá Carpintero

Supervision: Enric Tello Aragay
Mònica Serrano Gutiérrez

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to my parents, Yolanda and José

Acknowledgements

As I write these words, I feel profoundly excited. The last five years of my life have been shaped by the PhD thesis that you hold right now. It has been a deep, long, joyful, and at times tough journey. I have learned so much in many areas, extending beyond academia. This thesis connects me to my roots and my family. I was raised in a rural area in Galicia: Castroverde. My parents, as many generations before, still operate a small farm. Unlike the previous generations, they specialized in the production of milk. This—why my family's farm specialized in milk—was one of the answers I discovered in my research. Despite such specialization and through significant effort, they keep alive the cultural heritage of this rural area—the management of forests for the provision of wood, which they use, among others, for baking their own bread; growing potatoes for their own consumption as well as for feeding pigs that will eventually become part of their food supply; and so on—. Now I know this is linked to the provision of 'agroecosystem services'. What will happen when they retire? I feel privileged to have had the opportunity to broaden my understandings of how food systems work. There are many pending questions I need to address. Yet so far, I feel very fulfilled. At the same time, I deepened my concerns about the great threats and challenges small farmers like my parents all over the world face—being much more worrying in the Global South—, and also the risk all humanity faces if no action is taken to mitigate the hazardous environmental and social impacts of current food systems and their drives—one of which is the disappearance of small family farms—. This thesis is fully committed to addressing these challenges, and it is my wish that it contributes to tackling them. I would like to express my gratitude to everyone who made this PhD possible and who contributed to it in various ways.

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others PhD candidates. I am speaking on their behalf as well. Completing a PhD in three years, while also fulfilling the teaching obligations stipulated in the contract—which are particularly demanding in the University of Barcelona due to the structural shortage of teaching staff—is an impossible task. Consequently, many PhD candidates have to finish their research without funding. This was my case, I spent almost a year without funding. Considering that the monthly salary from contract is barely higher than the Minimum Interprofessional Wage of Spain, living in a city such as Barcelona, with its high cost of living and housing problems, is difficult. I feel obligated to report the precarious situation many PhD face during their research. It adversely affects our mental and physical health. Undertaking a PhD is not an easy journey; we have to deal with a lot of uncertainty. This precarious economic situation exacerbates the difficulties. I urge the institutions involved, the Generalitat de Catalunya, the AGAUR, the University of Barcelona, as well as the Ministry of Universities of Spain, to take immediately action to reverse this situation and ensure decent working conditions for all PhD candidates. I would also like to thank my colleagues from Transformem UB, for their significant work in this field, for opening a space to share common worries and articulate actions for change. I would like to express my gratitude to the project "Agroecological Landscapes and Food Systems in Catalonia and the Balearic Islands: Past, Present and Future Transitions (AGROECOLAND)"-PID2021-123129NB-C41, funded by the Ministry of Science and Innovation of Spain, in which my PhD was framed, as well as to the Centre d'Estudis Jordi Nadal, for their extra funding for courses, activities and congresses during my PhD.

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Abstract

In this PhD Thesis, I examine the transformations of the Spanish food system from 1980 to the present, focusing on its socioeconomic structural changes and their impacts on sustainability and social equity. My research is grounded in agrarian history and political economy approaches, and also incorporates insights from ecological and feminist economics. The first and third Chapters are empirical in nature. Based primarily on data from Spanish national accounts, the results demonstrate the increasing integration of the Spanish agri-food system into the global one and the growing dependence of agriculture on external inputs. They also reveal a sharp decline in the agrarian population along with the increase in the share of salaried work. This is explained by the reduction in the number of farms throughout the period, particularly small family farms, which also show an aging process of their holders. The decline of the agrarian income has been a major determinant in this path. The combination of these trends jeopardizes the present and future reproduction of Spanish agroecosystems. I also examine the evolution of food expenditure of Spanish households, as a first exploration of the food cost in the reproduction of labouring population. The results show a halt in the reduction of its weight, but further research is needed for a definitive conclusion. Additionally, the results suggest an increasing inequality in the distribution of value added along the agri-food chain. In the second Chapter, I develop a research framework to investigate food systems at a national level, and particularly their role in the reproduction mechanisms of the capitalist system in which they are embedded, based on the approaches of the food regimes, social metabolism, and surplus/reproduction. This framework has helped me to interpret the results from the first and third Chapters from a more comprehensive approach. The framework includes six dimensions encompassing 36 elements linked through six key cross-cutting connections.

Resumen

En esta tesis doctoral, examino las transformaciones del sistema alimentario español desde 1980 hasta el presente, centrándome en sus cambios socioeconómicos estructurales y sus impactos en la sostenibilidad y la equidad social. Para ello, parto de la historia agraria y la economía política, e incorporo también perspectivas de la economía ecológica y feminista. El primer y tercer Capítulo de la tesis son de naturaleza empírica. Basados principalmente en datos de la Contabilidad Nacional de España, los resultados muestran la creciente integración del sistema agroalimentario español en el global y la creciente dependencia de la agricultura de insumos externos. También revelan un fuerte descenso en la población agraria al tiempo que aumenta la proporción de trabajo asalariado. Esta tendencias se explican por la disminución del número de explotaciones, especialmente de las pequeñas explotaciones familiares, que además están experimentando un proceso de envejecimiento. La diminución de la renta agraria a lo largo del periodo ha sido un determinante fundamental de esta tendencia. En conjunto, estos procesos ponen en peligro la reproducción presente y futura de los agroecosistemas en España. En el Capítulo III también examino la proporción del gasto en alimentación de los hogares españoles, como una primera exploración a la evolución del coste de los alimentos en la reproducción de la fuerza de trabajo. Los resultados muestran el fin de la disminución de su peso en el total de los gastos. Sin embargo, son insuficientes para llegar a una conclusión definitiva. Asimismo, los resultados evidencian un aumento de la desigualdad en la distribución del valor añadido a lo largo de la cadena agroalimentaria. En el segundo Capítulo, desarrollo un marco de investigación para investigar los sistemas alimentarios a nivel nacional, y particularmente su papel en los mecanismos de reproducción del sistema capitalista del que forman parte, partiendo de los enfoques de los regímenes alimentarios, del metabolismo social y del excedente reproducción. Este marco me ha ayudado a interpretar los resultados del primer y tercer Capítulo desde un enfoque más amplio y completo. El marco de investigación incluye seis dimensiones que abarcan 36 elementos vinculados a través de seis conexiones transversales.

Resum

En aquesta tesi doctoral examino les transformacions del sistema alimentari espanyol des del 1980 fins al present, centrant-me en els canvis socioeconòmics estructurals i els impactes per a la sostenibilitat i l'equitat social. Per això, parteixo de la història agrària i l'economia política, i incorporo també perspectives de l'economia ecològica i feminista. El primer i tercer Capítol de la tesi són de naturalesa empírica. Basats principalment en dades de la Comptabilitat Nacional d'Espanya, els resultats mostren la creixent integració del sistema agroalimentari espanyol dins del global i la creixent dependència de l'agricultura d'insums externs. També revelen un fort descens de la població agrària, al mateix temps que augmenta la proporció de treball assalariat. Aquestes tendències s'expliquen per la disminució del nombre d'explotacions, especialment les petites explotacions familiars, que a més estan experimentant un procés d'envelliment. La disminució de la renda agrària al llarg del període ha estat un determinant fonamental d'aquesta tendència. En conjunt, aquests processos posen en perill la reproducció present i futura dels agroecosistemes a l'Estat espanyol. Al Capítol III també examino la proporció de la despesa en alimentació a les llars espanyoles, com una primera exploració a l'evolució del cost dels aliments en la reproducció de la força de treball. Els resultats mostren el final de la disminució del seu pes en el total de les despeses. No obstant això, són insuficients per arribar a una conclusió definitiva. Així mateix, els resultats evidencien un augment de la desigualtat en la distribució del valor afegit al llarg de la cadena agroalimentària. Al segon Capítol, desenvolupo un marc de recerca per investigar els sistemes alimentaris a nivell nacional, i particularment el seu paper en els mecanismes de reproducció del sistema capitalista del qual formen part, partint dels enfocaments dels règims alimentaris, del metabolisme social i de l'excedent reproducció. Aquest marc m'ha ajudat a interpretar els resultats del primer i tercer Capítol des d'un enfocament més ampli i complet. El marc de recerca inclou sis dimensions que abasten 36 elements vinculats a través de sis connexions transversals.

INTRODUCTION

This Thesis was conducted within the PhD interuniversity Programme of Economic History of the University of Barcelona (UB), the University of Carlos III de Madrid and the University of Valencia in its line of environmental and agrarian history, under the supervision of Prof. Enric Tello (from the Department of Economic History, Institutions, Policy and World Economy, UB) and Prof. Mònica Serrano (from the Department of Economics, UB) both in Faculty of Economics and Business at the UB. The thesis was developed in the framework of the Spanish research project "Agroecological Landscapes and Food Systems: Past, Present and Future Transitions" (AGROLAND, PID2021-123129NB-C41) funded by Spanish Ministry of Science & Innovation.

The general research question of this PhD Thesis is: How has the Spanish food system transformed over the last forty years, from before its accession to the European Union and its Common Agricultural Policy, to the most recent data available today? This question primarily focuses on the prevailing socioeconomic structural changes over this period and their impacts on the sustainability and social equality of the food system. My main hypothesis is that these transformations have increased the unsustainability and injustices of farming and the food system in Spain.

The thesis is framed in the agrarian history of Spain in the last century, and particularly in the last forty years. Nevertheless, it build bridges with other disciplines such as political economy (Bernstein, 2016; Collinson, 2003)—more specifically with the political economy of food systems (Duncan, Levkoe, & Moragues-Faus, 2019)—, agri-food studies (Constance, 2023) and sustainability science (Kates et al., 2001). It is also influenced by Feminist Economics (Carrasco, 2011, 2014; Marco, 2017; Picchio, 1992) and Ecological Economics (Costanza, 1989; Georgescu-Roegen, 1971; Gerber & Scheidel, 2018), yet in a lesser extent.

I will start this introduction by summarizing the main events and trends in the realm of Spanish agrarian sector[1] over the last century as well as the literature which addressed them. This is a first necessary step to understand the motivations behind this thesis and its significance.

The transition from the Mediterranean and Atlantic organic agricultural society towards industrial agriculture was one of the major changes so far (Abad & Naredo,1997; Naredo, 2004 [1971]). The Mediterranean and Atlantic organic agricultural society was characterized by a 'natural agrarian economy', in which

[1] I understand 'agrarian' as relating to rural and agricultural matters (including not only agricultural production, but also institutions, policies, etc.). I use 'agriculture' to also include livestock breeding and forestry. When different, I specify it.

the flows of materials and energy were mainly closed within the sector, and thus it kept the capacity to replace with internal renewable resources a significant proportion of the biophysical inputs spent. This still relevant degree of bioeconomic circularity was kept alive by the central role of the peasantry, made up of free peasants who run small farms and waged labour working in big farms. According to Naredo (2004 [1971]), the crises of the organic agricultural society reached its highest point in the 1960s, resulting from the mechanization process which started in the previous decade. The strong wave of Spanish migration in 1940s and 1950s, and the resulting increase of agricultural salaries, was considered as the main driver of the mechanization process by Naredo (2004 [1971]) as well as by other authors (Arnalte Alegre & Ceña, 1993). In contrast, other authors considered that agrarian mechanization was not an endogenous feature of agriculture, but rather the result of the permanent need of expansion of capital in the capitalism system (Etxezarreta, 2006b; García-Morilla, 2006).

The mechanization process favoured big farms at expenses of small family farms. For the former, the adoption of new technologies was more affordable. In addition, they benefited from economies of scale (Clar, Martín-Retortillo, & Pinilla, 2018; Naredo, 2004 [1971]). Mechanization, combined with monocultural cropping and livestock specialization, was key in the development and consolidation of capitalist production relations in the countryside, favouring the social division of labour and increasing the market dependence of farmers due to the growing use of external industrial inputs (Abad & Naredo, 1997; Naredo, 2004 [1971]; Etxezarreta, 2006; Etxezarreta, 2006b; González de Molina et al., 2020). This process was understood by some authors as 'agricultural structural adjustment' (Arnalte Alegre, 2002, 2006; López-Iglesias, 2006). Many authors have studied the evolution of Spanish agrarian population and agricultural holdings since then from different approaches, and coincided with their results: Spanish agriculture has suffered a continuous reduction in its agrarian

population as well as in the number of farms, particularly the smaller ones, while lager farms increased in size (Arnalte Alegre, 2002, 2006; Clar et al., 2018; Collantes & Pinilla, 2011; Etxezarreta, 2006; Etxezarreta, Cruz, García Morilla, & Viladomiú, 1995; Etxezarreta, 2006a; González de Molina et al., 2020b; Guzmán, Fernández, Aguilera, Infante-Amate, & de Molina, 2022; López-Iglesias, 2006; Naredo, 2004 [1971]).

As everywhere, the role of policies was crucial in the unfolding of the transformation process of agriculture in Spain. The agreements between the United States (US) and Spanish Franco dictatorship in the 1950s were key for the introduction of Green Revolution technologies -fertilizers, pesticides, high-yield seeds and machinery-, setting the pillars for specialization and intensification (Barciela, 2000; Ernesto Clar, 2010; Ernesto Clar et al., 2018) and the Spanish opening to international markets (Ernesto Clar, Serrano, & Pinilla, 2015). Furthermore, the land consolidation policy was specifically implemented to eliminate smallholdings (Ernesto Clar et al., 2018). In the 1960s, the Stabilization Plan of 1959 fostered the development of industry and services, and favoured migration from rural to urban areas, as well as to other European countries. Thus, it highly contributed to the agrarian exodus (Clar & Pinilla, 2009; José Manuel Naredo, 2004 [1971]). This scenario continued until the advent to democracy following Franco's death in 1975. During this period, the agricultural policy underwent a shift in focus towards addressing the plight of farmers in the aftermath of the crises of 1970s as well as towards aligning to Common Agrarian Policy (CAP) (Arnalte Alegre & Ceña, 1993; Ernesto Clar et al., 2018).

The accession of Spain to the European Economic Community (EEC) in 1986 was a pivotal event. It resulted in a new regulatory framework under the CAP that has been determining for the trajectory of Spanish agriculture so far. A detailed overview of the CAP, and its main stages, was provided by Etxezarreta (2006)

and Collantes (2020) from a political economy approach. The CAP impacts in Spain were studied by Etxezarreta et al., (1995), Etxezarreta (2006) and López-Iglesias (2006) from a political economy approach, and by Clar, Martín-Retortillo, & Pinilla (2018) from an historical/agrarian change perspective. A review of the CAP and its impacts in Spain is surpasses of the scope of this introduction. However, the aforementioned literature shows a key feature that I consider important to highlight: the CAP has concealed important contradictions since the 1980s. On the one hand, it has sought to maintained family agriculture and rural society alive, an objective which lies beyond the need to guarantee territorial equilibrium as well as on the benefits they provided, such as ecosystem services. On the other hand, European agriculture operates within the global capitalist system. International markets force agriculture to be competitive in this highly asymmetric framework, which only can be achieved through industrial-intensive and large-scale agriculture.

In addition, the Spanish accession to the EEC was decisive for the opening to the European market. Spanish agriculture deepened its integration in international markets after 1986 (Clar et al., 2018, 2015; Etxezarreta, 2006a), along with its specialization and intensification (Clar, 2010; Clar et al., 2018; González de Molina et al., 2020; López-Iglesias, 2006). Paradigmatic cases were intensive livestock farming and irrigated agriculture, which further increased Spanish dependence on external industrial inputs—particularly imported animal feeding—at the expenses of traditional agricultural inputs (Clar, 2010; Clar et al., 2018, 2015; González de Molina et al., 2020). This transformation was hand in hand with changes in diet that gradually replaced Mediterranean diet with one based on unhealthy doses of animal and processed foods (Brunori et al., 2020; Collantes, 2017; M. González de Molina et al., 2020b; Langreo & Germán, 2018; Medina-Albaladejo, Martínez-Carrión, & Calatayud, 2023). As a result, Spanish agriculture continued to strengthen its links with industry, both from the origin

of its inputs and as destination of its outputs (Abad & Naredo, 1997; Clar et al., 2018; De Haro & Titos, 1982; Naredo, 1991).

Despite the increases in Spanish agricultural production, yields and exports, the participation of the agrarian activity in Spanish value added as well as agrarian income have decreased since 1950 (Clar et al., 2018; González de Molina et al., 2020). The increasing dependence on external inputs, integration with and dependence on industry, and negative terms of trade between prices received and paid by farmers have been identified as the main drivers of this income decline endured mainly by small family farms (González de Molina et al., 2020; Naredo, 1991).

Labour, land and total factor productivity increased during the second half of the 20th century (Ernesto Clar et al., 2018). However, studies from bio-physical approaches showed a very different picture. From an energetic standpoint, studies by Naredo & Campos Palacín (1980), Carpintero & Naredo (2006), González de Molina et al. (2020) and Tello et al. (2016, in press) showed that the energy efficiency of Spanish agriculture followed a downward trend. Furthermore, given the strong dependency on fossil fuels of our current energy system, such energy consumption concealed an important source of greenhouse gases (GHG) emissions—considering the entire agri-food system worldwide the figure was as large as 34% of total GHG emitted in 2015, making this sector the single largest emitter in the world economy (Crippa et al., 2021; Laso & Hoehn, 2018; Lassaletta et al., 2016; Rockström, Edenhofer, Gaertner, & DeClerck, 2020).

The socio-metabolic changes of Spanish agriculture have also resulted in soil degradation and biodiversity loss. The latter favours the emergence of plagues and diseases, which leads to an increase in the use of phytosanitary products. This creates a vicious cycle, as the pollution associated to their use further

jeopardizes biodiversity (González de Molina et al., 2020). Water consumption has also increased, leading to the overexploitation of water resources, increase of salinity levels, and endangerment of water-linked ecosystems (Duarte et al., 2014, 2016a; Ibarra et al., 2008; Lassaletta, Billen, Romero, Garnier, & Aguilera, 2014; Vila-Traver et al., 2021). Additionally, the use chemicals and pesticides has contributed to the pollution of groundwater with nitrates and phosphates (Duarte, Sánchez-Chóliz, & Bielsa, 2002; Ibarra et al., 2008). From a social standpoint, the continuous reduction of the agrarian population has jeopardized their critical role in the transmission of peasants' and farmers' biocultural heritage (Koohafkan & Altieri, 2011) as well as way of life, leading to serious depopulation problems in rural Spain (Collantes & Pinilla, 2020).

In a nutshell, Spanish agriculture has increased its ecological deficit and triggered harmful social and environmental impacts since mid-20th century (Naredo, 2001; Simón, 1999). These trends are not unique to the Spanish case, as they are common to the functioning of the global food system (Crippa et al., 2021; Intergovernmental Panel on Climate Change [IPCC], 2019; Rockström, Edenhofer, Gaertner, & DeClerck, 2020) and there is increasingly wider consensus on the need to transform them to be more sustainable and fair (Caron et al., 2018; European Commission, n.d.; Food and Agricultural Organization [FAO] of the Unitated Nations, 2018; López-García, 2023).

This Thesis responds to this need. Its main objective is to advance understandings of Spanish agriculture and of the entire Spanish food system since 1980 to the present. It particularly focuses on the more recent stage of agricultural and food system transformations in recent contemporary times, covering a pivotal moment—Spain's entrance into the ECC and UE—up to the present. This Thesis aims to connect past, present, and future. It seeks to better understand the historical trajectory of the Spanish food system in order to gain

insights that can be useful for addressing our present societal challenges and formulating proposal for its future transformation. This Thesis is grounded on a sound commitment to advance towards a more just and sustainable food systems.

As the reader may have noticed, this Thesis does not focus solely on agriculture, but rather on the food system. I understand food system as 'the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal and natural environments in which they are embedded' (FAO, 2018). This system boundary is cross-cutting in the Thesis, and with it, I address on one of the main limitations of the Spanish agrarian literature to date: its primary focus on agriculture only.

Before delving into this issue, which brings us closer to the specific knowledge gaps which I addressed in this Thesis, the research questions, and objectives of each chapter, as well as the approaches and methods used, I consider it very important to clarify that the research conducted during this Thesis was the result of an evolving and feedback-based process from chapter to chapter. In other words, the results obtained in each chapter as well as the intellectual evolution that as a young researcher I experienced over these years, shaped, and enriched the subsequent research questions and approaches I used to address them. Below, I succinctly present the three chapters that structure this thesis and explain why and how I formulated them.

The first Chapter of this Thesis '***Transformations in agriculture, stockbreeding, forestry and fishing within the Spanish agri-food system (1980-2016)',*** which was published as an article with same title in the journal *Historia Agraria* (Parajuá, 2022), was the starting point of this Thesis. In it, I

formulated the following specific research question: Which were the socio-economic transformations experienced by agriculture, stockbreeding, forestry and fishing within the agri-food system in Spain between 1980 and 2016? In the framework of Chapter I, the agri-food system is comprised of agriculture, stockbreeding, forestry and fishing; the food industry; and food services.

To address this question, I used data from the input-output framework of the Spanish *Instituto Nacional de Estadística* (National Statistics Institute, INE) and created series on value added, labour and supply for agriculture, stockbreeding, forestry and fishing; the food industry; and food services between 1980 and 2016. In addition, I calculated their intermediate inputs structure for 1980 and 2015. Chapter I showed the continuous reductions in the share of agriculture, stockbreeding, forestry and fishing's value added and labour within the Spanish agri-food system, as well as the increase in the rate of salaried labour along the period. Additionally, it showed that Spanish agriculture, stockbreeding, forestry and fishing increasingly became decoupled from the land, reducing its 're-use' rate and becoming more dependent on external intermediate inputs, while deepening its integration in the global food system. A final outstanding result from Chapter I was that trade services emerged as a major player in the system. This Chapter contributed to the former literature by deepening on the linkages between the economic activities involved in the agri-food system in Spain and continued with the works by De Haro & Titos (1982), Naredo (1991), Titos (1995) and Abad & Naredo (1997). It contributed to this literature in three ways: first, it enlarged the period of study from 1995 to 2016 and provided series and data for almost forty years (1980-2016); second, it included food services—only studied in the year 1988 by Titos (1995)—; and third, significantly broadened the level of disagregation of the products, activities and services included in the Spanish agri-food sytem.

The results from Chapter I highlight the need for further study the role of trade and price dynamics to advance our understanding of the Spanish agri-food system. At the time these questions emerged, I delved deeply into the literature of food regimes (Friedmann, 2005; Friedmann & McMichael, 1989; McMichael, 2005). Food regimes provide an approach to studying the historical relations of agriculture, food, and the reproduction dynamics of global capitalism (Bernstein, 2016; Campbell & Dixon, 2009). This literature was highly inspiring to me, as it allowed to broaden my perspective on the agri-food system. Food regimes are situated within the field of political economy (Collinson, 2003), and specifically within the political economy of food systems, which addresses the differential power relations across all aspects of food systems—from harvesting and production, to distribution, consumption, and waste management—along with related influences and impacts. Moreover, the dynamics of food systems are understood in terms of relations of power and not simply material goods and outcomes (Duncan et al., 2019). I considered this approach highly relevant for better understanding the transformations of the Spanish agri-food system shown in Chapter I as well as the dynamics behind them.

Chapter II, ***'A research framework to investigate food systems at national scale'***, emerged around this. My research visit to the department of Rural Sociology at Wageningen University and Research in the 2022 spring, under the mentorship of Dr. Jessica Duncan—with who I am still collaborating to transform Chapter II into a publishable article—was critical for addressing this stage of the Thesis. Chapter II issued from the question of 'How can I use food regimes to investigate the Spanish food system between 1980 until the present?' That meant to go into a novel research on how to investigate food systems at a national level, and particularly their role in the reproduction of the capitalist system in which they are embedded. This research framework includes six dimensions—'food governance', 'agri-food chain', 'social metabolism',

'surplus/reproduction', 'socio-ecological impacts' and 'conflicts and leverages of change'—, which encompass 36 elements in total, and six cross-cutting connections within and between dimensions. In addition, Chapter II empathises the core idea of food regimes—cheap food is a prerequisite for capital accumulation (Araghi, 2003; Tilzey, 2019).

The development of this research framework was grounded on a literature review of studies which used food regimes to investigate national scenarios, from which I identified a set of key aspects in the unfolding of food regimes at this scale, and which I further combined with the approaches of social metabolism from ecological economics and surplus/reproduction from feminist economics. Chapter II contributes to food regimes literature by overcoming two of its main limitations: its level of abstraction and its scale—global so far— (Jakobsen, 2021; Moran, Blunden, Workman, & Bradly, 1996; Pechlaner & Otero, 2010). Additionally, it contributes to the expansion of the political economy by bringing together new approaches and perspectives (Duncan et al., 2019; Moragues-Faus & Marsden, 2017).

Chapter III, ***'Towards a crisis of reproduction? An empirical exploration on smallholder agriculture and food expenditure in Spain (1980-2021)'***, builds upon the results and contributions from Chapter I and Chapter II. Relying on the research framework proposed in Chapter II, in this Chapter I carry out an initial, tentative exploration on the trends experienced from 1980 to 2021 of the Spanish food system focused on two aspects: on the one hand, the evolution of smallholder agriculture, and on the other hand, the evolution of food expenditure in household expenditure. These two aspects are critical in terms of reproduction of the system. Small family farms are part of the agroecosystem, the reproduction of which is essential for the provision of agroecosystem services—including food—. Food expenditure is a critical cost for the

reproduction of the labouring population. In this way, this Chapter continues the work of Chapter I, which focused on the production sphere, by addressing the sphere of reproduction.

I used data and microdata from the Spanish Agrarian Censuses and the Spanish Household Budget Surveys (HBSs) from the INE and the Agrarian Yearbooks from the Spanish Ministry of Agriculture, Fishing and Food (*Ministerio de Agricultura, Pesca y Alimentación*, MAPA) between 1980 and 2021. I created series on the number of farms and their size; the distribution of Utilised Agricultural Area (UAA) by legal form; the age of farm holders; the Agricultural Working Units and their nature—family work or employee based—; the production of agriculture, stockbreeding and forestry, their intermediate inputs, amortizations, subsides and taxes; the agrarian income and its components; the active and employed agrarian population; the ratio between the Index of Prices Received by farmers and the Index of Prices Paid by them; the average monthly net monetary income of households by occupation of main household breadwinner; the average monthly household expenditure; the distribution of average household expenditure by category of expenditure; and the average share of household expenditure on food in relation to total expenditures by occupation of household main breadwinner.

The results of Chapter III showed the continuation of the trend of reduction in the number of Spanish farms accompanied by a concentration of land in the largest ones. It also showed a significant aging process of the ones remaining. Additionally, the results shed light on the economic aspects that might have led to this abandonment—the decrease of agrarian income and the deterioration of terms of trade between prices received and paid by farmers—. Regarding the weight of food expenditure in relation to total expenditures of households, although the results confirm the end of the decline of this weight, they are still

not sufficient to answer the question whether there has been an increase in the food cost of labour reproduction in Spain. This way, Chapter III contributes to the literature on the evolution of Spanish agricultural holdings and their drivers by enlarging the period of study and providing novel data; to the literature on food expenditure of Spanish households by creating a series between 1980 and 2021 and by providing data by occupation of household main breadwinner; and to the political economy of food systems in Spain, by framing the former results into the research framework of Chapter II.

This Thesis finalises with a final Chapter presenting an overall conclusion from the three Chapters that comprise it, which includes its main limitations, the future avenues of research, and its usefulness in transforming current food systems.

CHAPTER I. Transformations in agriculture, stockbreeding, forestry and fishing within the Spanish agri-food system (1980-2016)[2]

[2] This chapter has been already published as an article in the journal *Historia Agraria*. The citation is: Parajuá, N. (2022). Transformations in agriculture, stockbreeding, forestry and fishing within the Spanish agri-food system (1980-2016). *Historia Agraria*, (88), 253–283. https://doi.org/10.26882/histagrar.088e04p

ABSTRACT

This paper examines the evolution of *agriculture, stockbreeding, forestry and fishing (ASFF)* within the Spanish *agri-food system* for 1980-2016. It adopts a socio-economic approach based on data from the input-output framework of Spanish National Accounting of the *Instituto Nacional de Estadística* [National Statistics Institute]. I examine the series on value added, labour and supply for the activities and products involved in the *agri-food system,* and calculate their intermediate input and use structures in 1980 and 2015. The results show the continuous reductions in the share of *ASFF*'s value added and labour within the Spanish *agri-food system*. Moreover, Spanish *ASFF* increasingly became decoupled from the land, reducing their 're-use' rate and becoming more dependent on external intermediate inputs. *Trade services* emerged as a major player in the system, a development associated with the country's growing integration in the global agri-food system and higher rates of salaried labour.

Keywords: agri-food system, supply and use tables, input-output, Spain.

JEL CODES: E01, Q10, Q17, N54.

1.1. Introduction

There is no doubt that agriculture has multiple vital functions, from its potential as a net provider of renewable materials and carriers of energy to the rest of the economy (Georgescu-Roegen, 1971) to its capacity to supply ecosystem services (*e. g.* carbon sequestration, water supply, disease control) that are essential for the sustainability of human life (Daily, 1997; MEA, 2005). Agroecosystems are the kind of human intervention into natural systems with the widest territorial scope on earth by far, as they take up roughly 40% of the total land area (IAASTD, 2009). This is why agriculture is considered a key dimension in tackling many of the environmental problems we currently face [IPCC (Intergovernmental Panel on Climate Change), 2019]. Furthermore, agricultural activities have a major social role in that they are a source of employment and a way of maintaining cultural heritage all over the world (Koohafkan & Altieri, 2011). Despite this, the importance of agriculture in terms of value added and labour has sharply declined in most countries (World Bank, s. d.-a, -b). This is also the case for Spain. What is behind this fact?

Agriculture has undergone important transformations over the last three centuries. However, they are minor compared with the changes that it has experienced since the second half of the twentieth century (Clar, Martín-Retortillo & Pinilla, 2018). Historically agriculture has had the function of feeding and fuelling the world, being the core sector of food production. However, since industrialization, new economic processes have gradually developed between the agricultural production of food and food consumption, including transportation, packaging, processing and distribution, resulting in the value chains of the so-called *agri-food system* (Malassis, 1973; Infante-Amate & González de Molina, 2013). This makes essential the distinction between 'agricultural product', understood as the output derived from the production of the agricultural sector (Rodríguez Zúñiga & Soria, 1986), and 'food product,' defined as the final production of goods resulting from the transformation of agricultural products and the addition of diverse uses (Lancaster, 1966). Thus, ongoing debates on agriculture and food should be framed in terms of the entire agri-food system.

In addition, the current agri-food system has become increasingly globalized, thanks to the industrialization of the agri-food chain, as well as being increasingly ruled by agribusiness and more recently by big distribution. This new stage of agricultural transformation has been called the "internationalized agri-business model" (Clar, Martín-Retortillo & Pinilla, 2018) and framed as the "third food regime" (McMichael, 2009; Friedmann, 2018; Krausmann & Langthaler, 2019). At the same time, the current agri-food system has become highly unsustainable, both from an environmental perspective (Cardinale et al., 2012; Tscharntke et al., 2012; Infante-Amate & González de Molina, 2013; Laso et al., 2018) and socially (Camarero et al., 2006; Tello & González de Molina, 2017; FAO et al., 2018).

These transformations have been studied with reference to Spain from various perspectives. In political economy, Spanish agricultural dynamics were analysed by Etxezarreta (2006) from the mid-1970s to the beginning of the twentieth

century. Agrarian change in Spain from 1900 to 2008 has been examined by González de Molina et al., (2020b) and Guzmán, González de Molina, Soto Fernández, Infante-Amate, & Aguilera (2017) using a socio-metabolic approach, and from 1950 to 2015 by Clar et al., (2018) using a more conventional economic standpoint. These contributions are undoubtedly highly significant, though they focus primarily on agriculture.

The first contribution in broadening out this study to the agro-industrial complex was made by Titos and Haro, who examined the mutual dependence between food as a primary production activity and the food industry in Spain based on input-output data and techniques between 1962 and 1975 (Haro & Titos, 1982), which they also compared with other European countries (Titos & Haro, 1983). Subsequently, Naredo (1991) and Abad and Naredo (1997) analysed the Spanish transition from "traditional agriculture" towards an "agro-industrial system" in the second half of the twentieth century. They also used an input-output framework, for the first time linking the decline in agriculture's socio-economic aggregates to the development of the food industry. Taking a further step forward, Titos et al. (1995) included trade and food services by creating and analyzing an input-output table of the agri-food system in Spain for the year 1988. This work was further enlarged by applying a structural decomposition analysis of the period between 1970 and 1988 (Titos et al., 1996).

Apart from these major contributions using input-output data and/or techniques for Spain as a whole, there are many other such works at the regional level, most of them focusing on the agro-industrial complex. These regions include Córdoba (Titos, 1974), Aragón (Arnal, 1980; Pérez & Feijoó, 1993); Catalonia (Artís, Suriñach & Pons, 1994; Enciso & Sabaté, 1995); Andalucía (Titos, 1995; Pablo & Céspedes, 1996), Navarra (Iraizoz & Rapún, 2001; Iráizoz, 2004) and Galicia (Valdês & López Iglesias, 2008).

This paper contributes to this literature by providing new evidence on the dynamics followed by the Spanish agri-food system in recent decades,

highlighting the links between economic activities. It goes further in disaggregating the activities and products involved in the agri-food system and thus brings new features of their dependencies to light. In addition, it includes food services, an aspect that few researchers have explored. It also extends the period of time being examined up to 2016, therefore continuing the work of the authors mentioned above. In this regard, this paper covers a key historical moment: Spain's entry into the European Economic Community (EEC) (1986). This had major consequences for the development of the Spanish agri-food system since it opened the country up to international trade agreements and launched rule by the later European Union (EU)'s Common Agrarian Policy (CAP).

To this end, I adopt a socio-economic approach based on data from the input-output framework. I examine value added, labour, supply and use data from the supply and use tables (SUTs) and input-output tables (IOTs) of the Spanish Instituto Nacional de Estadística (INE, s. d.-d) for *agriculture, stockbreeding, forestry* and *fishing (ASFF),* as well as the *food industry* and *food and accommodation services*[3] between 1980 and 2016.

The paper is structured as follows. After this introduction, section 1.2 briefly presents the database and the methodological approach. Results of the analysis are set out in section 1.3, divided into the outcomes from value added and changes to labour (section 1.3.1.), as well the findings regarding supply (section 1.3.2.) and uses (section 1.3.3.). The results are discussed in section 1.4 and concluding remarks made in section 1.5.

1.2. Data and methodology

This study adopts a socio-economic approach based on data from the input-output framework. Thus, I use data from SUTs and IOTs from the Spanish National System of Accounts provided by INE (INE, s. d.-a). In Annex I.a, I offer a

[3] When using italics, I am referring to the categories of economic activities and products of the National System of Accounts from INE.

brief but detailed description of the input-output framework. INE published SUTs from 1995 to 2017 on an annual basis and IOTs for 1980, from 1985 to 1994 on an annual basis, from 1995 to 2015 once every five years, and for 2016.

Data from SUTs are preferred for the purposes of this paper, which is fundamentally descriptive in nature. As explained in Annex I.a, the compilation of IOTs relies on certain assumptions that require the application of adjustments. Under the product technology assumption, secondary production—that is, production that is not characteristic of an activity—is reassigned so that symmetric IOTs can be constructed. This adjustment entails a distancing from primary data that SUTs show. However, data from Spanish IOTs can be considered a good proxy since secondary production is relatively low. According to my own calculations[4] from 1995 to 2016, secondary production averaged 6.4% for *agriculture, stockbreeding, forestry* and *fishing (ASFF),* 4.8% for the *food industry*, and 3.4% for *food and accommodation services*. These results are consistent with those published by Eurostat (2008), according to which secondary output of Spanish economic activities averaged 4.7% between 1995 and 2000. In addition, I use data from the Spanish *encuesta de población activa* (INE, s. d.-b) and the *anuarios* (INE, 1990, 1994, 1996, 1997) for those years without labour data from the input-output framework (from 1980 to 1995).

From these sources, I construct series on value added, labour and supply from 1980 to 2016 for all the categories of activities and products related to *ASFF, food industry* and *food and accommodation services*. These three groups are assumed to constitute the *agri-food system* in the framework of this study. Value added and supply series are calculated in current monetary units (pesetas from 1980 to 1996 and euros from 1997 to 2016), while the labour series are calculated in terms of the number of people employed. In addition, the labour series include data on salaried and non-salaried labour, while the supply series include data on domestic and imported supply.

[4] Calculations are based on Supply Tables at basic prices 1995-2016 (INE, s. d.-a).

As for uses, on the one hand I calculate the intermediate input structure for *ASFF,* the *food industry* and *food and accommodation services* in 1980 and 2015 in order to compare the situation at the beginning and end of the period. The intermediate input structure, also known as the *specific demand connection*[5] gives the weight of intermediate inputs used by a given activity in producing its output. On the other hand, I also calculate the use structures of *ASFF products*, *food products* and *food and accommodation services*, *i. e.* the weight of uses by category of use, for 1980 and 2015. In this case, my calculations draw on the methodology known as *specific use connection*[6]. However, I include not only intermediate uses, but also final uses (*i. e.* exports, household consumption and fixed capital formation), which enables me to depict a wider picture of product uses in the economy. In both cases, I base my calculations on data from the IOTs of years 1980 and 2015. I use year 2015 and not 2016 since 2015 is the latest year for which the INE published the IOT of domestic production and the IOT of imported production.

It is important to note that the INE used different systems of accounts and accounting base years, particularly affecting the classification of products and activities. Table 1 summarizes the system of accounts, accounting base years and classifications of products and activities used from 1980 to 2016. It also shows the availability of SUTs and IOTs and the level of the disaggregation of products and activities related to the agri-food system they include. The largest disaggregation is shown by SUTs from 1995 to 2009, based on the Clasificación Nacional de Actividades Económicas (CNAE-93) (INE, s. d.-c) and the Clasificación Nacional de Productos por Actividades 1996 (CNPA-96)[7] (INE, s. d.-d). Tables 2 and 3 in Annex I.b display the main categories of products and

[5] A detailed explanation of the calculation of the specific demand connection (*ligazón específica de demanda* in Spanish) can be found in Haro and Titos (1982).

[6] A detailed explanation of the calculation of the specific use connection (*ligazón específica de oferta* in Spanish) can be found in Titos et al. (1995).

[7] CNAE-93 is structured into five hierarchical levels, including 17 sections, 60 divisions, 222 groups, 512 classes and 7,666 subclasses of activities. CNPA-96 is structured into seven hierarchical levels, including 17 sections, 31 subsections, 60 divisions, 222 groups, 492 classes, 947 categories, 2,305 subcategories and 6,188 elements.

activities that make up *ASFF,* the *food industry* and *food and accommodation services* for the period of study (1980-2016).

Table 1. Database description by system of accounts, accounting base year, products and activities classifications, availability of SUTs and IOTs and categories of products and activities related to the agri-food system they show

Period	System of Accounts	Base	Products class.	Activities class.	Tables	Agri-food system products class.*	Agri-food system activities class.**
2016	ESA 2010	2010	CPA 2008	CNAE 2009	**SUTs**	**A (5), I (8), S (2)**	**A (5), I (8), S (1)**
					IOT	**A (3), I (1), S (1)**	**A (3), I (1), S (1)**
2015-2010	ESA 2010	2010	CPA 2008	NACE Rev. 2.	**SUTs (all years)**	**A (3), I (1), S (1)**	**A (3), I (1), S (1)**
					IOT (2010, 2015)	**A (3), I (1), S (1)**	**A (3), I (1), S (1)**
2009-2008	ESA 1995	2008	CPA 2008	NACE Rev. 2.	**SUTs (all years)**	**A (5), I (8), S (2)**	**A (5), I (8), S (2)**
2007-2000	ESA 1995	2000	CNPA 96	CNAE 93	**SUTs (all years)**	**A (5), I (8), S (2)**	**A (5), I (8), S (2)**
					IOT (2000, 2005)	**A (3), I (5), S (2)**	**A (3), I (5), S (2)**
1999-1995	ESA 1995	1995	CNPA 96	CNAE 93	**SUTs (all years)**	**A (5), I (8), S (2)**	**A (5), I (8), S (2)**
					IOT (1995)	**A (3), I (8), S (1)**	**A (3), I (8), S (1)**
1994 - 1985	ESA 1979	1986 (from 1986 to 1994)	R56	R56	**IOT**	**A (1), I (5), S (1)**	**A (1), I (5), S (1)**
		1985 (year 1985)					
1980	ESA 1979	1980	R43	R43			

*Notes: European System of Accounts (ESA); Clasificación de Productos por Actividades (CPA) 2008 Clasificación Nacional de Productos por Actividades (CNPA) 1996; Nomenclatura de Actividades Económicas de la Comunidad Europea (Nace Rev. 2); Clasificación Nacional de Actividades Económicas (CNAE) 93; supply and use tables (SUTs); input-output table (IOT); * "A" refers to agricultural, stockbreeding, forestry and fishing (ASFF) products; "I" refers to food products and "S" refers to food and accommodation services. The number in parentheses refers to level of disaggregation of products' categories for A, I and S; ** "A" refers to agriculture, stockbreeding, forestry and fishing (ASFF); "I" refers to food industry and "S" refers to food and accommodation services. The number in parentheses refers to level of disaggregation of activities' categories for A, I and S.*

Source: based on the input-output framework (INE, a)

Due to these differences in accounting, it was not possible to construct homogeneous series for the entire period of study. As Table 1 shows, *food services* are particularly affected, being aggregated along with *accommodation services* for 1980, from 1985 to 1994, from 2010 to 2015 and for 2016. However, the examination of data from the years in which *food services* and *accommodation services* were accounted separately confirms the major share of *food services* in the aggregated value (83.3% on average in 1995-2009 and 2016).

A final concern has to do with distribution between the links of the value chain that makes up the *agri-food system*. SUTs and IOTs do not directly show the

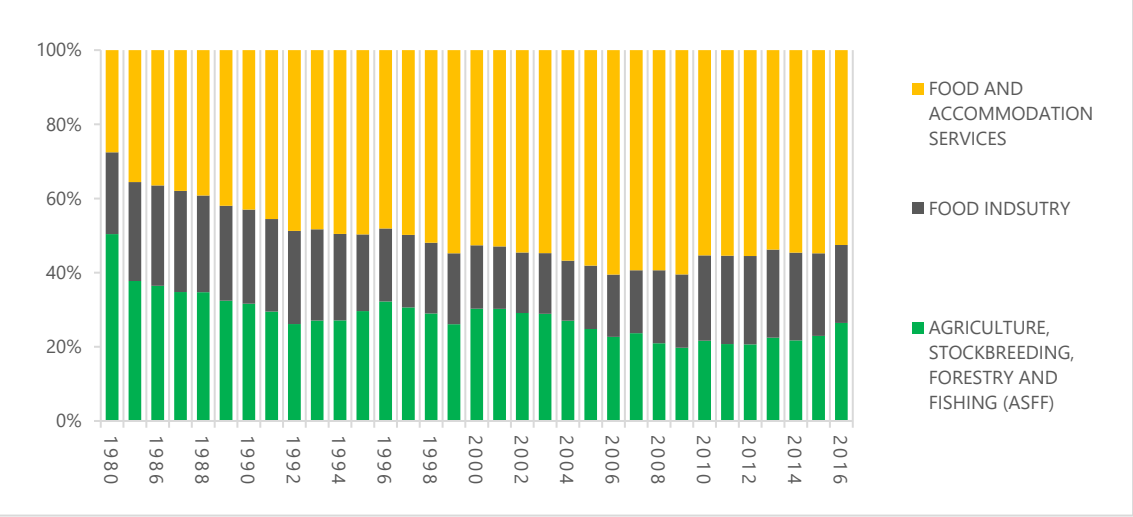
share of *transport* and *trade services* that are involved in the agri-food system (Titos *et al.,* 1995; Titos & Haro, 1983). Disentangling this requires further research. For this reason, distribution is excluded as going beyond the scope of this paper. However, *transport* and *trade services* are taken into account in examining the intermediate input structures and use structures related to *ASFF, food industry* and *food and accommodation services*.

1.3. Results

1.3.1. Value added and labour in the agri-food system: the fall in *ASFF* and the rise in *food and accommodation services*

Figure 1 shows the evolution of the shares of value added of *ASFF, food industry* and *food and accommodation services* in the Spanish *agri-food system* from 1980 to 2016. Note that the weight of *ASFF* almost halved from 50.4% to 26.4% throughout the period, compared to a nearly twofold increase from 27.6% to 52.5% in the case of *food and accommodation services*. The share of *food industry* remained quite stable (average share of 21.5% throughout the period). As a result, *food and accommodation services* became the major contributor to the Spanish *agri-food system* in terms of value added, replacing the position *ASFF* occupied at the beginning of the period.

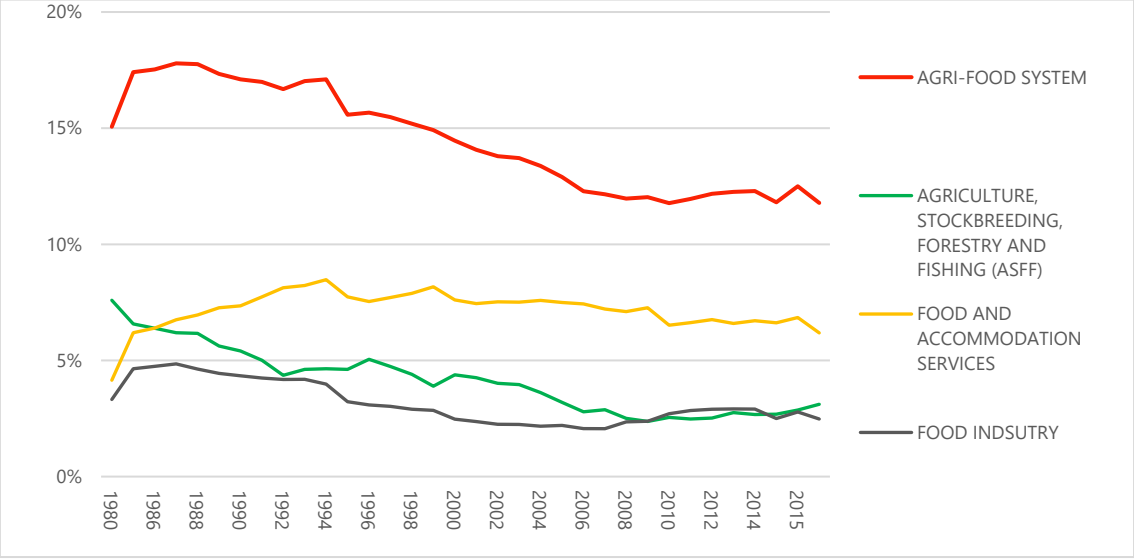
Figure 1. Value added by group of activity (% of agri-food system), Spain 1980-2016



Source: based on data from the input-output framework (INE, a)(Instituto Nacional de Estadística (INE), n.d.-c)(Instituto Nacional de Estadística (INE), n.d.-c)(Instituto Nacional de Estadística (INE), n.d.-c)

Figure 2 shows the evolution of the same three aggregate activities in the total value added of the Spanish economy, also from 1980 to 2016. Again, the declining weight of *ASFF* is notable, falling 59%, from 7.6% to 3.1% of the Spanish total value added between 1980 and 2016. The share of *food and accommodation services* increased 78%, from 4.6% to 8.2% up to 1999, although in the twenty-first century it slightly contracted at an average rate of 1.2%. The weight of the *food industry* fell 24%, from 3.3% in 1980 to 2.5% in 2016. The joint result of these trends was a reduction in *the agri-food system* in the total value added of the Spanish economy, from 15.1% in 1980 to 11.8% in 2016. This downward trend was only interrupted between 1980 and 1987, when it expanded at an average rate of 1.7%. This evolution was the result of changes not only to the agri-food system, but also to the Spanish economy as a whole. The output of the *agri-food system* in absolute terms did not decrease, but other economic activities have emerged that have gained great relative weight in recent decades.

Figure 2. Value added by group of activity (% of total economy), Spain 1980-2016

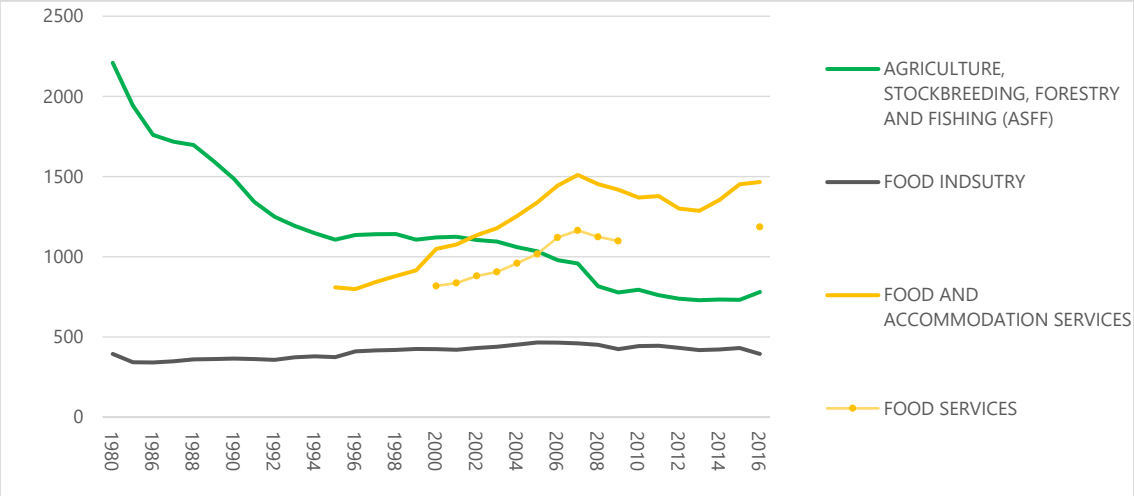


Source: based on data from the input-output framework (INE, a)

The reduction of the share of *ASFF* in the value added of Spain's *agri-food system* and economy went hand in hand with a drastic fall in the agricultural labour force (Fig. 3). This was particularly pronounced in between 1980 and

1994, when the number of people employed halved from 2,209,100 to 1,106,500. In 2016, only 779,700 people worked in *ASFF*.

Figure 3. Number of people employed by activity (in thousands of people), Spain 1980-2016



Notes: People employed refers to people aged 16 and older that have been working at least one hour in exchange for a remuneration in cash or in kind during the references' week. It also includes those with work but temporarily absent through illness, holidays, etc. They are subdivided into freelance workers (employers, businesspersons without employees and independent workers) and employees (public or private)

Source: From 1996 to 2016 data were sourced from supply tables (INE, a) showing "positions" from 1996 to 2007 and "people employed in the activity" from 2008 to 2016. For the period 1996-2007 "positions" is used as a proxy since there are no data on "employees in the activity". Data on food and accommodation services in year 1995 also shows "positions". The lack of labour data before 1995 from supply tables was complemented with data from the Encuesta de Población Activa (EPA) (INE, b) for ASFF and from Anuarios (INE, 1990, 1994, 1996, 1997) for food industry.

Due to the lack of available data, it was not possible to calculate the share of agricultural labour in the total labour of the *agri-food system* in 1980. However, it must have been substantial. In 2000, the first year with available labour data for *ASFF,* the *food industry* and *food services*, the share of people employed in *ASFF* was 47.4% of the figure for the total *agri-food system*—excluding *accommodation services*—. In 2016, this share fell to 32.7%, thus declining by about 45%. Its corresponding share of the total labour of the Spanish economy fell by 78%, from 18.6% in 1980 to only 4.1% in 2016.

In line with the evolution of value added flows, the number of people employed in *food services* increased. Data are only available from 1995 onwards, aggregated along with *accommodation services* from 1995 to 2000 and 2010 to

2015. Nevertheless, labour in *food services* seems to have followed an upward trend since the 1980s (Fig. 3). In 2000, 771,100 people were employed in *food services*, accounting for 34.6% of all labour in the *agri-food system*—excluding *accommodation services*—and for 4.8% of Spain's total labour. This figure increased to 1,244,500 in 2016, accounting for 51.1% of labour in the Spanish *agri-food system* —excluding *accommodation services*—and for 6.3% of the total labour in the Spanish economy.

The figure for those employed in the *food industry* remained stable in absolute terms, being 393,850 in 1980 and 393,400 in 2016. However, in relative terms, its weight fell 9%, from 17.9% in 2000 to 16.2% in 2016, of the total labour of the Spanish *agri-food system*, and 36%, from 3.3% in 1980 to 2.1% in 2016, of the total labour in the Spanish economy.

Labour data also reveal an increase in the rate of salaried labour. In the case of *ASFF,* the share of non-salaried labour nearly halved, from 71.7% in 1980 to 37.7% in 2016. These data also show that 1996 was a turning point in the inversion of salaried and non-salaried shares. As a result, *ASFF* labour substantially declined at the same time as it became predominantly employee-based.

Data on the types of labour employed in the *food industry* and *food services* have been only published from 1995 onwards. These data show that salaried labour was prevalent in both the *food industry* and *food and accommodation services* between 1995 and 2016 and that its weight increased relatively during this period. The share of salaried labour increased 7% in the *food industry*, from 89.7% in 1995 to 95.9% in 2016, and 18% in *food and accommodation services*, from 64.3% in 1995 to 75.7% in 2016.

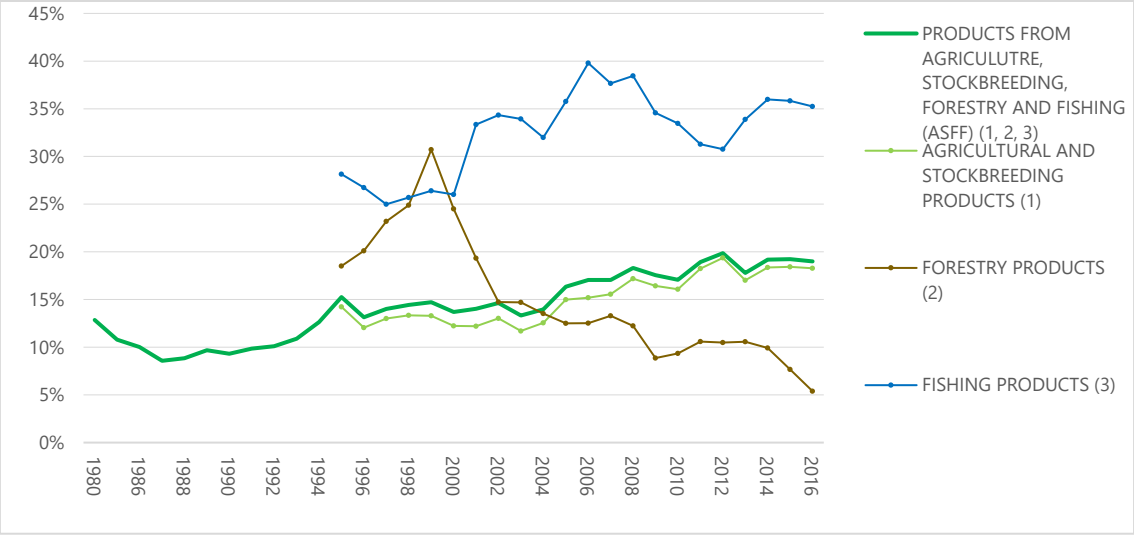
1.3.2. Increasing internationalization of the agri-food supply

Supply data show that the share of imported products in total supply increased in all categories from 1980 to 2016. In the case of *ASFF products* this trend was

only interrupted from 1980 to 1986, just before Spain joined the EEC, when it fell from 12.7% to 8.6% (Fig. 4). Since then, the share of *ASFF* imports in the total supply more than doubled, reaching 19.9% in 2016. In the last decade, *ASFF products* were by far those with the highest share of imports, with an average of 18.3%, in contrast to *food products* (14.3%) and *food and accommodation services* (1.6%). In the available data (1995-2016) the shares of *ASFF* imports for the EU and non-EU categories are quite similar, on average 44.8% for the former and 55.2% for the latter.

Looking at the paths followed by *ASFF* imports at a greater level of disaggregation (available from 1995 onwards), Figure 4 shows that the behaviour described above refers mostly to *agricultural* and *stockbreeding products*. This is due to the fact that these products account for most of the output of *ASFF products*. *Fishing products* showed the highest rate of imports, with an average rate of 32.5% between 1995 and 2016. Moreover, this increased from 28.2% to 35.2% during the period. In constrast, the share of imports of *forestry products* decreased from 18.5% in 1995 to 5.4% in 2016.

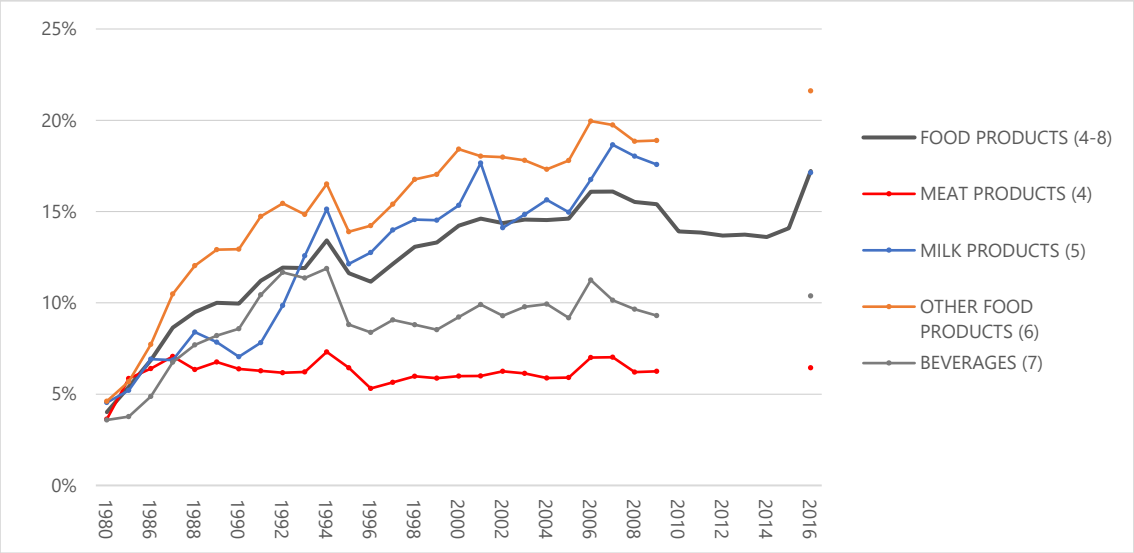
Figure 4. Imports of ASFF products regarding total supply by category of product (in %), Spain 1980-2016



Notes: Share of imports is calculated as the number of imported products in relation to its total supply by category of product.

Source: based on data from the input-output framework (INE, a)

Figure 5. Imports of food products regarding total supply by category of product (in %), Spain 1980-2016



Notes: Share of imports is calculated as the number of imported products in relation to its total supply by category of product. Food products also includes category 8 (Tobacco products).

Source: based on data from the input-output framework (INE, a)

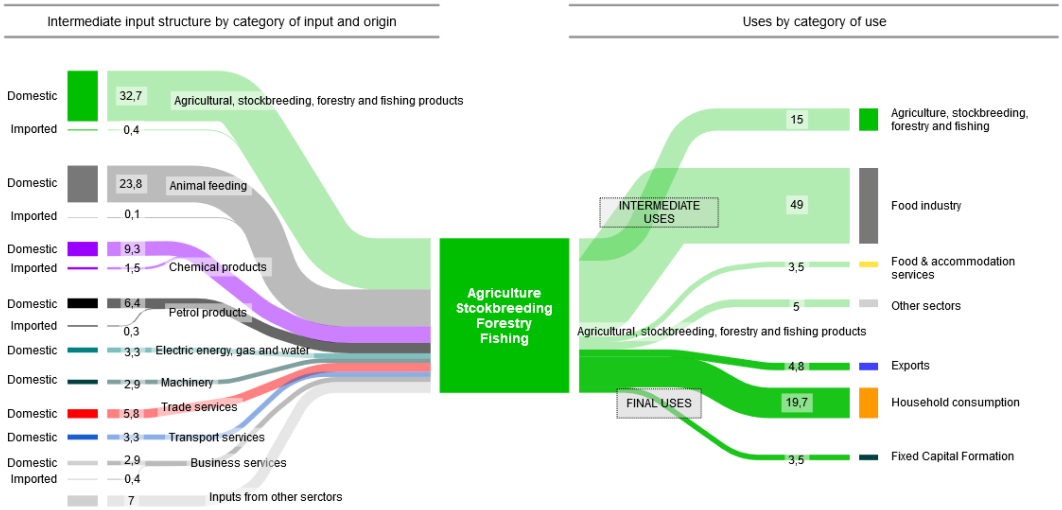
The share of imported *food products* increased fourfold, from 4.1% to 17.2% between 1980 and 2016 (Fig. 5). This growth was only interrupted by the 2008 financial crisis. *Food products* were mainly imported from the EU (65.9% on average between 1995-2016), while the non-EU share was 34.2% on average in the same period. Within *food products*, the highest rate of imports corresponds to *other food products* (*animal feed* being the sub-category that accounts for the most of its aggregated value). Conversely, *meat products* had the lowest rates of imported supply. Moreover, the rates remained fairly stable throughout the period, with an average share of 6.8% in 1995-2016. *Food and accommodation services* were supplied domestically for most of the period. Only in 2015 and 2016 do imports show upward shares of 1.4% and 2.4% respectively.

1.3.3. Changes in the links between economic activities

Figures 6 and 7 show the structural changes of the intermediate inputs structure of *ASFF* (left side of the diagram) and the structure of intermediate and final uses of *ASFF products* (right side of the diagram) from 1980 to 2015. One of the

major changes is the fall in the share of reused inputs coming from the *ASFF* itself, from 33.1% to only 11.1%. This involves a 67% contraction of the 're-use' rate (Abad & Naredo, 1997) in agri-food primary production. In 1980, this internal circularity still was the first intermediate input category of *ASFF*, but it lost this leading role at the beginning of the 1990s, falling to the third position by 2015. In addition, the relative weight of imported intermediate inputs by *ASFF* grew from 1.2% to 22.0% between 1980 and 2015. This result is consistent with the increase in imported supply already shown in Figure 4.

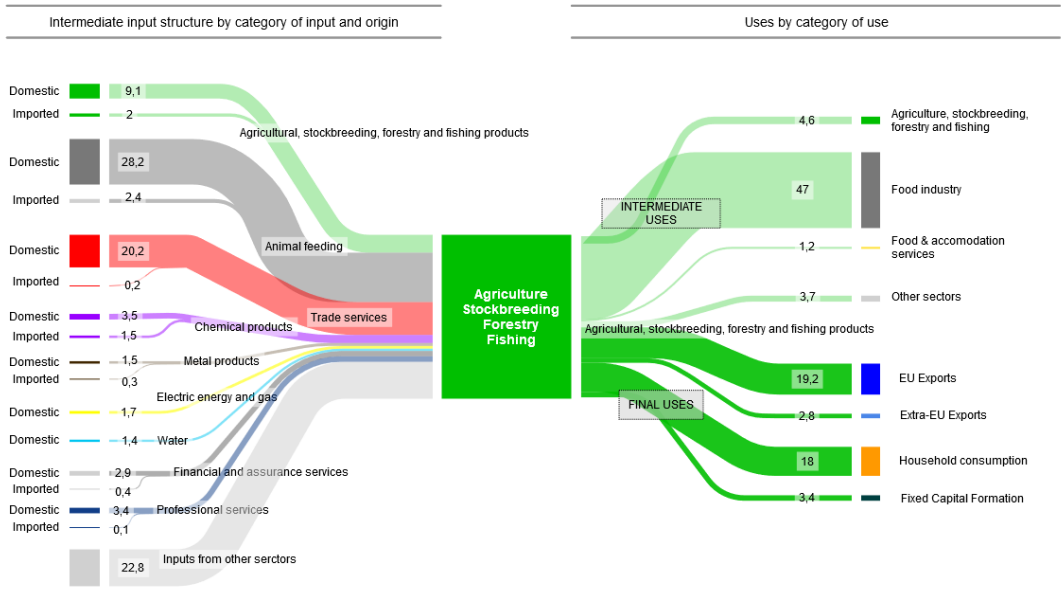
Figure 6. Structure of intermediate inputs of ASFF (in %) and of the subsequent intermediate or final uses of ASFF products (in %), Spain 1980



Notes: Data were collected from the input-output table at basic prices (million pesetas) 1980. The intermediate input structure shows the nine main categories of inputs in terms of weight. Data on other food products (6) -which includes animal and vegetal fats and oils (6.1.), animal feeding (6.2.) and other food products (6.3.)- are used as a proxy of animal feeding. Animal feeding accounted for 98.7% of the aggregated value made up of 6.1, 6.2 and 6.3. in 1995 (this year is the first one for which the INE published these disaggregated data). Calculations are based on the use table at basic prices, 1995. Thus, it can be considered a good estimation.

Source: based on data from the input-output framework (INE, a)

Figure 7. Structure of intermediate inputs of ASFF (in %) and structure of the subsequent intermediate or final uses ASFF products (in %), Spain 2015



Notes: Data on the intermediate input structure (left side of the diagram) were collected from the input-output table of domestic production at basic prices (million euros) and the input-output table of imports at basic prices (million euros) of Spain, 2015. Data on the uses (right side of the diagram) were collected from the input-output table at basic prices (million euros) of Spain, 2015. The intermediate input structure shows the nine main categories of inputs in terms of weight. Data on food products is used as a proxy of animal feeding. Neither the input-output table nor the supply table of 2015 show disaggregated data of the sub-categories that make up food products. However, the supply table at purchasers' prices of 2016 shows it. Animal feeding accounts for 98.7% of the aggregate value. Thus, it can be considered a good estimation. Professional services is made up of categories Other professional, scientific and technical services; veterinary services and security and research services; building and landscaping services; administrative and office services and other business services. Trade services include categories wholesale services, except from repair of motor vehicles and motorcycles and retail services, except from repair of motor vehicles and motorcycles.

Source: based on data from the input-output framework (INE, a)

There have been other structural shifts within *ASFF* that changed the links both between and within these activities. Use tables from 1995-2016 provide disaggregated data for *agriculture and stockbreeding (1)*—differentiating between *agriculture (1.1)*, *stockbreeding (1.2)*, *services related to agriculture and stockbreeding (1.3.)*—, *forestry (2)* and *fishing (3)*. Interdependencies between *agriculture and stockbreeding (1)* and *forestry (2)* are of special interest. Historically, these activities were followed in the same agroecological landscape, and their mutual disconnection has been identified as the main driver of the loss of bioeconomic circularity and the reduction in the energy efficiency of

industrial agriculture (Tello et al., 2016; Padró et al., 2017; Cattaneo, Marull & Tello, 2018; González de Molina et al., 2020).

The examination of these data reveals that flows from *forestry (2)* to *agriculture and stockbreeding (1)* are notably weak, representing only 0.1% on average (1995-2016) of the total of the intermediate inputs of *agriculture and stockbreeding (1)*. As expected, the weight of the 're-use' rate in *agricultural and stockbreeding (1)* fell significantly, between 1995 and 2016, from 20.7% to 6.2%. These trends are consistent with the fact that *agriculture and stockbreeding (1)* account for most of the aggregated value of *ASFF*.

An even more exhaustive analysis of the inward flows between these three activities from 1995 to 2009, made possible by INE's disaggregated data on *agriculture (1.1), stockbreeding (1.2.)* and *services related to agriculture and stockbreeding (1.3)*, shows two main features: firstly, *agricultural products (1.1)* were the intermediate input that was sourced internally the most by *agriculture and stockbreeding (1)*, with a share of 47.9% on average in the period 1995-2009; secondly, *services related to cropping and livestock breeding (1.3)* doubled their weight in the intermediate input structure of *agriculture and stockbreeding (1)* from 11.9% to 20.5%.

As for *forestry (2),* the flow from *agricultural and stockbreeding* significantly weakened. The share of *agricultural and stockbreeding products (1)* in the intermediate input structure of *forestry (2)* fell from 12.4% in 1995 to 1.9% in 2015 (85% decrease). At the same time, the 're-use' rate within *forestry* (2) skyrocketed, from 0.3% in 1995 to 48.1% in 2015. Both features point to a lack of connection with other agricultural and stock-raising activities. However, the *forestry (2)* figures need to be taken with caution due to the changes in the accounting criteria adopted by the INE. This specific issue needs further research.

Going back to Figures 6 and 7, we observe how the share of *animal feed* in the intermediate input structure of *ASFF* increased from 23.9% in 1980 to 30.6% in

2015. Following the opposite path of the internal re-uses of *ASFF, animal feed* became the major intermediate input of *ASFF* by 1990s. In addition, the rate of imports of *animal feed* grew from 0.4% in 1980 to 8.5% in 2015.

Chemical products, which include pesticides and other agrochemicals, synthetic fertilizers and pharmaceutics, were others main intermediate inputs of *ASFF* throughout the period. Nevertheless, their weight halved between 1980 and 2015, from 10.8% to 5.0%. At the same time, the share of imports of *chemical products* also increased substantially, from 13.9% to 42.9%, thus reinforcing the trend towards greater dependence on industrial inputs from abroad.

However, one of the most important structural changes has to do with *trade services*. Their share was 5.8% in 1980, a figure that remained quite stable until the beginning of the twenty-first century. Since then, it tripled to 20.4% in 2015, becoming the second major intermediate input of *ASFF*. *Trade services* are by far the new big player in the intermediate input structure of primary agri-food production. The rapid increase in the trade costs for *ASFF* producers from 1980 to 2015 deserves special attention. Within the input-output framework, *trade* is considered a service whose output is measured by trade margins, calculated as the difference between the value of goods sold by agents and their purchase value, without these goods having suffered any transformation in a year (Titos et al., 1995). Thus, the above results mean that a significant share of the increase in the production costs of agri-food primary producers would have come from a prominent rise in trade margins.

Apart from that, Figures 6 and 7 show that the weight of *electricity, gas and water* in the *ASFF* intermediate input structure remained nearly steady: 3.3% in 1980 and 3.1% in 2015. We know that within these aggregated figures there have been changes in the energy and water uses of Spanish agriculture and stockbreeding due to the increase in the consumption of electricity for heating, lighting and the aeration of livestock production in industrial feedlots (González de Molina et al., 2017; Infante-Amate, Aguilera & González de Molina, 2018). The abandonment of farms and tilled cropland has also meant a more than

proportional reduction of tractors, with those into operation being more energy-efficient in Spain, as everywhere in the world (Aguilera et al., 2015; Pellegrini & Fernández, 2018). Water and energy expenditure has also increased in physical units along with irrigation (Vila-Traver et al., 2021), but their conversion in terms of added value depends on the evolution of prices. This issue deserves a more detailed specific study.

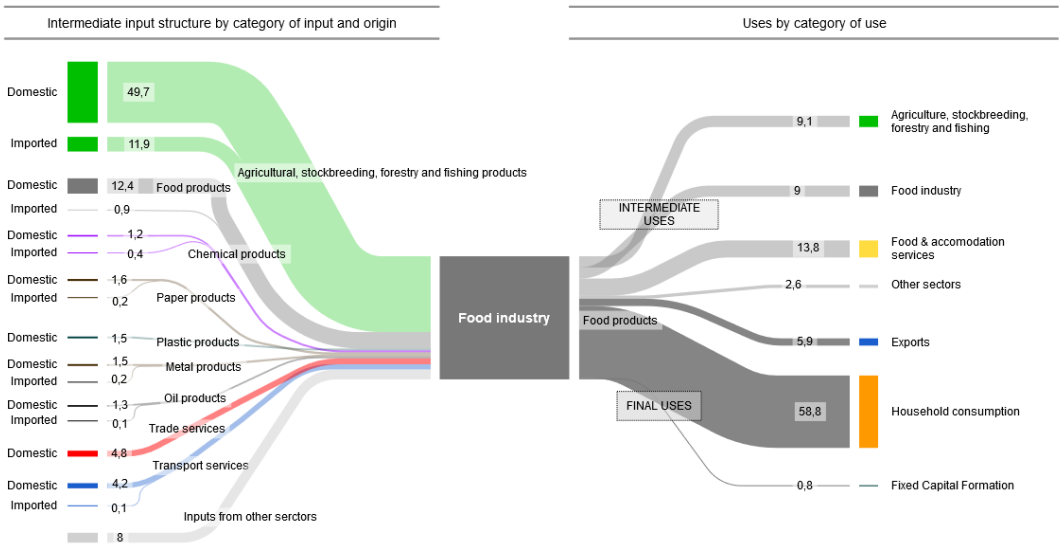
On the right side of the diagrams, which portray the changes in product uses, Figures 6 and 7 shows that *ASFF products* were mainly used as intermediate inputs by other activities throughout the period. However, the share of these intermediate uses in total uses fell 27%, from 72.0% in 1980 to 56.5% in 2015. In addition, note the change in the composition of intermediate uses. Those diverted again as inward flows towards *ASFF* halved, from 20.1% in 1980 to only 8.1% in 2015, denoting once more the reduction in economic circularity. The share of intermediate uses by *food and accommodation services* also declined by about 57%, from 4.9% in 1980 to 2.1% in 2015. Conversely, the share of intermediate uses by the *food industry* increased 22%, from 68.1% to 83.2%. Indeed, the *food industry* was by far the main destination of *ASFF products* in relation not only to intermediate uses, but also total uses, with shares of 49.0% in 1980 and 47.0% in 2015.

This relative decline in intermediate uses in Spanish economic activities is the consequence of the increase in exports of total uses of *ASFF products*, which multiplied by 3.5, from 4.8% in 1980 to 21.9% in 2015. 87% of these exports went to the EU in 2015. Of course, a relevant share of them might be used as intermediate inputs by foreign industries, signalling a greater integration of Spanish *ASFF* in the value chains of the global agri-food system. The input-output framework does not provide information on the uses of exports, and further research is needed to determine this. Moreover, the data show that the share of exports exceeded that of final consumption by households in 2015, which declined slightly from 19.7% in 1980 to 18% in 2015. Finally, the weight of

fixed capital formation in *ASFF* total uses remained quite stable throughout the period, with shares of 3.5% in 1980 and 3.4% in 2015.

If we move our focus to the intermediate input structure of the Spanish *food industry*, we can see that *ASFF products* were its main intermediate input in 1980, with a share of 61.6%, whereas in 2015 their share more than halved, accounting only for 25.5% (Figs. 8 and 9).

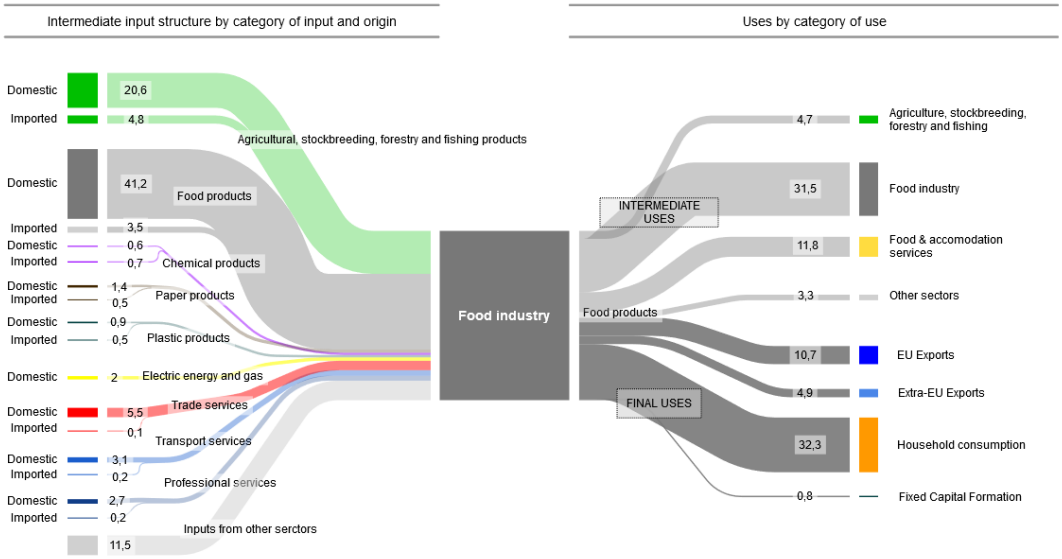
Figure 8. Structure of intermediate inputs of food industry (in %) and of the subsequent intermediate or final uses of food products (in %), Spain 1980



Notes: Data were collected from the input-output table at basic prices (million pesetas) 1980. The intermediate input structure shows the nine main categories of inputs in terms of weight.

Source: based on data from the input-output framework (INE, a)

Figure 9. Structure of intermediate inputs of food industry (in %) and of the subsequent intermediate or final uses of food products (in %), Spain 2015



Notes: Data on the intermediate input structure (left side of the diagram) was collected from the input-output table of domestic production at basic prices (million euros) and the input-output table of imports at basic prices (million euros) of Spain, 2015. Data on the uses (right side of the diagram) were collected from the input-output table at basic prices of Spain, 2015. The intermediate input structure shows the nine main categories of inputs in terms of weight. Trade services include wholesale services, except of motor vehicles and motorcycles and retail services, except of motor vehicles and motorcycles. Professional services is made up of categories other professional, scientific and technical services; veterinary services and security and research services; building and landscaping services; administrative and office services and other business services.

Source: based on data from the input-output framework (INE, a)

Conversely, the share of *food products* grew more than threefold, from 13.3% in 1980 to 44.7% in 2015. This increase entails a greater 're-use' rate within the *food industry*, a trend that contrasts with that experienced by *ASFF*. In addition, the share of *ASFF* imported inputs slightly fell from 19.3% in 1980 to 18.9% in 2015, again differing from the path followed by *ASFF*. However, this was not the case for the share of *food products* as imported inputs, which increased 15.7%, from 6.8% in 1980 to 7.8% in 2015.

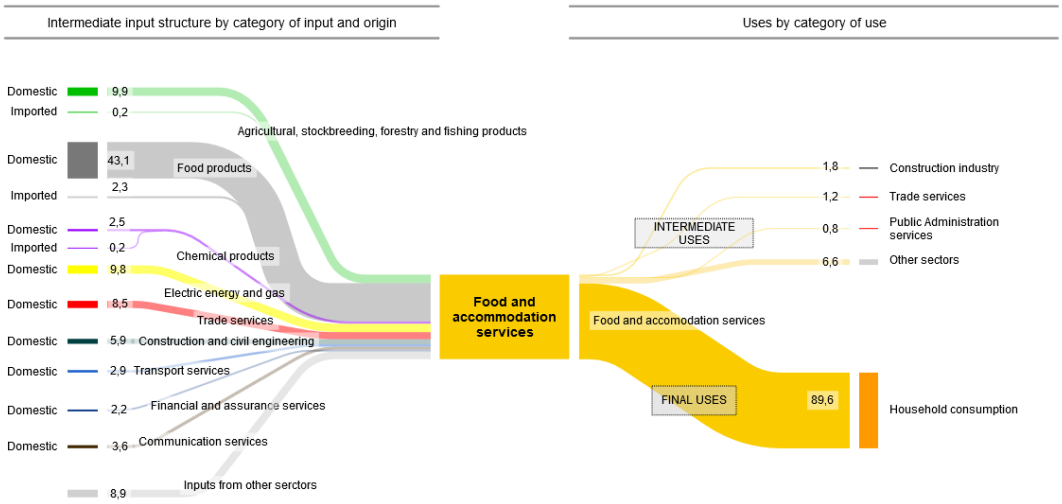
The share of *oil products*, related to the use of fossil fuels as energy sources, was 1.4% in the intermediate input structure of the *food industry* in 1980. In 2015 it was not even listed among the nine primary categories of intermediate inputs in the *food industry*. Conversely, *electric energy and gas* was not among

the nine primary intermediate inputs of the *food industry* in 1980, though by 2015 their share was already 2.0%.

On the uses side (right side of the diagram), note that the share of intermediate uses in the total uses of *food products* increased 49%, from 34.5% in 1980 to 51.4% in 2015. The share of uses by *food and accommodation services* fell from 40% in 1980, when it was the major destination of *food products*, to 23.0% in 2015. Similarly, the share of uses by *ASFF* fell 65% from 26.3% in 1980 to 9.2% in 2015. Conversely, the share of uses of *food products* by the *food industry* more than doubled, from 26.2% to 61.2%, a feature consistent with the increase of its 're-use' rate. As expected, the share of exports in total uses of *food products* grew, from 5.9% in 1980 to 31.9% in 2015. 68.7% of total exports of Spanish *food products* went to the EU in 2015 (Fig. 9). As in the case of *ASFF products*, the question of the uses of these exports needs to be explored further with additional data from other sources. Apart from that, the data show that final household consumption in Spain lost 45.2% of its relative weight in total of uses of *food products*, falling from 58.8% in 1980 to 23.3% in 2015. Finally, use as fixed capital formation remained stable throughout the period, with a share of 0.8% in both 1980 and 2015.

As for *food and accommodation services,* figures 10 and 11 show an 84% decline in *ASFF products* in respect of their intermediate input structure, from 10.1% to only 1.6% between 1980 and 2015. This indicates that the backward structural linkages between *ASFF* and *food and accommodation services* were severely weakened throughout the period. In contrast, the share of *food products* remained the main intermediate input of *food and accommodation services*, from 45.5% in 1980 to 41.3% in 2015. In addition, note that the ratio of imported intermediate inputs increased for both *ASFF products* and *food products.* In the first case, it increased almost six-fold, from 2.0% in 1980 to 14.3% in 2015. In the case of *food products* inputs, it increased about 8% from 5.3% to 14.3%.

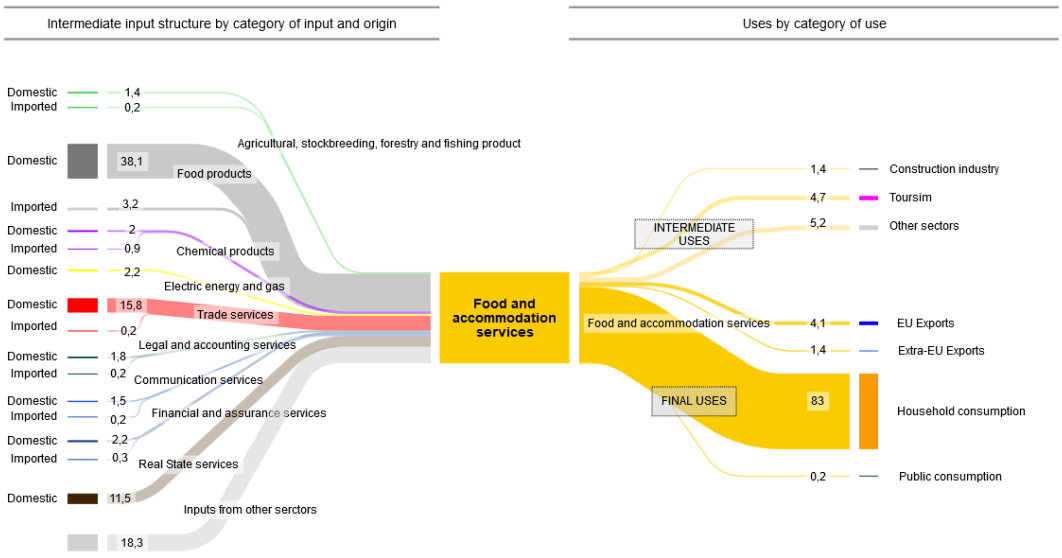
Figure 10. Structure of intermediate inputs of food and accommodation services (in %) and of the subsequent intermediate or final uses of food and accommodation services (in %), Spain 1980



Notes: Data were collected from the input-output table at basic prices (million pesetas) 1980. The intermediate input structure shows the nine main categories of inputs in terms of weight.

Source: based on data from the input-output framework (INE, a)

Figure 11. Structure of intermediate inputs of food and accommodation services (in %) and of the subsequent intermediate or final uses of food and accommodation services (in %), Spain 2015



Notes: Data on the intermediate input structure (left side of the diagram) were collected from the input-output table of domestic production at basic prices (million euros) and the input-output table of imports at basic price (million euros) of Spain, 2015. Data on the uses (right side of the diagram) were collected from the input-output table at basic prices of Spain, 2015. The intermediate input structure shows the nine main categories of inputs in terms of weight. Trade services include categories wholesale services, except of motor vehicles and motorcycles and retail services, except of motor vehicles and motorcycles. The supply tables of 2015 do not show disaggregated data on food services and accommodation services. The supply table of 2016 at purchasers' prices shows it. Based on it, food services' output -as an activity- was 83 496 million euros (basic prices) and accommodation services' output -as an activity- was 28 609 million euros (basic prices). Thus, food services accounted for 74% of the aggregated value. Food services' output -as a product- was 90 161 million euros (purchasers' prices) and accommodation services' output -as a product-

was 26554 million euros (purchasers' price) in 2016. Thus, food services accounted for 77% of their aggregated. These figures can be used as proxy of the weight of each component in 2015.

Source: based on data from the input-output framework (INE, a)

Moreover, the share of *trade services* increased 88%, from 8.5% in 1980 to 16.0% in 2015. This suggests that a driver behind the weakening of the links between *food and accommodation services* and *ASFF* could have been the rise of commercial intermediation services between these two groups of economic activities.

Along with these major transformations, figures 10 and 11 also show a 78% decline in the share of *electric energy and gas* intermediate inputs, from 9.8% in 1980 to 2.2% in 2015. Oil energy sources were not significant in the intermediate input structure of food and accommodation services. Furthermore, the share of *construction and civil engineering* was 5.9% in 1980, and it was not listed among the nine primary intermediate inputs of these services in 2015. Conversely, *real estate services* were not listed among the nine primary intermediate inputs in 1980, but their share was 11.5% in 2015. This suggests a shift in the preference for renting facilities rather than building them.

In regard to uses, the right sides of figures 10 and 11 show that *food and accommodation services* were mostly used as household consumption in both 1980 and 2015. However, this share in total uses declined 7%, from 1980 89.6% in 1980 to 83.0% in 2015. This seem to be related to the rise in exports, which were non-existent in 1980 but grew by up to 5.5% in 2015, 75% going to the EU. Public consumption also rose by up to 0.2% of their total uses in 2015. The share of intermediate uses of *food and accommodation services* as intermediate inputs of other economic activities increased 9%, from 10.4% in 1980 to 11.3% in 2015. Additionally, they changed in composition. In 1980, *construction services* were their main destination, with a share of 17.3% of their total intermediate uses, while in 2015, *tourism* used accounted for most of them, with a share of 41.6%.

1.4. Discussion

The foregoing results make apparent that primary production in the Spanish agri-food system continued to deepen its integration with the global agri-food system from 1980 to 2016, while reducing its 're-use' rate and decoupling livestock feeding from other agricultural activities (González de Molina et al., 2017).

Supply and use data show the increasing involvement of Spanish agriculture in international markets**.** The share of imports in the total supply of *ASFF* increased by 42% between 1980 and 2016. Likewise, exports were the category that increased the most in *ASFF product* uses, multiplying its share by 3.5 in the same period. As a result, these trends, which could already be observed in the 1960s, were maintained and intensified until the second decade of the twenty-first century (Titos & Haro, 1983). In addition, these results are consistent with the structural changes that were made in the use of land and work and in the pattern of biophysical flows in Spanish agriculture (González de Molina *et al.,* 2020) and also when considering the growth of Spanish agri-food trade, which was higher than the world and European averages during the second globalization and increased further after Spain joined the EEC (Clar, Serrano & Pinilla*,* 2015).

Use data confirm that *ASFF products* were used mainly as intermediate inputs of other industries—fundamentally, the *food industry*—since the transition from 'organic agriculture' to the 'agro-industrial system' up to 2016 (Abad & Naredo, 1997; Clar, Martín-Retortillo & Pinilla, 2018). At the same time, use by foreign industries increased more than use by domestic ones. These trends reveal a growing dependence on exports as purchasing markets, but also a decoupling from the end consumers in the domestic market. Moreover, the flows from *ASFF* to Spanish *food and accommodation services* more than halved between 1980 and 2015, which seems to be explained by a rise in the degree of intermediation by traders.

The examination of the intermediate input structure of Spanish *ASFF* suggests that the links with the global food industry continued to tighten (Titos & Haro, 1983). A major issue has been the consolidation of *animal feed* as the primary *ASFF* input since the 1990s, which reached up to 30.6% of the value of its total intermediate inputs in 2015. This evidences the shift from food to feed in the globalized agri-food system (Soto et al., 2016), and it is linked to the abandonment of the healthy Mediterranean diet (González de Molina et al., 2020). The Spanish specialization in stock-raising towards an intensive model of animal fattening has been the main driver of this shift (Clar, Martín-Retortillo & Pinilla, 2018) at the expense not only of animal well-being but also of the risks to public health (Wallace, 2016).

Livestock numbers had already started to increase in Spain before the 1980s. Indeed, they more than doubled from 1960 to 2008, led mainly by pigs and poultry. The fact that these are monogastric animals explains the high demand for domestic and imported grains used as industrial compound feed, which replaced the extensive grazing of pastures by the traditional Spanish livestock landraces of ruminants like sheep, goats and cattle (González de Molina et al., 2017). This also locked Spanish producers into close dependence on the agro-industrial provision of animal feed. The shift away from a Mediterranean diet towards one that was more based on animals mostly explains this change, which can also be linked to the 'westernization' of diets globally (Kearney, 2010), in which the Spanish meat industry has also played a significant role (Clar, Martín-Retortillo & Pinilla, 2016, 2018).

In addition, the decoupling of stock-raising from Iberian cropland, pastureland and forests is behind the drastic shrinkage in the 're-use' rate of Spanish *ASFF* (from 33.1% in 1980 to only 11.1% in 2015), thus strengthening the trend followed in the previous two decades (Abad & Naredo, 1997; Titos & Haro, 1983). Data on SUTs and IOTs show to what extent the links among cropping, stock-raising and forestry became increasingly weaker. The disintegration of formerly complex agro-silvo-pastoral systems and their landscape mosaics, which began in the middle of the twentieth century (Garrabou & Naredo, 2008;

Naredo, 1991), continued and intensified until recently (Marull et al., 2010, 2015, 2016; Parcerisas et al., 2012; Marull & Font, 2017; Tello et al., 2020).

This shift is an important driving force of the current ecological crisis. Firstly, this is due to the lesser biological complexity of agroecosystems it entails (Cardinale et al., 2012; Marull et al., 2019). Secondly, it is due to the harmful impacts of agrosystems' high dependence on external fossil-fuel inputs in terms of water use and pollution, greenhouse gas emissions, and low energy efficiency (Duarte, Pinilla & Serrano, 2014, 2016; Aguilera et al., 2019a, 2019b), thus undermining the capacity of Spanish agriculture to provide ecosystem services. In this sense, the Spanish agri-food system is evolving in the opposite direction to the circular bioeconomy being advocated by the EU (European Commission, 2018), as well as the agroecology transition being pushed by the Food and Agriculture Organization of the United Nations (FAO, 2018) and many scientists and social movements (Altieri & Nicholls, 2012; IPES-Food, 2016).

Along with these major transformations, the results reveal a growing predominance of distribution in Spanish *ASFF*. The share of *trade services* reached 20.4% of the total of the intermediate inputs of *ASFF* in 2015. Data suggest that the rise in trade margins on animal feed is largely responsible for this. Historically animal feed had been led by a small number of international corporations in Spain (Titos, 1978), which are part of the agribusiness complex that exerts major market power on the agri-food chain (Davis & Goldberg, 1957; Etxezarreta, 2006). This phenomena was favoured by Spain's entry to the EEC since it opened up the path to large international food distributors (Cruz, Rebollo & Yagüe, 2003), which fostered international investment in the country and its integration within the dynamics of the global agri-food system (Sanz Cañada, 1997; Marsden, Moragues Faus & Sonnino, 2019) .

The results also demonstrate the increasing weight of *trade services* in the intermediate input structure of *food and accommodation services*, given that their weight almost doubled between 1980 and 2015 (from 8.5% to 16.0%). Surprisingly, *trade services* were of minor importance in the case of the Spanish

food industry, with shares of 4.8% in 1980 and 5.6% in 2015. The increase in the 're-use' rate within the *food industry*, more than three-fold over the period, from 13.3% in 1980 to 44.7% in 2015, explains this fact. This implies a strengthening of the integration of activities within the *food industry* that took place at the same time as the inputs from *ASFF products* halved (Titos & Haro, 1983).

All these trends favoured the change in the composition of the value added of the agri-food system. Under the assumption that the *agri-food system* is made up of *ASFF,* together with the *food industry* and *food and accommodation services*, the data show that the share of *ASFF* almost halved, from 50.4% in 1980 to 26.4% in 2016. This fall was also reflected in the framework of the Spanish economy. Conversely, the share of *food and accommodation services* increased by about 90% in the Spanish *agri-food system*, from 27.6% in 1980 to 52.5% in 2016. The weight of the *food industry* remained stable, with an average share of 21.5% throughout the period. These results are consistent with other studies and confirm that the trends in them portrayed deepened up to 2016 (Naredo, 1991; Titos et al., 1995; Titos & Haro, 1983).

While there is strong evidence for how the growing dependence of *ASFF* on external inputs reduced its value added (Abad & Naredo, 1997; González de Molina et al., 2020), the role exerted by distribution needs to be examined further. Studying *trade services* is essential to complete the picture of the value added chain of the Spanish *agri-food system*. According to Titos et al. (1995), the share of agri-food trade in the total of the value added of the Spanish agri-food system was 19.1% in 1988, while Sanz Cañada (1997) stated that it had already overtaken those of the food industry and agriculture by 1991.

In this scenario, market power relations and their impact on prices appear to be determinant. Prices, and the monetary valorisation of all the processes and tasks behind them, shape the production relations that are reflected in the input-output framework. We know that the 'terms of trade' between the prices paid and received by farmers have become unrelentingly worse since the mid-

twentieth century (Abad & Naredo, 1997; Serrano & Pinilla, 2011; González de Molina et al., 2020). A clear example is the fine imposed on milk companies by the Spanish National Commission on Markets and Competition, most of them subsidiaries of transnational companies, due to their collusion in fixing low prices for the milk they purchased from family farms (Marey, 2020). But also, there is a lot of evidence on the asymmetrical power relations between manufactures and retailers. Food product retailers have experienced processes of concentration and internationalization resulting in large distribution groups with dominant power over food manufacturers (Cruz, Rebollo & Yagüe, 2003; Mir, Fayos & Calderón, 2008), as well as having detrimental impacts on traditional retailers (Casares & Rebollo, 1997) and wholesalers (Mollá & Sánchez Pérez, 2000).

All in all, the decline in value added retained by *ASFF*—which is, in turn, the source of primary producers' incomes—went hand in hand with the reduction in the number of those employed in these activities in both absolute and relative terms. The results show that the share of people employed in *ASFF* in total figures in Spain fell from 18.6% to 4.1% between 1980 and 2016. Thus, the reduction in the agrarian population continued the downward trend that has been observed since the second half of the twentieth century (J. M. Naredo, 1991). This fall also took place in relation to the *agri-food system* (in 2016, its share was 32.7%). Conversely, the number of people employed in *food services* continued to grow, reaching 51.1% of the total labour in the *agri-food system* (excluding *accommodation services*) in 2016. This is consistent with the path followed by *food and accommodation services* in terms of value added.

Furthermore, there was an increase in the rate of salaried workers throughout the *agri-food system,* but very particularly in *ASFF,* with growth from 28% to 62% between 1980 and 2016. This illustrates the decline of family farms (Etxezarreta et al., 1995; González de Molina et al., 2020) and the strengthening of the divorce between the economies of rural households and the dynamics of agricultural production (Abad & Naredo, 1997) after being increasingly

integrated into the global accumulation process (Etxezarreta, 2006). This reduction was suffered mainly by the smaller farms, many of which only worked part-time (Abad & Naredo, 1997; González de Molina et al., 2020). Along with the increase in average household spending in Spain, rural families underwent a process of decline in their living standards that endangered the viability of the small family farms that used to be the main providers of agri-food products (González de Molina et al., 2020).

The important body of knowledge that agrarian communities held and inherited generation after generation on the site-specific management of agroecosystems, known as 'agricultural heritage' (IAASTD, 2009; Koohafkan & Altieri, 2011; Agnoletti & Emanueli, 2016), has thereby been put at risk. The fall in incomes retained by *ASFF* rendered these activities dependent on subsidies from the CAP (Etxezarreta, 2006) and on external financing (Abad & Naredo, 1997). Data on SUTs and IOTs show that the weight of *financial and assurance services* in the intermediate input structure of *ASFF* increased from close to 0% in 1980 to 5.2% in 2015.

A last question that is unavoidable concerns the role of economic policies. With a different CAP, how different would things have been? While the issue of the impacts of CAP on agrarian change in Spain have already been raised by some authors (Clar, Martín-Retortillo & Pinilla, 2018; Etxezarreta et al., 1995), giving a response to this question here would go beyond the scope of the present research. Nevertheless, this is a key dimension in understanding both current trends and the debate on its future paths.

1.5. Conclusions

This paper has provided an overview of the transformations of agriculture, stockbreeding, forestry and fishing within the framework of the Spanish agri-food system. It has adopted a socio-economic approach based on data from the Spanish input-output framework. I created series on value added, labour and supply for the activities and products related to *ASFF, food industry* and *food*

and accommodation services—assumed to make up the *agri-food system* in the framework of this study—between 1980 and 2016, as well as calculating their intermediate input structures and use structures in 1980 and 2015. This allows us to shed light on how the evolution of the links between different economic activities might have influenced the path and fate of agri-food primary production in Spain.

The results show that the contribution of *ASFF* to the value added of the *agri-food system* and the economy of Spain continued to fall from 1980 to 2016. Conversely, the contribution of *food and accommodation services* significantly grew. In line with this, the number of people employed in *ASFF* experienced a pronounced reduction both relative and absolute terms. Those remaining in the activity did so mostly as employees instead of family farmers, thus reversing the composition of labour observed at the beginning of the period. Supply and use data show a growing integration of the Spanish *agri-food system* in international markets, a feature more pronounced in the case of *ASFF*.

The findings also reveal a shift in the intermediate input structure of *ASFF,* characterized by a reduction of the 're-use' rate. This is mainly the result of a decoupling of forest and livestock management from agricultural land and forests, together with the growing weight of animal feed produced in industrial feedlots. This transformation conceals detrimental environmental impacts. In addition, *trade services* emerged as the second major intermediate input of *ASFF* in the twenty-first century, resulting from an increase in trade margins. This points to the great power exerted by large corporations within the global agri-food system and the impact of pricing dynamics on the value added retained by each of the stages of the agri-food chain. The decline in the share of value added and in the related incomes of agri-food primary producers was seemingly determined by these globalization processes. Family farms are particularly affected, endangering the fundamental roles they fulfil as providers of ecosystem services.

Moreover, the results show a deterioration in the weight of *ASFF products* in the intermediate input structure of *food industry* and *food and accommodation services* throughout the period. Simultaneously, the *food industry* strengthened its 're-use' rate, indicating a greater integration of industrial processes that also explains why *trade services* did not increase so much in the input structure of the *food industry*. The reduction of flows from *ASFF* to *food and accommodation services* was particularly marked. The data suggest that this reduction is related to a greater intermediation by traders, since the weight of *trade services* in the intermediate input structure of *food and accommodation services* increased significantly between 1980 and 2015.

Therefore, this study documents the increasing weight of distribution in the Spanish agri-food system and its crucial importance in examining the role of prices and market power relations, which go hand in hand with trade services and trade margins. This is the main limitation of this study by far. The role of economic policies, mainly the CAP, and the evolution of the number, structure and productive characteristics of the units of production involved in the Spanish agri-food system are also issues that need to be explored further.

The portrait of the transformations to the Spanish agri-food system in recent decades presented in this paper is a first approximation of these changes from a macroeconomic perspective based on data from the input-output framework. For a more comprehensive picture of these transformations and the analysis of the driving forces behind them and their socioecological impacts, my findings need to be further integrated with the study of other dimensions—such as the biophysical and care dimensions—and alternative approaches and scales.

Annex I.a. Introduction to the input-output framework

A supply table shows goods and services, classified by type of product, that an economy (i.e., a country) can get either because they have been produced by domestic activities or they have been imported, whereas a use table shows how those goods and services are used in the economic system (i.e., intermediate inputs, final consumption, investment, and exports). The use table also shows the components of gross value added by activity, including compensation of employees, other taxes less subsides on production, consumption of fixed capital and net operation surplus. By doing so, it allows knowing the cost structure of national industries (Eurostat, 2008). Additionally, an IOT[8] displays the relations between homogeneous products and components of the final demand in an economy under the assumption that each product is produced by a single activity (product technology assumption) (Eurostat, 2008).

Both SUTs and IOTs are accounted in monetary units. However, there are some nuances. Supply tables are compiled in basic prices[9], including a valuation matrix which allows to transform total supply by product at basic prices into purchasers' prices[10]. Use tables are compiled in purchasers' prices. The *INE* also publishes use tables at basic prices. This transformation from purchaser's prices to basic prices is needed for the construction of IOTs, which are entirely accounted at basic prices.

[8] IOTs published by the *INE* are *product by product* kind of (INE, 1999).

[9] The basic price is defined as "the price receivable by the producer from the purchaser for a unit of good or services produced as output minus any tax payable on that unit as a consequence of its production or sale (i.e. taxes on products), plus any subsidy receivable on that unit as a consequence of its production or sale (i.e. subsidies on products). It excludes any transport charges invoiced separately by the producer. It includes any transport margins charged by the producer on the same invoice, even when they are included as a separate item on the invoice" (Eurostat, 1996).

[10] The purchasers' price is defined as "at the time of purchase, the producer's price is the price the purchaser actually pays for the products; including any taxes less subsides on products (but excluding deductible taxes like VAT on products); including any transport charges paid separately by the purchaser take delivery at the required time and place" (Eurostat, 1996).

Annex II.b. Products and activities involved in the agri-food system by type of classification.

Table 2. Products involved in the agri-food system by type of classification.

Years	1980	1985-1994	1995-1999	2000-2007	2008-2009	2010-2015	2016
Classification	R43	R56	CNPA-96	CNPA-96	CPA 2008	CPA 2008	CPA 2008
System of Accounts	ESA 1979	ESA 1979	ESA 1995	ESA 1995	ESA 1995	ESA 2010	ESA 2010
AGRICULTURAL, STOCKBREEDING, FORESRTY AND AFISHING (ASFF) PRODUCTS	(01) Cropping, livestock breeding and fishing products	(010) Cropping, livestock breeding and fishing products	(1) Cropping products	(1) Cropping products	(1) Cropping products	(1) Cropping, livestock breeding and related services	(1) Cropping products
			(2) Livestock breeding products	(2) Livestock breeding products	(2) Livestock breeding products		(2) Livestock breeding products
			(3) Services related to cropping and livestock breeding	(3) Services related to cropping and livestock breeding	(3) Services related to cropping and livestock breeding		(3) Services related to cropping and livestock breeding
			(4) Forestry products	(4) Forestry products	(4) Forestry products	(2) Forestry products and related services	(4) Forestry products
			(5) Fishing products	(5) Fishing products	(5) Fishing products	(3) Fishing products and related services	(5) Fishing products and related services
FOOD PRODUCTS	(15) Meat products	(310) Meat products	(16) Meat products	(16) Meat products	(11) Meat products	(5) Food products, beverages, and tobacco	(11) Meat products
	(16) Milk products	(330) Milk products	(17) Milk products and ice-cream	(17) Milk products and ice-cream	(12) Milk products		(12) Milk products
	(17) Other food products	(350) Other food products	(18) Fats and vegetable oils	(18) Fats and vegetable oils	(13) Fats and vegetable oils		(13) Fats and vegetable oils
			(19) Animal feed	(19) Animal feed	(14) Animal feed		(14) Animal feed
			(20) Other food products	(20) Other food products	(15) Other food products		(15) Other food products
	(18) Beverages	(370) Beverages	(21) Alcoholic beverages	(21) Alcoholic beverages	(16) Alcoholic beverages		(16) Alcoholic beverages
			(22) Non-alcoholic-beverages	(22) Non-alcoholic-beverages	(17) Non-alcoholic-beverages		(17) Non-alcoholic-beverages
	(19) Tobacco products	(390) Tobacco products	(23) Tobacco products	(23) Tobacco products	(18) Tobacco products		(18) Tobacco products
FOOD AND ACCOMMODATION SERVICES	(29) Food and accommodation	(590) Food and accommodation	(68) Accommodation services	(68) Accommodation services	(73) Accommodation services	(36) Food and accommodation services	(73) Accommodation services
			(69) Food services	(69) Food services	(74) Food services		(74) Food services

Source: based on the input-output framework (INE, a)

Table 3. Activities involved in the agri-food system by type of classification.

Years	1980	1985-1994	1995-1999	2000-2007	2008-2009	2010-2015	2016
Classification	***R43***	***R56***	***CNAE-93***	***CNAE-93***	***NACE Rev. 2***	***NACE Rev. 2***	***CNAE 2009***
System of Accounts	*ESA 1979*	*ESA 1979*	*ESA 1995*	*ESA 1995*	*ESA 1995*	*ESA 2010*	*ESA 2010*
AGRICULTURE, STOCKBREEDING, FORESTRY AND FISGHING (ASFF)	*(01) Cropping, livestock breeding and fishing*	*(010) Cropping, livestock breeding and fishing products*	*(1) Cropping, livestock breeding and hunting*	*(1) Cropping, livestock breeding and hunting*	*(1) Cropping, livestock breeding and hunting*	*(1) Cropping, livestock breeding and hunting*	*(1) Cropping, livestock breeding and related services*
			(2) Forestry	*(2) Forestry*	*(2) Forestry*	*(2) Forestry*	*(2) Forestry*
			(3) Fishing	*(3) Fishing*	*(3) Fishing*	*(3) Fishing*	*(3) Fishing*
FOOD INDUSTRY	*(15) Meat products' industry*	*(310) Meat industry*	*(12) Meat industry*	*(12) Meat industry*	*(5) Meat industry*	*(5) Food products, beverages, and tobacco industries*	*(5) Meat products' industry*
	(16) Milk industry	*(330) Milk industry*	*(13) Milk industry*	*(13) Milk industry*	*(6) Milk industry*		*(6) Milk products' industry*
	(17) Other food industries	*(350) Other food industries*	*(14) Other food industries*	*(14) Other food industries*	*(7) Other food industries*		*(6) Other food industries*
	(18) Beverage industry	*(370) Beverage industry*	*(15) Beverage industry*	*(15) Beverage industry*	*(8) Beverage industry*		*(7) Beverage industry*
	(19) Tobacco industry	*(390) Tobacco industry*	*(16) Tobacco industry*	*(16) Tobacco industry*	*(9) Tobacco industry*		*(8) Tobacco industry*
FOOD AND ACCOMMODATION SERVICES	*(29) Food and accommodation services*	*(590) Food and accommodation services*	*(44) Food and accommodation services*	*(44) Accommodation services*	*(45) Accommodation services*	*(36) Food and accommodation services*	*(47) Accommodation services*
				(45) Food services	*(46) Food services*		*(48) Food services*

Source: based on the input-output framework (INE, a)

CHAPTER II. A research framework to investigate food systems at a national scale[11]

[11] This chapter is an expanded version of the manuscript co-authored with Enric Tello and Jessica Duncan, which was submitted to the Journal of Agrarian Change on the 22nd of September, 2022.

ABSTRACT

This Chapter aims at advancing understandings of food systems functioning at a national scale as well as at identifying the levers of change beyond their transformation. Building on food regime analysis and further combining it with the approaches of social metabolism and surplus/reproduction, we develop a research framework to investigate national food systems, and particularly their role in the reproduction mechanisms of the capitalist system in which they are embedded. We take a national scale as unit of analysis due to the important roles and obligations of states. The research framework proposal consists of six dimensions encompassing 36 elements linked through six key cross-cutting connections. The framework contributes to expanding food regime studies.

Key words: food systems, political economy, national scale, food regimes, social metabolism, food governance

2.1. Introduction

There is broad consensus on the urgency to transform food systems to be more sustainable and fair (IPCC, 2019; Rockström et al. 2020; Crippa et al., 2021). Examples of this can be seen in the call and actions put forward by institutions like the United Nations Committee on World Food Security [CFS] and Food and Agriculture Organization [FAO] as well as the European Commission to promote food system changes towards agroecology (Caron et al., 2018; High Level Panel of Experts [HLPE], 2019; European Commission, n.d.). However, the paths to follow in order to accomplish such transformations remain contested (Canfield, Duncan, & Claeys, 2021; Davies, 2020; Duncan, Rivera-Ferré, & Claeys, 2020; Moragues-Faus, Sonnino, & Marsden, 2017; Rivera-Ferre, 2020).

Food systems encompass "the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from

agriculture, forestry or fisheries, and parts of the broader economic, societal and natural environments in which they are embedded" (FAO, 2018, p.1). Late Modern and Contemporary food systems are embedded in the functioning of capitalist system in which they develop a key role, as we explain in section 2.2. Therefore, addressing the relation between food systems and capitalism is essential to understand food systems functioning.

The aim of this Chapter is to advance understandings of food systems at the national level, and particularly of their role in the reproduction mechanisms of the capitalism system in which it is embedded. In order to make our approach comprehensive, we build on food regimes literature (Friedmann & McMichael, 1989; Friedmann, 2005; McMichael, 2005), and take insight from the approaches of social metabolism (González de Molina, & Toledo, 2014; Gerber & Scheidel, 2018) and surplus/reproduction (Picchio, 1992; Mincyte, 2023; Marco, Padró & Tello, 2020a).

We make use of food regimes because it provides an approach to study the relations of agriculture, food and the reproduction dynamics of global capitalism, and is also widely used in agrarian change (Bernstein, 2016; Buttel, 2001) and agrifood studies (Magnan, 2012). However, a move towards problematizing the spatiality of food regimes approach has been recently identified among food regimes scholars due to the insufficient attention paid to the national and regional variability in their experience and paths (Moran et al., 1996; Schermer, 2015; Otero, 2016; Rioux, 2018; Jakobsen, 2021; Mukahhal et al., 2022). As Moran et al., (1996) put forward "some of the characteristics of the production and distribution systems that are assumed in the food regimes literature remain quite differentiated and important national and local political-economic processes are not incorporated into international processes" (Moran et al., 1996, p.245).

Given that we search for a research framework useful to address the current crisis of the corporate food regime and explore the opportunities and barriers to advance towards fairer and more sustainable food systems, we take the nation-state scale as unit of analysis. The national scale is important because nation-states are a critical agents in determining the extent to which global food regimes dynamic materialised in space and time within national boundaries (Moran et al., 1996; Pechlaner & Otero, 2010; Tilzey, 2018, 2019).

Building on this, McMichael has recently made a distinction between identifying food regime moments—periods of accumulation and associated transitions—and using 'food regime analysis' to identify significant relationships and contradictions in the political history of capital across space and time. In this regard, McMichael contends that, as a method of analysis, food regime "can be deployed in a variety of ways to illuminate local, national, regional and global processes" (McMichael, 2013, p.108). An emerging body of studies that link food regimes to regional (Pechlaner & Otero, 2010; Otero 2012; Corrado 2016; Otero & Lapegna, 2016; Wang, 2018; Andrew et al., 2022), national (see Annex II.a) and local (Jakobsen, 2019; Vicol & Pritchard, 2020) scenarios highlights the utility of this approach. Yet, what remains less clear is "how, theoretically and methodologically, can we approach the interrelations between multiple special loci and scales" (Jakobsen, 2021, p.3). In this Chapter, we address this question and propose a research framework to investigate food systems dynamics and transformation at the national level.

To that aim, our research framework is grounded on a critical review (Grant & Booth, 2009) of research linking food regimes to national case studies to systematically identify the main aspects addressed so far in the literature. We discuss and further combine them with the approaches of social metabolism and of surplus/reproduction, which add respectively the role of energy and

social reproduction for capital and labour dynamics in capitalist accumulation. This helps to better understand and articulate the aspects identified throughout the review, and goes in line with the call to expand the political economy of food systems to be more interdisciplinary and transdisciplinary (Duncan, Levkoe, & Moragues-Faus, 2019). The resulting research framework consist of six main dimensions: food governance, food chain, social metabolism, surplus/reproduction, socioecological impacts, conflicts, and levers of change. The framework encompasses 36 elements in total. It also includes six cross-cutting connections within and between dimensions.

The Chapter is structured as follows. After this introduction, we briefly address the theoretical and conceptual framework of this proposal in section 2.2. In section 2.3., we explain the methods followed for the review (2.3.1.) and summarize and discuss the results (2.3.2). Section 2.4. presents the research framework and explains how to use it as a guide for studying national food systems. Finally, section 2.5. concludes by connecting our research framework proposal with the current prospects for an agroecology-based, more fair and sustainable food regime for the 21st century.

2.2. Theoretical and conceptual framework: food regimes, social metabolism and surplus/reproduction

2.2.1. Food regimes: conceptualization

In 1989, Friedmann and McMichael published the seminal work *Agriculture and the state system: the rise and fall of national agricultures, 1870 to the present* in which "they explored the role of agriculture in the development of the capitalist world economy and in the trajectory of the state system" (Friedmann & McMichael, 1989, p.93). To do that, they organized their argument around the concept of food regime that links international relations of food production and consumption to forms of accumulation broadly distinguishing periods of capital

accumulation since 1879. Although the first formulation of food regimes goes back to Friedmann (1987), it was in their joint work in 1989 when Friedmann along with McMichael presented a more systematic formulation of the concept.

The two theoretical approaches underpinning the initial food regime formulation were the regulation theory and the world system theory approach. The regulation theory posed a means to explain the emergence of extensive periods of economic and political stability. It sees capitalism to be stabilized when a mode of regulation—regulatory practices and settings—coincides with a regime of accumulation—the conditions for profit making—(Pritchard, 2009). Periods of institutional stability are followed by periods of crises and recomposition (Campbell & Dixon, 2009). The world-system approach seeks to understand and explain economic and political processes in their global historical terms. Thus, it emphasizes the world-historical conditions that underpin the individual circumstances of economic and political actors involved in the agri-food chains. That is, the multifaceted struggles confronting actors in the world economy are seen as ultimately deriving from a system-wide logic of global capitalist accumulation processes (Pritchard, 2009).

By blending the regulationsits and world system approaches and applying it to food, Friedmann and McMichael came up with a "new way of framing agri-food power relations as well as an approach for agricultural research and policy analysis that moved food from the periphery to the centre of wider theories about society and interpretations of the history of capitalism" (Campbell & Dixon, 2009, p.261). The aim was to enrich the means available for a historical framing of the capitalist world economy with reference to food and agriculture (Bernstein, 2016). Since then, the concept of food regime has significantly evolved, particularly from the 2000s onwards (Campbell & Dixon, 2009). It further deployed in the so-called food regime analysis, and continues to be in

formation (McMichael, 2009a). Down below we briefly review some of the more significant evolutive steps.

From Friedmann's side, there has been a movement of the focus from periods of stability or regimes to periods of transition and change between regimes. Her more recent definition of food regime is "a specific constellation of governments, corporations, collective organizations, and individuals that allow for renewed accumulation of capital based on shared definition of social purpose by key actors while marginalizing others" (Friedmann, 2005, p.228). This results in relatively "stable sets of key relationships and practices" that persist over time. The idea of 'frame' is critical in Friedmann's thinking. A 'frame' is understood as an enduring complex of assumptions and implicit rules for interpreting reality. Friedmann contends that "food regimes emerge out of contests among social movements and powerful institutions, and reflect negotiated 'frames' for instituting new rules" (Friedmann, 2005, p.232). Nevertheless, food regimes hold internal tensions that, eventually, turn into crises and open a new scenario of contestation until a new regime is unfolded. Friedmann has given particular attention to the study of the role of social movements as engines or agents of regime crisis and transformation, expanding this way the thematic scope of food regime analysis (Bernstein, 2016).

Taking other direction, McMichael (2009b) has emphasised the distinction between identifying food regime moments and using food regime analysis to identify significant relationships and contradictions in capital processes across time and space. In regard to the former, McMichael argues that "food regimes analysis brings a structured perspective to the understanding of agriculture and food's role in capital accumulation across time and space" (McMichael, 2009a, p.140). He further explains that, in specifying patterns of circulation of food in the world economy, food regime analysis underlines the agri-food dimension of

geopolitics, being this compatible with treatment of different agricultures across the world (McMichael, 2009a).

Recently, Bernstein (2016) has contributed to a better understanding and framing of the purpose and scope of food regimes encapsulating some of the key ideas of food regimes analysis so far. He succinctly posits that food regime analysis considers some fundamental questions in the changing political economy of capitalism since the 1870, being *Where, how and by whom is (what) food produced in the international economy of capitalism; Where and how is food consumed, and by whom?; What are the social and ecological effects of international relations of food production and consumption in different food regimes?* To answer these questions, Bernstein explains that it is necessary to investigate food regimes' determinants and drivers, shape, consequences, tensions, crises, and transitions. He further identifies eight key 'analytical elements' or 'dimensions' that bear on the former—(i) *The international food system*, (ii) *International divisions of labour and patterns of trade*, (iii) *The 'rules' and discursive (ideological) legitimations of different food regimes*, (iv) *Relations between agriculture and industry, including technical and environmental change in farming*, (v) *Dominant forms of capital and their modalities of accumulation*, (vi) *Social forces, other than capitals and states,* (vii) *The tensions and contradictions of specific food regimes*, (viii) *Transitions between food regimes*— . These 'analytical elements' are used in Bernstein's work to review the food regimes—the first, second and eventual-third food regimes—in modern history. We will go back to this issue in section 2.2.

In addition, Bernstein has also summarized the main—and 'little', according to Bernstein—critiques that food regime analysis has received so far. An early substantive critique was elaborated by Goodman & Watts (1994, 1997). These authors disagreed with Friedmann and McMichael's periodization of recent

capitalism regulation theory to agriculture, particularly the shift from Fordism to Post-Fordisms, contending that 'the parallels between agriculture and industry are radically overdrawn' (Goodman & Watts 1994, p.5). Instead, they argued for taking into account the differences between agriculture and industry, with particular emphasis on territoriality and spatiality as a factor of differentiation. Besides, they pointed to need to consider the role of states in the regulation of agriculture and the importance of contingency, polyvalence, heterogeneity, and the like.

Other of the main critiques came from Araghi (2003), who has pointed the centrality of value relations and labour in food regimes. Araghi argues that "global agriculture and food are inseparable from the production of labour power" (Araghi, 2003, p.51). That is, food is intrinsic to capital's global value relations since it is central to the reproduction of wage labour, and other forms of labour coming under capital's way (McMichael 2009a). Therefore, using Berstein's words—"purged of regulationist and similar theoretical contamination, the fruits of food regime analysis can be incorporated in global value relations as the proper framework for investigation the history of world capitalism/imperialism" (Bernstein, 2016, p.633). Going further in Araghi's argument, the concept of 'global value relations' he uses "include the politics of state relations, the world market, colonization and imperialism, and the (often geographically separated) labour regimes of absolute and relative surplus value production" (Araghi, 2003, p.49). This concept emphasizes the dialectical/relational and contradictory unity of the production of absolute and relative surplus value. Based on this, he proposed his own historical framing.

Bernstein (2016) himself has raised some critiques—or 'absences'—in regard to food regimes framework. In spite of the fact that food regimes have expanded its scope in the last decades, including new issues—primarily related to the

debate around the third food regime (Campbell & Dixon, 2009)—, Bernstein has pointed to the question of population and 'the peasant question'. With the former, Bernstein has criticized that food regimes do not take into account the sharp increase in the number of people that needs to be fed over the last centuries, lacking a demographic dimension. With the later—'the peasant question—Bernstein has pointed out deficiencies from a conceptual-analytical standpoint, including a lack of an adequate theorization and specification of peasants and family farmers when understood as an 'awkward class' of small agri-food producers that have unexpectedly remained in place under a capitalist global system (Akram-Lodhi & Kay, 2010a, 2010b; McMichael, 2008; Netting, 1993; Shanin, 1971, 1972).

Finally, (Tilzey, 2018, 2019) has reassessed the seminal work of Friedmann and McMichael (1989) and has introduced some additional critiques. He has pointed out its 'structuralism' or 'abstract globalism', highlighting "the unresolved tensions and omission to present a theoretical basis for conceptualising the dialectic between 'structure' and 'agency'" (Tilzey, 2019, p.232), and which is ultimately linked to an absence of a conceptualisation of the relation between capital, class, and the state. Drawing on 'Political Marxism', Neo-Gramscian International Political Economy and a comprehensive interpretation of Regulation Theory, Tilzey argues that capitalism is not the agent-less force—as sometimes portrayed in food regimes literature—but rather an 'agent-full' series of political projects that advances or retreats according to the relationship between material/discursive power of the hegemonic class fraction and resistances to it, both from other capitalist class fractions and from non-capitalist fractions (Tilzey, 2018). This relationship of intra-class and inter-class struggle takes the form variously of compromise and co-optation—hegemony—and of opposition and suppression—domination—.

According to Tilzey, the state plays a key role in here; it is the place in and through this relationship occurs, thus constituting the crucial nexus for struggle. Following Jessop (2016), Tilzey understands the state as a 'social relation'. Jessop argues that in strategic-relational terms "state power is an institutionally and discursively mediated condensation—a reflection and a refraction—of a changing balance of forces that seek to influence the forms, purposes, and content of polity, politics, and policy in specific conjunctures, marked by a variable mix of opportunities and constraints, themselves linked to the wider natural and social environment" (Jessop, 2016, p.53).

Tilzey also draws on Jessop's features of the 'capitalist type of state' (see Jessop, 2016, p.104), and empathizes the function of the state in performing legitimacy, as important as its function in sustaining accumulation. All the aforementioned ideas result in and are encapsulated in Tilzey's concept of 'state-capital nexus'. This way, capitalism, in intimate conjunction with the state, generate food regimes as integral parts of its growth and power dynamic. This has a threefold logic which is tied up with both the accumulation and legitimation aspects of the state-capitalist nexus: first, to supply food to its labour force; second, to supply this food as cheap as possible to diminish the socially average wage and thus maximizing surplus value in the production of commodities; and third, to afford opportunities for profit-making by the various class fractions of agrarian capital (Tilzey, 2019).

Building on the former works, Tilzey, along with Seddon and Sugden, have very recently offered a more detailed exposition of the theory underlying the state-capital nexus and imperial-peripheral relations, as well as the role of peasantry in it (Seddon, Tilzey, & Sugden, 2023; Tilzey, Sugden, & Seddon, 2023). In them, they highlight the need to conceptualize state-capitalism system as comprising a small number of imperialist states—the global North—, which a determining

role in the nature of food regimes, and a periphery—the Global South—, where in most of cases export-oriented elites maintain systems of economic subordination to the Global North. This understanding of the centre-periphery is also critical in terms of the state's legitimation function. In the Global North, legitimacy is fundamentally secured through a relative distribution of wealth, which also involves a transformation of the former peasantry into a class of proletarians or commercial family farmers. In contrast, in the Global South, the peasantry survives as a semi-proletariat, subject to super-exploitation and thus facilitating the transfer of surplus value to the Global North, upon which the latter's affluence is centrally predicated. Additionally, building on Tilzey (2018), they propose a revised periodization of food regimes (Tilzey et al., 2023) (see section 2.2.2.4).

As a final remark in this section, we consider important raising the issue of the character of food regimes from an epistemological point of view. This aspect has not been addressed so far. The terms 'food regime concept', 'food regime framework', 'food regime analysis', 'food regime approach' and 'food regime theory' are used indifferently—paradigmatic examples are Campbell & Dixon (2009), McMichael (2009a) and Bernstein (2016)—. We consider that food regimes provide a useful conceptual framework to understand the long-term evolution of food systems in industrial capitalist societies, and this is the position we keep along the Chapter. Yet, we consider that food regimes need to verify its assumptions with more empirical data (Krausmann & Langthaler, 2019; González de Molina et al., 2019) to clarify concepts and historical disputes that remain unresolved. Among them, the role of national regulations and policies requires downscaling the global framework of food regimes to study them with more specific and empirical approaches.

2.2.1. Food regimes: periodization

Since 1870, two periods of historical stability in food and agriculture—food regimes—have been identified. In this section, we highlight the essential features of the first and second food regimes to then comment the debates around the emergence of a contested food regime from the 1980s onwards.

2.2.1.1. The first food regime

The first food regime (Friedmann & McMichael, 1989) or 'diasporic-colonial food regime' (Friedmann, 2005) emerged in 1870 and lasted up to 1914/1930s. It arose in the form of a world wheat market, being the first price-governed global market in staple food, under the British hegemony. Prior to this, colonial agriculture had already extended over many regions in Africa, Asia and South America and had an important role in supplying imperial states with exotic food (pepper, sugar), 'preciosities' (silver) and some bulk commodities (such as guano, wood, and cotton) mainly used as raw materials for industry (Wallerstein, 1989; Hornborg et al, 2007). Yet, these products were not essential for the subsistence of European empires, nor did they compete with their domestic agricultural production. It was the shift in the role of imports from 'exotic' to staple food what marked the difference.

The first food regime emerged in a moment of social unrest and hunger in Europe that triggered a new 'consensus' between the state, industrial employers, landowners and capital farmers, and social movements. The repeal of the Corn Laws in 1846, resulting from the division of agricultural farmers in the Britain (Winders, 2009) and the growing power of industrial and commercial segments, was an essential pre-requisite. In line with this, the first food regime was framed within a general rhetoric of free trade (Chang, 2002, 2003) and the actual working of the gold standard international monetary system (Eichengreen

& Flandreau, 2005), which played a key role in regulating international currencies and trade (Friedmann, 2005).

In the scenario of that First Globalization (O'Rourke & Williamson, 2001), imports from settler-states of North America and Australia (mainly wheat and meat) to European imperial powers were combined with exports of labour and capital from the latter to the former (Krausmann & Langthaler, 2019). Cheap food from colonies was for the first time critical in provisioning emerging European industrial classes (Moore, 2008). Therefore, this regime was characterized as an 'extensive' form of capitalism: increasing food supply at lower prices contributed to the accumulation of capital in the agrarian sector and beyond by limiting the increase in labour costs (Friedmann & McMichael, 1989; Akram-Lodhi, 2019). At the same time, cattle ranchers and farmers who extended monocultural agricultures in the new settler states demanded industrial manufactured goods from European metropoles. In this regard, the nature of specialized commercial agriculture was industrial itself (Friedmann, 1978), resulting in a form of 'development' as an articulated dynamic between agriculture and industrial sectors (McMichael 2009a). Territorial expansion was also a key driver for the spread of railway and thus European and international profits (Friedmann, 2005). In McMichael's words, the "British's 'workshop of the world' project linked the fortunes of an emergent industrial capitalism to expanding cheap food supply chains across the world" (McMichael, 2005, p.272).

The first food regime produced at least three critical outcomes that transformed social and ecological relations between Europe and the European settler states. First, it made possible the emergence of a new class of settler family farmers in the emerging states where world agricultural frontiers were expanded. European settlers, who migrate due to economic and political reasons, intended to establish themselves as farmers and to stay. This brought about a new phenomenon: fully commercial farms based on family labour specialized in

monocultural export crops. These family farms were dependent on distant export markets and at the mercy of the private interests of railways, banks, and grain merchants as well as of the states that organized the grain trade (Cronon, 1991). The fact that these new class of family farmers could only exist through an international grain commodity trade articulated from Chicago to New York and London, also entailed that they would suffer most from a collapse of the regime (Friedmann, 2005). Simultaneously, this articulation process of global integrated market of food commodities (Abel, 1980) generated a distinctive farm politics expressed in new agrarian social movements (Magnan, 2012; Edelman & Borras, 2016) that would play a role in shaping the second food regime.

The second outcome has to do with the creation of a system of national economies governed by independent states. This was one of two simultaneous and contradictory movements: the culmination of colonialism—articulated on colonies of 'occupation'—and the rise of the nation-state system that emerged and was consolidated both in Europe and in colonial 'settlement' of European offshoots (Friedmann & McMichael, 1989).

From an environmental point of view, extensive monoculture in virgin soils occupied by settlers led to soil fertility depletion and eventually to water depletion, causing significant environmental problems—made apparent, among others, by the so-called 'Dust Bowl' in the North American Great Plains in the 1930s (Cunfer, 2004, 2021; Harriet Friedmann, 2005; Krausmann & Langthaler, 2019). This, along with the fall in agricultural prices originated by grain overproduction (Offer, 1991; O'Rourke, 1997; O'Rourke & Williamson, 2001) led to the collapse of the first food regime (Koning, 1994; Friedmann, 2005; Winders, 2009).

2.2.1.2. The second food regime

A period of instability and reordering of agri-food consumption and production relations followed the end of the first food regime. During this time, the emergence of the United States as the new hegemonic power, and the influence of farm movements within US politics, and in many other parts of the world until the aftermath of the II World War (Edelman & Borras, 2016) were critical drives in the unfolding of a new regime.

According to Friedmann & McMichael (1989), a second food regime can be identified from 1947 to 1973, characterized by a state-led model of national regulation of agriculture under the US hegemony exercised from the Chicago-based global food staples market, and the leading role of US corporations and state policies in deploying and diffusing the Green Revolution technology package. This is why it was later termed as the 'mercantile-industrial food regime' (Friedmann, 2005, p.240) and 'US-centered intensive food regime' (McMichael, 2013, p.32-38). This new period of stability witnessed two critical opposing movements, tough: the extension and completion of the international state system to former colonies, which became independent states, and the transnational restructuring of agricultural towards agri-food complexes by global agribusiness.

The strongest expression of the mercantilist character of the second food regime was food aid: subsidized exports from the US in exchange for 'soft currencies'—currencies not convertible to dollar—held by the US government as 'counterpart funds'. The role of the Bretton Woods monetary system was thus essential to this. Food aid was created as a means for providing an outlet for US food surpluses originated by the public direct subsidies paid to farmers introduced during the New Deal (1933-39) and reinforced in the II World War. Food aid programmes were first originated with the Marshall Plan in 1948-1951

for Western Europe, and the MacArthur Plan in 1945-1952 for Japan. Once European and Japanese agricultural production were restored, it was driven towards poorest nations in the periphery through the Agricultural Trade Development and Assistance Act of 1954 or Public Law 480 (PL 480) (Harriet Friedmann, 1983; Winders, 2009). The condition for countries to have access to those food aids was to be engaged into the North Atlantic Treaty Organization and other military blocs with the US, and to embrace the policies of the new global Western-capitalist economic order set in Bretton Woods.

In addition, to create a Western block against the Soviet Union, the second food regime was framed in an understanding of 'development' as 'national industrialization growth' (Harriet Friedmann, 2005), termed as the 'development project' by McMichael (McMichael, 2009a). In the South, the 'development project' was seen as key to the completion of the state after decolonisation. 'Development states' internalised the model of national agro-industrialisation, adopting Green Revolution technologies (McMichael, 2009a). Thus, the second food regime was characterized by a technical change involving mechanisation and an increase in the use of chemicals and fertilisers that tightened the linkages between industry and agriculture. This resulted in an intensification of agriculture that led to an even larger increase of surpluses in the US, and later on in Europe. This explains that in European states the 'replication' of US model of national regulation of agriculture soon included support prices and export subsides (Bernstein, 2016).

Internal subsidies paid to sustain farmer's incomes in the US and EU were necessary to offset the farmers' curse on the increasingly abundant crops they grew with the Green Revolution. The prices they obtained from increasingly asymmetric food markets fell, while the cost of industrial inputs rose steadily. The former was good not only for the oligopolistic wholesale and supermarket

chains, but also for further compressing the share of food in household consumption baskets of the rest of working class so as to divert greater proportions of their income to purchase consumer durables produced by the new Fordist factories. The latter side of the coin was the lower value added retained by small family farmers, leading them to the dilemma of either give up and migrate to growing industrial sites, or try to stay afloat in the vicious circle of cultivating more land more intensively with more expensive external industrial inputs (synthetic fertilizers and pesticides) and heavier machinery (González de Molina et al., 2020). But the unattainable promise of economies of scale was always in vain for them, who could only survive by also becoming dependent on public subsidies largely hoarded by wealthy landowners. The subsidies paid both to the primary producers and to the food exports managed by big traders became a key part and parcel of the new roles assumed by public policies in the national states of the Global North during the second food regime, aimed at fostering economic growth with the spread of the oil-based second industrial revolution.

In this scenario, a new division of labour and trade patterns emerged. The US became the dominant exporter so far, and Europe turned into a self-sufficient region shortly after the I World War and eventually a major export region (Friedmann, 2005). The ruling elites of the new nations of the South welcomed cheap US food exports as a means to foster industrialisation and proletarianization during the attempt of state-led growth policies like the CEPAL (United Nations Economic Commission for Latin America and the Caribbean) ones carried out in Latin America before the neoliberal turn imposed by the external debt crisis in the 1980s (Infante-Amate et al., 2022). This becomes another example of the key role of national policies under the second food regime. Local farming, unable to compete with US subsidized imports, was undermined as a result. The ultimate outcome of this process was the beginning

of an import-dependence path in the peripherical regions, despite the fact that some countries experienced notable increases of cash-crop yields and exports due to the state promotion of Green Revolution technologies in the Global South (Friedmann & McMichael, 1989; Bernstein, 2016). Food aid thus helped to build up future commercial markets for US agricultural goods eliminating competition (Harriet Friedmann, 1990, 1993; Winders, 2009), while it also continued to be an instrument of the foreign policy of the US against the Red armed insurgent movements that proliferated across the Global South in the framework of the Cold War (Patel, 2013; Picado, 2022).

A detrimental socioecological outcome of this was the simplification of agroecosystems that, along with the use of chemicals and pesticides, led to harmful environmental impacts. Furthermore, rural communities based on mixed farming cultures were marginalized, threatening loss of both indigenous cultivars and knowledge (McMichael, 2005; Toledo & Barrera-Bassols, 2008; Burke et al., 2023).

Not surprisingly, within the regulated spaces of the second food regime large industrial firms emerged—mainly of US capital—, playing a key role in the reorganization of food and agriculture and gathering increasing market power. Agribusiness created transnational linkages between national farm sectors, subdivided into specialized activities linked by global supply chains, which resulted in transnational agri-food complexes like the 'intensive meat complex'—linking grain/carbohydrate, soy/protein, and lot-feeding—and the 'durable food complex' (Friedmann & McMichael, 1989; Friedmann, 2005; McMichael, 2009a). The change in diet towards increasingly inefficient, unhealthy, and unstainable meat and dairy intake (Tilman & Clark, 2014; Wallace, 2016; Alexander et al., 2017; Willett et al., 2019) was an unavoidable transformation from the consumption side, going hand in hand with such

restructuring process. Traditional diet gave way to standardized mass consumption with a prominent increase of meat. In fact, beef was considered 'the symbolic centre of the post-war diet' (Friedmann & McMichael, 1989, p.106). As a result, agribusiness led a process of transnational accumulation which 'doubtly undercut the independent capacities of states to regulate domestic production and trade' (Friedmann & McMichael, 1989, p.94).

As a final remark, and as we indicated before, US farmers movements influenced the US policies and, and as the hegemon at that time, were critical in shaping the second food regime at its early stage (Friedmann, 2005). Equally, the loss of political weight of these farmers in favour of agribusiness, with increasingly loobying power, contributed to the vanishing of the regime. However, the catalyst of its demise was the 'deténte' between the US and the Soviet Union in 1972/1973, which facilitated Soviete-American grain deals and cleared US surplusses stocks. Food aid in other countries was suspendend. As a result, prices sharply increased -the price of wheat and other grains and oilseed more than tripled- provocking the World Food Crises in 1974 (Friedmann, 2005). Other factors contributing to the end of the second food regime were the rise of energy prices with the oil shocks of 1973-1979, the incrased of state debt particularly in the South and the increase of international competition due to the entry of NACs (Friedmann, 1993). Meanwhile, neoliberal polices centered on trade and finance triumphed in the 1980s and 1990s (Friedmann, 2005).

2.2.1.3. The third food regime

The first and second food regimes are well established in the literature. In contrast, the period after the crises of the second food regime has been a disputed arena among food regimes scholars, without a consensus on whether a new third food regime has completely unfolded since the 1980s up today (Jakobsen, 2021). Below, I summarize the main views on this issue.

Early contributions were made by Pistorious & Van Wijk (1999) who, focusing on the leadership in agricultural development, envisioned a 'Third agro-food order' from the 1980s characterized by a replacement of sates by private industry in Research & Development investment (McMichael, 2009a). Then, Friedmann (2005) suggested the emergence of a 'corporate-environmental food regime' that would result from a larger restructuring of capitalism in response to 'green' issues. That is, Friedman links the potential new food regime to 'green capitalism', a concept that refers to a new 'ecological' phase of the capitalism entailing 'a shift in rules of economic activity so that profits are renewed through less depletion of resources—which can mean lower raw material costs—, less pollution—which can create demand for new technologies—, and selling products that are culturally defined as environmentally superior' (Friedmann, 2005, p.230). In line with Friedmann's approach, which emphasises the role of social movements as engines of change the emerging 'corporate-environmental food regime' arises, all in all, as a response to pressures by social movements. That is, concerns regarding safety issue or the environmental impact of food production. In Friedmann's view, this explains that since the early 1970s a web of enterprises had started to produce and market certified organic food.

This emerging third food regime would involve a reorganization of the food supply that complemented the provision of transnational rich consumers—keen and able to buy 'green' high quality food—and poor classes that could only afford cheap industrially ultra-processed unhealthy food. According to her, in both cases this reorganization would be led by private capitals, other of the features of the emerging food regime. Yet, Friedmann argues that national states continue to play a key role in regulating food and agriculture, since private capital alone cannot regulate conditions of production, such as land use, labour markets cross-border temporary labour migrations, or of consumption—

mainly from a very limited food safety approach—. This way, Friedmann (2005) concludes that tension at the heart of the emerging corporate-environmental food regime is the struggle over the relative weight of private, public, and self-organized institutions—democracy—given that the emergence of organic production through differentiated market niches has been also an outcome of many grassroots social and agroecological initiatives from below.

Despite the fact that Friedmann acknowledges the looming shape of a new emerging food regime, she concludes that the regime has not been completely unfolded, since the set of more lasting relations on which regimes rests is not yet visible (Campbell, 2009). In contrast, McMichael (2005, 2009) does identify a third 'corporate food regime' which, despite carrying legacies of the previous regimes, expresses a new moment in the political history of capital (McMichael 2005). McMichael characterizes this regime as a vector of the 'globalisation project', referring to "a politically-instituted process of economic liberalisation privileging corporate entities and rights in the food system, with respect to crop development and the management of 'food security' as a service performed not by nation-states, but by transnational corporations through the world market" (McMichael 2009a, p.150). This quote bluntly portrays the core features of the regime, being a tendency for liberalization of markets and privatization of resources—yet with exceptions, as we will see below—favouring and led by private corporations operating at a global level. In doing so, the 'corporate food regime' defines a set of rules institutionalizing corporate power in the world food system (McMichael 2009a).

The determination of a 'world price', artificially depressed due to dumping subsides in the US and European Union (EU) and the strong and growing market asymmetry at the beginning and end of agri-food value chains (IPES-Food, 2016) is critical in the functioning of this third corporate food regime maintain

the key objective of providing cheap food that cheapens the reproduction of the labour force in all other major sectors of the economy. It works as mechanism in the articulation of the 'world agriculture', which refers "not to the entirety of agriculture across earth, but to a transnational space of corporate agricultural and food relations by commodity circuits" (McMichael, 2005, p.282). This makes possible the 'accumulation by dispossession' (Harvey, 2017). It does so by undermining local farming—and thus, local markets and cuisines—which are unable to compete with subsidized prices, but also—we have to add—through corporate alliances with states to carry out worldwide processes of land and green grabbing (Borras, Hall, Scoones, White, & Wolford, 2011; Corson & MacDonald, 2012; Marc Edelman et al., 2017; van der Ploeg, Franco, & Borras, 2015), and biopiracy (Cottrell, 2022; Goyes & South, 2016; Mgbeoji, 2010; Shiva, 2016b, 2016a). As a result, rural and urban populations are increasingly incorporated to consumption relations into global agro-export circuits and therefore to capital accumulation process.

In this regard, the World Trade Organization (WTO) plays a major role, being considered as the 'key institution' of the third regime. McMichael explains that the recent political determination of world agricultural commodity prices emerged through the Uruguay Round negotiations, which sought to stem the escalation of farm subsidies and manage the crisis of overproduction arising from the US and European Community agricultural policies (McMichael, 2005). Since then, under the rhetoric of free trade the WTO promotes world agricultural trade, forcing Southern states to reduce their agricultural protections and food security concerns while it preserves subsidies for the Northern powers (McMichael, 2009a).

As a consequence, a new international division of agricultural and labour takes shape, characterized by Northern exports of staple grains to the South, and

Southern exports of 'exotic' food to the North (Krausmann & Langthaler, 2019; Infante-Amate et al., 2022). This division is further combined with the distinction of two main categories of food, being 'food from nowhere'—cheap food coming from 'world agriculture'—and 'food from somewhere'—organic place-based food—(McMichael, 2009a).

This duality is also at the core of the main contradiction of the 'corporate food regime' from McMichael's view. He argues that 'agriculture without farmers'—industrial/farmless agriculture—and the environmental and social damages it brings about are leading to the flourishing of agroecologically-oriented practices and movements as a response. La Via Campesina exemplifies by far the major counter movement, expressing 'food sovereignty' as an alternative model and moral economy (McMichael, 2005; Narotzky, 2012; Homs & Narotzky, 2019). What is more, agroecology is gaining ground and legitimacy in international organizations, such as the FAO (HLPE, 2019) and among producers. These emergent relations opposes the dominant ones performed by corporate firms (McMichael, 2009a; Akram-Lodhi, 2021).

Apart from this major contributions, other authors have also added other features to the debate of this contested third food regime. Burch (2007) and Burch & Lawrence (2005, 2009) linked the rise of the retailing sector to the transformations of financial relations, suggesting a 'financial food regime'. They argue that financialization has become endemic to the food industry, from supermarkets establishing their own financial services in partnership with banks, acting like private equity companies, and so on. Burch & Lawrence (2005) firstly envisioned a new third food regime resulting from a restructuring of the agri-food system driven by the strengthening of retailer's dominance of the supply chain hand in hand with the emergence of new consumer patterns. They pointed to the 'own brand' supermarket's revolution as the key driver of this

restructuring since it allowed retailers to gain significant shares in food and beverages markets, and facilitated the introduction of new products meeting convenience, freshness and novelty criteria on a flexibility and adaptability basis. In producing their own brands, supermarkets increased even further their market power over farmers and food manufactures from a privileged position, determining the terms of production, and thus extending their control over the supply chain. Some manufacturing firms shifted to produce exclusively for 'own brands' products, exemplifying the peak of this process.

Then, grounding on the latter work and others (Burch, 2007; Burch & Lawrence, 2005, 2007), Burch & Lawrence (2009) further linked the raise in the dominance of retailers with the process of 'financialisation', suggesting a 'financialized third food regime'. Putting it straightforward, Burch & Lawrence's central argument is that the growing involvement of finance institutions in the agri-food system as they were never before while retailed-led agri-food companies increasingly behaving like financial institutions—what they call 'financialisation in reverse'—, provide another outline of the new regime. The authors use the example of hedge funds and private equity takeovers to exemplify this. In addition, Burch & Lawrence went further in their argument by explaining that the decline in the rate of profit in the post-War Keynesian period, along with the transformation in models of corporate governance towards 'sharehold-capitalism', were behind the current processes of financialisation (Burch & Lawrence, 2009, p.269), which was further associated with enchanced capital mobility at a global scale (Burch & Lawrence 2009, p.270).

Pritchard (2009) also contributed to the debate on the third food regime debate putting the focus on the WTO. In his regard, the key question for food regimes scholars is whether agriculture's incorporation into the WTO should be understood as facilitating a free market 'third' food regime', in which food–

society relations are governed by the overarching politics of the global market, or whether it represents a state-centred carryover of the crises of the second food regime which it is incapable of resolving. Pritchard argues that the collapse of the Doha Round negotiations in July 2008 resolved this question in favour to the second option. That is, "that the WTO is more appropriately theorized as a carryover from the politics of the crisis of the second food regime, rather than representing any putative successor" (Pritchard 2009, p.297), thus arguing against the idea of a third food regime so far.

More recently, a new strand of the debate has surfaced regarding the re-emergence of China's power and its impact in the reordering of the food regime through agri-food production, trade and finance (Belesky & Lawrence, 2019; McMichael, 2019). Belesky & Lawrence (2019) contend that the food regime is in a period of fluidity with a transition towards an increasing polarity and highlight the importance of China's re-emergence as an economic power and its distinctive variety of state-led capitalism and neomercantilist strategies in the agri-food sector. Moreover, they argue that "the analytical contours of the current food regime cannot be adequately comprehended without recognising the importance of state-led capitalism and neomercantilism and the ways in which these socio-political and economic dynamics are reshaping relations of power" (Belesky & Lawrence 2019, p.3). Despite of acknowledging China's growing power, McMichael argues that it is "premature to define a future food regime trajectory" and that "China's current engagement does however offer a lens on a transitional process, taking into account the dynamic combination of conjunctural relations, but not assuming China will necessarily become a new hegemon" (McMichael 2019, p.26).

Green (2021) bluntly summarizes the arguments regarding China's dominance in global food trade and the reconfigured food regime relation that resulted from

it. According to him, this tends to be based on one of three primary claims, or some combination of them. First, China has adopted a neomercantilism foreign policy that aims to secure access to agri-food imports for domestic consumption. Second, the Chinese state has channelled sovereign wealth funds into state-owned and private enterprises to expand the international influence of its agribusiness industry and challenge transnational corporations' control over agri-food production, processing, and distribution. Third, China has both entrenched, and reconfigured, the dominant relations of neoliberal market rule for its own strategic purposes (Green, 2021).

As a final thought, despite the fact that an agreement regarding the consolidation or not of a third food regime has not been reached so fa —or whether we are in a 'Post-Neoliberal one'—, all the former contributions have added significant and complementary insights regarding the role of agriculture and food in the world financialized corporate capitalism since the 1980s, when the Second Globalization began (Crafts & Venables, 2003; Glyn, 2006; Krausmann & Langthaler, 2019), significantly helping to understand food systems functioning at a global scale.

We want add to this that, in a world immersed in a global ecological crisis and a climate emergency of which the current food system is a major driver, having caused 34% of all global greenhouse gas emissions (Crippa et al., 2021) and crossing five different planetary boundaries (Rockström et al., 2020), the ongoing trends of this third food regime can only have an actual future if it is successfully contested from the alternative prospects of a deep agroecological system transformation (González de Molina, Petersen, Garrido-Peña, & Caporal, 2019; IPES-Food & ETC Group, 2021; McGreevy et al., 2022). Many studies of ecological economics and political ecology have provided clear evidence that counteracting the current transgression of planetary boundaries while providing

a safe and just space for all to have a good life requires material and energy degrowth to at least close to the levels of consumption per capita that existed in the Global North in the 1970s, precisely when the Second Globalization unleashed by the neoliberal turn was beginning along with the third corporate-financial food regime (Dietz & O'Neill, 2013; Fanning, O'Neill, & Büchs, 2020; Hickel & Kallis, 2020; Hickel, Kallis, et al., 2022; Hickel, O'Neill, Fanning, & Zoomkawala, 2022; O'Neill, 2020; O'Neill, Fanning, Lamb, & Steinberger, 2018; Vogel, Steinberger, O'Neill, Lamb, & Krishnakumar, 2021). There is a lack of assumption about all that among many food regime debates, which continue to address capitalist prospects forgetting that being so unsustainable also means that the prevailing corporate food regime cannot last long without leading humanity towards a societal collapse already foreseeable (Steffen et al., 2018; Tilzey, 2019).

2.2.1.4. An alternative periodization by Tilzey et al., (2023)

As I advanced in section 2.2.1., Tilzey et al., (2023) have proposed a revised periodization of food regimes, which builds upon Tilzey's previous work (Tilzey, 2018) and their understandings of the state, capitalism, class and imperialism. Below, I summarize it:

Tilzey (2019) and Tilzey et al., (2023) identify a 'First', British 'Liberal' or 'Free Trade' food regime between 1840-1870 resulting from the reform of the Corn Laws. This is considered the first international capitalist food regime founded on the integration of 'core' states as—notably Germany and France—, for the first time, predominantly capitalist economies. The increase in the cost of cereals in Britan—the main item in the working class diet—fundamentally due to protectionism led to the reduction of profits. This pushed industrial capitalist to look after cheaper supplies. These pressures were eased by the 'spatio-temporal' fixes of bilateral trade agreements with complementary class

fractional interests overseas, drawing this way on a 'frontier' of extraction. Britain began to invoke the principle of 'comparative advantage', whereby wage foods should be sourced from wherever they could be produced most 'cheaply', supplying in turn a competitive boost to Britain's preeminent industrial status.

This regime is followed by the 'Second' or 'Imperial' food regime between 1870–1930, which was characterized by the development of 'socially and sectorally articulated' capitalism in these imperial countries—first in the Britan, an then in US, France and Japan—, which counterposed to the establishment and perpetuation of 'disarticulated' capitalism in the periphery on the basis of exploitative mechanisms to obtain super-cheap primary commodities and securing captive markets in these regions. This relationship entailed the full proletarianization of the former peasantry—together with the creation of class of commercial family farms—in the imperium, while implying the perpetuation of a peasantry in the periphery existing under conditions of increasing precarity.

The aftermath of the First and Second World Wards led to the emergence of the 'Third' or 'Political Productivist' food regime, between 1930 and 1980. This regime responded to the need of facing the communist 'threat' while securing capital accumulation and addressing the oversupply of commodities in the US. The main feature of this regime as 'state-centred' accumulation of 'political productivism' in the 'core' states. Wage increases were balanced by productivity increases and the agri-food sector was restructured to favour the capitalist family farm, which led to the 'disappearance' of peasant agriculture. Although the concentration of capital in the agri-food sector pushed for liberalization and trade so that profitability could be increased, the opposition of neo-mercantilists and social welfare constituencies avoided it. In contrast, commodity surpluses were exported to the periphery, which "was opened up

following the subsided destruction of its staple food produces by means of dumping" (Tilzey, 2019, p.243).

Between 1980 and 2010 Tilzey (2019) and Tilzey et al., (2023) suggest a 'Fourth' 'Neoliberal' food regime, in which the reciprocal relation between imperial transnational capital and the agro-exporting oligarchy in the periphery led to the exploitation of larger areas in the latter to export agricultural commodities to the core. Thus, the periphery was constrained to adopt the full norms of neoliberalism while the core did not so for legitimacy reasons. At the same time, manufacturing was moved from the core to the periphery to benefit from super-exploitation of labour. This, together with the resurgence of extractivism led to the further erosion of self-subsistent peasantry in the periphery which become formally subsumed within capitalist relations of production. This, along with ecological degradation, resulted in resistance movements claiming food sovereignty.

Finally, Tilzey (2019) and Tilzey et al., (2023) suggest a 'Fifth International', 'Post-Neoliberal' food regime in his perioditization, which begun around 2010 with the re-emergence of China and the rise of the Latin America 'pink tide' states, along with 'land-grabbing' and neo-extractivism in the pheripheries. This regime is marked by a set of contradiction: the increasing wealth dispartities genereting crises of under-consumption, the increasing precarity hindering access to basic necessities, and environmental deterioration and resource depletion. The regime is also marked by the re-emergence of states intervening to mitigate the former contradictions and secure accumulation and legitimation functions for capital, as well as by inter-state competition.

2.2.2. Bringing together food regimes, social metabolism, and surplus/reproduction approaches

The concept of 'social metabolism' (or 'economic', 'socioeconomic' or 'societal' metabolism) arose from the acknowledgment that biological systems—organisms and ecosystems—and socioeconomic systems—households and firms—depend on a continuous throughput of energy and materials in order to maintain their internal structure and functioning (Giampetro, Mayumi, & Sorman, 2012; Manuel González de Molina & Toledo, 2014; Krausmann, 2017). Specifically, the social metabolism "refers to all energy and material transformations that are taking place, within an open social system such as an economy, and between this system and its environment" (Gerber & Scheidel, 2018, p.88). In these biophysical society-nature interactions, energy resources play a particularly relevant role. Production is impossible without energy provision since energy is an input to labour and capital that enables them to produce output—as Keen et al. (2019, p.41) say, "labour without energy is a corpse, while capital without energy is a sculpture".

The surplus/reproduction approach refers to the key role played for capital accumulation by the interlinked dynamics of capitalist firms and social reproduction of labouring population. The capitalist system depends on the supply of labour that requires ensuring its social reproduction—the processes of meeting the material and social needs of human communities (Polanyi & Pearson, 1977). Surplus value equals the value of commodity production sold to household consumers minus the costs of producing them. A relevant share of these cost is the subsistence wage of labour that allows its reproduction, according to a prevailing norm of consumption socioeconomically and culturally set as acceptable, including the food basket that meets the endosomatic needs of labouring people (Picchio, 1992). At the same time, this same wage labour provides most of the effective demand that allows capitalist firms to buy their

produce. Thus, the lower the subsistence wage of labour, the higher the surplus and capital accumulation provided that the commodity production can be bought and consumed. The shares are determined by the social conflict between labouring people, farmers, and capital owners. As (Georgescu-Roegen, 1971, p.361) pointed out "differences between individuals or between groups of individuals are not only normal but also unavoidable phenomena in the biological world. But only within the human species do we find, from the dawn of history on, inequalities of a different nature–social inequalities which have little, if anything, to do with the biological differences" (Marco et al., 2020b).

The cost of food for the household reproduction of the labour force becomes the key nexus between the approaches of food regimes, social metabolism and surplus/reproduction. The role of food in the capitalist system can be more comprehensively understood when these three approaches are brought together to highlight how cheap exosomatic raw materials and energy make cheap food production possible. The cheap endosomatic food intake enables both production and workforce reproduction inexpensive for the entire economic system, thus reducing the wage bill for all production-consumption chains (Tilzey, 2019). This is the core notion that explains why food regimes exist with a set of specificities which make food systems so dissimilar to the rest of economic sectors. The first specificity has to do with the much-debated agrarian question. The second, with its functioning—asymmetric differentiation and market power exerted along the agri-food chain—. The third, involves state intervention through subsidies, public infrastructures and specific rules.

Yet, the social reproduction of labouring population not only depends on energy, materials and food, but also on domestic and care unpaid work (Marco et al., 2020a, 2020b; Mincyte, 2023). This essential work for social reproduction has been historically carried out principally by women that have thus became

subordinated to ensure the creation of surplus value for capital accumulation (Picchio, 1992). In other words, food regimes are based on Moore's 'Four Cheaps'—energy, raw materials, food and labour (Moore, 2012)—on which capital accumulation relies through a 'Cheap Food model' (Moore, 2015b).

Scholars working on the political economy of food systems have recently called for bringing society and nature into the field by expanding it with socioecological and feminist perspectives among others, thus reinforcing the importance of interdisciplinary and transdisciplinary research (Moragues-Faus & Marsden, 2017; Duncan et al., 2019). At the same time, other researchers call on more systemic approaches to agri-food sustainability transitions that consider power relations and governance change (Gaitán-Cremaschi et al., 2019; Hebinck et al., 2021; Marsden, Hebinck, & Mathijs, 2018; Moragues-Faus, Marsden, Adlerová, & Hausmanová, 2020; Rossi, Bui, & Marsden, 2019; Sievers-Glotzbach & Tschersich, 2019; Weigelt et al., 2020). Our framework proposal responds to both calls.

2.3. Critical review

2.3.1. Methods

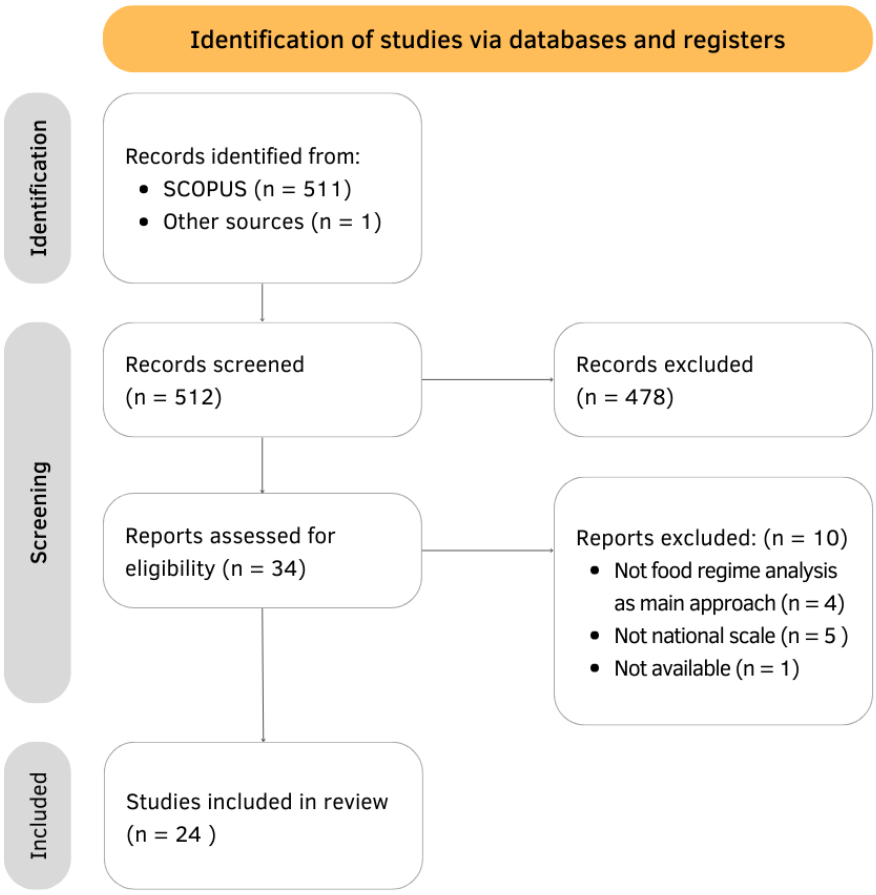
For a clear and concise way of reporting the steps followed in the critical review we followed the guidelines of the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)[12] (Page et al., 2021). We adapted this method due to the very great heterogeneity of the studies reviewed in terms of issues addressed and approaches used. Additional information of this review process can be found in Annex II.a.

[12] http://www.prisma-statement.org/

We set the following inclusion criteria: (i) studies must use food regimes approaches, and only studies that clearly identified the subject as the main topic were included; (ii) the scale of analysis must be national; (iii) studies must be written in English or Spanish; (iv) only peer-reviewed scientific literature is included; (v) studies were identified from direct search in SCOPUS[13] on the 25/07/2022 using 'food regimes' as search term (including titles, abstracts, and keywords). With them, 511 records were identified from the SCOPUS searching meeting these criteria, and Soldevila Lafon et al. (2015) was added leading to 512 records (Fig. 1). 478 were excluded after a first fast reading. From them, 404 (84.5% of total exclusions) were removed because of not meeting criterion one (approach); 73 studies (15.3%) because of not meeting criterion two (scale); and one study (0.2%) because of not meeting criterion three (language). After particular consideration, the studies by (Jakobsen, 2018, 2019) and Brown (2020) were excluded because their main point is expanding the food regime analysis from a Gramscian standpoint rather than applying it at the national scale. After a deeper reading of the 34 studies assessed for eligibility, 24 of them were finally included in the review and ten excluded (see Fig. 12, and Table 5 in Annex I.a. for the full list of studies included and a detailed explanation for those excluded).

[13] https://www.scopus.com/; We decided to use SCOPUS as search engine because we found similar results when using other search engines (Web of Science, Google Scholar), while SCOPUS offers more nested results regarding the meaning of food regimes used in each study.

Figure 12. Reporting of the review selection process



Source: Own elaboration based on Page et al. (2021). PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

Then we created an Excel document with the following items for each of the reviewed studies: year of publication; author(s); title; journal; key words; country; period of study; food regime(s) addressed; main focus; sources; terminology used to identify the approach; summary of food regimes aspects at which authors looked at, including a synthetic description of the variables entailed, and key remarks for a better interpretation of the such aspects when necessary. For each of the studies reviewed, we created a Word document in which we included detailed information regarding the aspects identified.

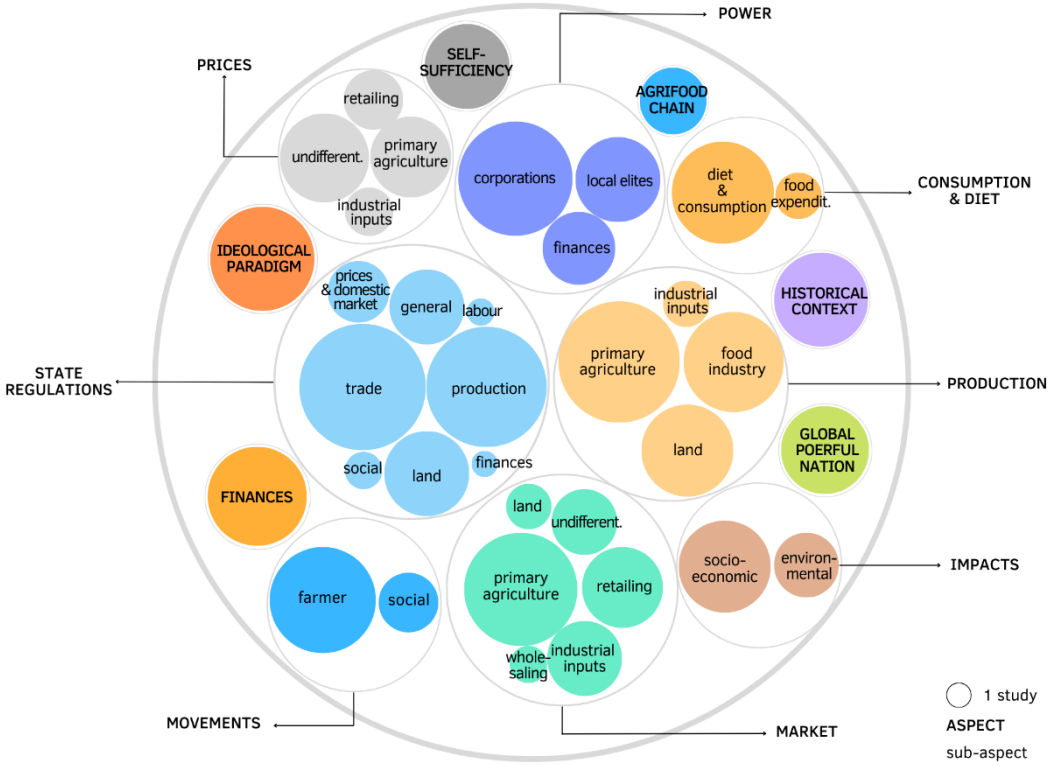
The results of this first round of examination, and particularly the aspects identified, which are the target of the critical review, were discussed by the authors of this Chapter and other researchers involved in this study. We made

use of 14 main categories and 32 sub-categories covering all the aspects identified so far and re-examined all the studies reviewed to check whether they addressed them or not, and how, using key words (see Table 6 in Annex II.a). We created another Excel document to quantify the number of studies addressing each aspect and sub-aspect (see Table 7 Annex II.b) and took further notes regarding the way such categories were addressed. We summarize the results in the following section.

2.3.2. Results and discussion

Fig. 13 shows the aspects of food regimes identified at a national level through the critical review considering 14 aspects (in capital letters), some of them further divided in up to 32 sub-aspects (in small letters). The size of circles accounts for the number of studies that addressed them. While some aspects have the same weight in terms of number of studies including them, the depth in which such aspects are tackled significantly vary within a same study or between studies. In some cases, detailed data is provided whereas in others only a general trend is provided (see Annex II.c for a detailed description of the results of the review).

Figure 13. Categories and sub-categories of aspects of food regimes identified at a national scale and number of studies addressing them



Source: Our own, with the dataset explained in the text.

The review points to the centrality of state regulations as a key aspect to understand how food regimes unfold at the national level, being addressed in all of the studies reviewed (24 out of 24). This finding is consistent with other studies (Jakobsen, 2021; Moran et al., 1996). However, the focus is put mostly on regulations related to international trade and to primary agricultural production, while little attention is given to regulations over the remaining areas of the food system (see Fig. 13).

With regards to production aspects, the results also show an emphasis on primary agricultural production, tackled in 21 out of 24 of the studies reviewed (Fig. 13). Yet, we consider insufficient the attention given to agricultural labour, included the role of migrant workforce, as highlighted by Weiler et al., (2020). The call to further investigate labour within food regimes has been also been

risen by Araghi (2003) and Jakobsen (2021). Although we agree with the importance of agricultural primary production, we argue for the need to give more attention to the remaining activities of the agri-food chain such as the production of agro-industrial inputs, food processing and also food services.

Similarly, when tackling markets, the focus is put on the primary agricultural market, and particularly on international trade, addressed in 18 out of the 24 studies reviewed (Fig. 13). In our review, we found that little attention is given to the market of agro-industrial inputs, wholesale markets, and retail markets, as well as on their articulation within agri-food chains. Addressing the former issues is important to have a comprehensive picture of food markets functioning.

With regards to price setting processes along these chains, we note that while they are included in 15 out of the 24 studies reviewed (Fig. 13), the way they are tackled remains very general. Authors mainly refer to their increase or decrease and point to some drivers behind such trends. Being prices a key component of food expenses of consumers and farmer's incomes, we consider that examining price setting mechanisms in more depth is essential. This issue goes hand in hand with markets considered as links among the actors moving food and money across the entire agri-food chain. Another outcome of the limited scrutiny of prices is reflected in the insufficient attention given to food expenses within the total expenditure of household budgets. Only three of the studies reviewed addresses this issue (Fig. 13). The food cost of household, and thus the cost of social labour reproduction, which is a critical aspect in food regimes studies that links labour to value relations (Araghi, 2003), is missing in most of the studies reviewed.

The review also brings out a set of connections between the aspects identified. A thorough explanation of these connections, including the studies which hold

them as well as how they did it, can be found in Annex II.c. These connections are: (i) state regulations result from contestation and influence from dominant forms of capital, social & farmer movements, and global hegemonic-powerful nations; (ii) state regulations are a central element framing food production, consumption and trade; (iii) dominant forms of capital exert power on the food system (including their price setting mechanisms); (iv) social and environmental impacts result from the food system functioning; and, (v) social and environmental impacts produce social and environmental movements in response.

The review also evidenced that further research needs to be done in order to inform the mechanism through which these connections unfold, and to provide empirical evidence to support them, which is lacking to a large extent. For example, the connection according to which state regulations result from contestations and influences from and between dominant forms of capital, social and farmer movements, and hegemonic and powerful nations, should include insights on the means and processes through which these actors exert their influence over the state, as well as how this intersects with the dominant ideological paradigm and the historical and geopolitical situation of each country. This would help to better understand how such contestation and influence takes place and translates into reality. Only the studies by Winders (2009), Gras & Hernández (2014) and Green (2021) provide deeper insight regarding some of these connections. The same applies to the power that dominant forms of capital held over the agri-food chain trough market concentration and power. Touching this issue, recent publications by IPES-Food (2017) and Clapp (2021, 2022) support this connection and also provide rich insights to approach it.

The results of the critical review make visible the great complexity of food regimes at a national scale, in which numerous aspects and connections interplay at different levels, including many nation-wide or even regional and local features that come from site-specific historical trajectories and heritages (Bernstein, 2016; Jakobsen, 2021). Among them, the role of large cities stands out either in the construction and maintenance of local/regional public food infrastructures (transport and storage in ports and airports, wholesale markets and hubs, municipal retail markets) or, on the contrary, in abandoning their traditional food policies leaving them in the hands of large private traders and supermarket chains. Together with nation-state policies, looking at food regimes functioning at the national scale also means considering the role of cities (Hebinck et al., 2021; Moragues-Faus, 2021), an issue not addressed in the literature so far.

In addition, this complexity points to the need to adopt a food system approach, which would be critical to integrate the many aspects above mentioned as well as their jointly assessment (Caron et al., 2018; Rivera-Ferre, 2020). The literature evidence that this systemic approach is largely lacking.

Finally, we note that none of the studies reviewed incorporated gender and feminist approaches, a critical issue for a sound understanding of the actual working of food systems (Marco et al., 2020a, 2020b; Ortega López & Cabana Iglesia, 2021; Mincyte, 2023) and beyond (Carrasco & Rodríguez, 2000; Picchio, 2003)

2.4. Our proposal of a research framework to investigate food systems at a national level

Our proposal of a research framework to investigate national food systems draws on the results from the review and its discussion, considering both their

contributions and shortcomings. To address these shortcomings, and also gain a deeper insight on the systemic dynamics of food regimes functioning, we also draw on the approaches of the social metabolism from ecological economics (Gerber & Scheidel, 2018; Keen et al., 2019) and of surplus/reproduction from feminist economics (Picchio, 1992; Marco et al., 2020a; Mincyte, 2023). We consider the latter approaches are critical to make more explicit some key nexuses and levers of change involved in food systems trends and transformation at a national level, to better understand how food systems shape capitalism and are shaped by it.

The resulting research framework organizes the functioning of national food system into six main dimensions, each one encompassing a set of elements. In addition, we include six connections between some of these aspects. Some connections are of cross-cutting character as they connect aspects of different dimensions. Table 4 summarize the dimensions, the elements they encompass, and the conceptual frames they belong to. Fig. 14 illustrate them, and we offer a more detailed description below in this section. The goal of this research framework is to provide a guide for studying national food systems and better addressing their complexity, making more explicit the key dimensions, elements, and the interconnections driving their functioning in order to facilitate the contrast with empirical evidence (Krausmann & Langthaler, 2019).

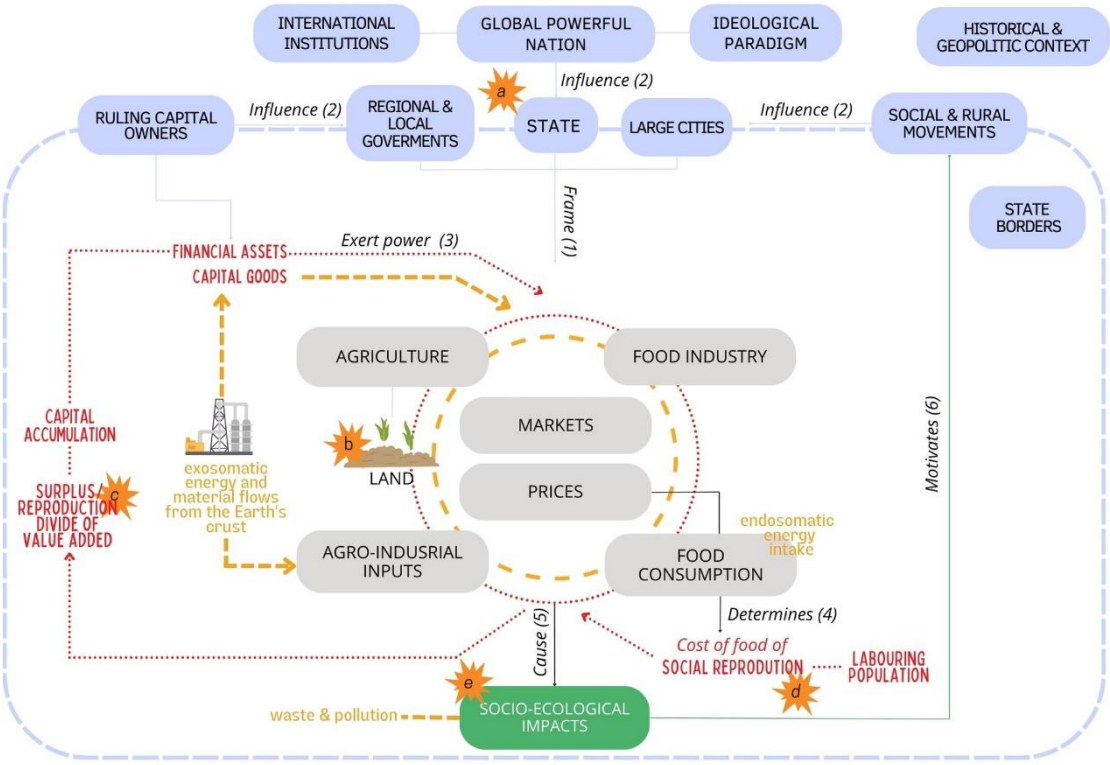
Table 4. Organization of national food systems in dimensions, elements encompassed, and conceptual frames they belong to

DIMENSIONS	ELEMENTS	CONCEPTUAL FRAMES
Food governance	– State – Regional & local governments – Large cities – Ruling capital owners – Social & farmer movements – International institutions – Global powerful nation(s) – Ideological paradigm – Historical & geopolitical context – State borders	Food Regimes Food Policy Home Rule of nation-states in the Postcolonial New World Order
Agri-food chain	– Agro-industrial inputs – Primary agricultural production	Food Regimes Food Policy

	– Land – Food industry – Food consumption – Market – Prices	Political Economy
Social metabolism	– Exosomatic energy and material flows from the Earth's crust – Endosomatic energy intake – Waste and pollution	Ecological Economics Planetary Boundaries
Surplus/reproduction	– Capital goods & financial assets – Labouring population – Surplus/Reproduction divide of value added & Capital accumulation process – Social reproduction of labouring population	Feminist Economics Political Economy
Socioecological impacts	– Expansion of export-led agricultural frontiers and land grabbing – Small farm abandonment – Ecological unequal exchange – Environmental (un)justice – Food poverty & deserts – Nutrition related diseases – Land degradation & desertification – Extension of agricultural frontiers of cash-crops exports – Biodiversity loss – Pollution of water, soils & atmosphere – Water scarcity and deprivation – GHGs & climate change – Other	Food Regimes Social Metabolism Planetary Boundaries
Conflicts & levers of change	a) the state, as a site of contestation between ruling and protesting agents, and with a critical power in shaping the food system at the national level and integrating nations into a global one. b) disputes over land property, land grabbing, as well as on land and commons reclamation. c) struggles on the distribution of surplus value between capital owners and labourers. d) struggle over the unpaid appropriation of women's domestic and care work. e) any other societal and environmental impact that led to social mobilisation, as well as the ecologically harmful impacts that endanger the food system functioning.	Food Regimes Food Policy Political Agroecology
Connections within and between dimensions	1. The state, regional and local governments, and large cities frame through food and rural policies the space in which agri-food production, distribution and consumption take place. 2. Ruling capital owners, social and farmer movements, global powerful nations and international institutions influence and contest food and rural policies. 3. Capital goods & financial assets are a mechanism trough which ruling capital owners exert their power on the agri-food chain functioning. 4. The price of food determines the food cost of households, and thus, the cost of labour reproduction. 5. Food system functioning causes socio-ecological impacts. 6. Socio-ecological impacts prompt social and farmers mobilisations.	Food Regimes

Source: Our own.

Figure 14. Functioning of national food systems considering their key dimensions, elements, and connections between them



Source: Our own.

A first dimension of Table 4 and Fig. 14 concerns food systems governance, understood as "institutions, actors, rules, and norms that shape how food is produced, distributed, and accessed across borders" (Canfield et al., 2021, p.128; Margulis & Duncan, 2016). The state, along with regional and local governments, and large cities is central (Moran et al., 1996; Pechlaner & Otero, 2010; Vignola, Oosterveer, & Béné, 2021). We understand the state as a social relation (Jessop, 2016; Tilzey, 2019), which shows the features of the 'capitalist type of state' (Jessop, 2016) and functions as the 'capital-state nexus' (Tilzey, 2018, 2019) (see a more detailed explanation in section 2.2.1). Through food policy (Hawkes & Parsons, 2019) and also rural policy (Bollman y Reimer, 2019), they frame the space in which agri-food production, distribution and consumption take place by setting the playground and its working rules. This conforms connection one (see Table 4, Fig. 14), which entails the mechanism

through which such policies translate into practice and the impacts they unfold in the actual functioning of food systems.

The ruling agency of the state, regional and local governments, and large cities results from contestation and influences between three other key agents: ruling capital owners, social, farmer and indigenous movements, and global powerful nations, the latter working hand in hand with international institutions over which they influence—World Bank, International Monetary Fund, WTO—(see Table 4, Fig. 14). These influences conform connection two (see Fig. 4). Ruling capital owners encompass both national and international entities, as they typically form alliances for operation. As long as they influence the national food system, they are to be included. In addition, global powerful nations and their linked international institutions work and promote certain ideological paradigms—the implicit rules as named by Friedmann (2005)—which legitimise the modus operandi of each epoch. To it, the particular historical and geopolitical trajectory of each country needs to be added to explain to some extent the differences between one nation and other. We include both of them as elements of the governance dimension. Additionally, the position of the nation in the core-periphery/Global North-Global South relations is critical to understand all the former aspects.

Finally, we added state borders to this dimension, too. Food and rural policies also interact with other state policies over state borders. States enforce and watch over their territorial borders to open and close to different flows of people and commodities. For example, until World War I the borders of Old Colonial Empires were crossed by massive migrations of European settlers to colonize the agricultural frontiers open, as well as by forced migrations of slaves and indentured workers coming from the Global South. After World War II, in what Sharma (2020) calls the 'Postcolonial New World', nation-states watch over

their borders to prevent illegal migrants to come in, only opening the door either to qualified workers from other countries of the Global North or to the entry of cheap precarious labour of casual workers from the Global South seasonally needed for harvesting or picking specific crops (Weiler et al., 2020; Werner, 2019).

A second dimension of the research framework corresponds to elements directly involved in the production, distribution, and consumption of food, which articulated in specific fashions, conform agri-food chain markets through which price setting takes place (Table 4, Fig. 14). In this dimension we include national production of agro-industrial inputs, primary agricultural products, and industrial processed food, each of them including their settings and outcomes, how they are produced, and by whom.

Land is another element included in this dimension (Table 4, Fig. 14). Primary agricultural production is intrinsically linked to land, considering what is produced in which land, how, and by whom. Although it is known that roughly more than 70% of global primary agricultural production in value terms is still carried out by family farms (Lowder, Sánchez, & Bertini, 2018; Lowder, Sánchez, & Bertini, 2021; Lowder, Skoet, & Raney, 2016; Shiva, 2016b) these may vary a lot at the national scale, with specific features and types farms in each place.

Markets are also included as an element of this dimension. All products involved in national food systems are exchanged through these markets, encompassing distribution and trade. We distinguish at least four main markets: the market of agro-industrial inputs, the market of primary agricultural products, the wholesale market, and the retail market. Understanding the functioning of these markets involves looking at what is traded, how, and by whom, both nationally and internationally. In addition, it involves tackling the prices at which products

are exchange, and price setting mechanisms in each of the markers, too. Thus, prices are also included in this dimension (Table 4, Fig. 14).

Finally, we included food consumption in this dimension as well. Food consumption encompasses what people eat and how (Table 4, Fig. 14). Addressing this aspect implies looking at least at diets and consumption patterns, including the role of food services, such as restaurants, meal houses, street stalls and canteens, hotels, and resorts. Different social classes, communities and nations buy different types of food in different food environments leading to different diets and healthy impacts (HLPE, 2016)

The intersection between prices and food consumption determines the cost of food, conforming connection four (Table 4, Fig. 14), which links this dimension to two others that make up the research framework proposed: the dimension of the social metabolism and the dimension of surplus/reproduction.

How does the cost of food connect these three dimensions? As explained in section 2.2.2, production is impossible without energy provision since energy is an input to labour and capital that enables them to produce food. In a simplified way, we include this socio-metabolic dimension in our research framework proposal, starting from the exosomatic energy flows and raw materials from the Earth's crust which are incorporated to agro-industrial inputs and capital goods, and which keep moving and transforming biomass flows along the agri-food chain up to food consumption, excretion, and waste disposal (Table 4, Fig. 14).

The operation and renewal of all sorts of capital goods require a constant provision of these exosomatic material-energy flows to compensate for their inevitable entropy. Food is also a form of endosomatic energy intake (while also providing other essential nutrients for humans) whose metabolization allow our bodies and minds to perform work. Both the exosomatic and endosomatic

energy inputs are thus essential to carry out human labour and the physical work of capital goods in the production processes, as well as to reproduce them over time. Thus, this socio-metabolic throughput connects with the (fourth) dimension of surplus/reproduction, that includes the dynamics of capital and labour in capitalist accumulation. We added in this dimension the elements of capital good & financial assets, labouring population, and the processes of surplus/reproduction divide of value added linked to capital accumulation, and social reproduction of labouring population (Table 4, Fig. 14). Capital goods and financial assets are mechanisms through which ruling capital owners exert their power on the agri-food chain functioning, conforming connection three (Fig. 14).

Here appears an interesting contrast; capital goods are subject to constant entropic corrosion that leads to the need for repair and maintenance costs, and inevitably shortens their useful life until replacement. As Joan Robinson and the group of economists at the University of Cambridge (United Kingdom) pointed out in the 1970s debate on capital theory (Cohen & Harcourt, 2003), physical capital goods are primary contributors to increasing labour productivity and the wealth of society. Their monetary valuation as assets, used by the Harvard economists—in the other Cambridge of Massachusetts—to account for capital stocks in their theory of economic growth is, in reality, a social construction that only determines who owns those capital goods, and therefore, is entitled to appropriate as profit the surplus resulting from subtracting to the monetary value added flow of production the cost of reproduction of the labour force employed, and the payment of other material and energy inputs, which must always be 'cheap'.

Interestingly, instead of the entropic decay of physical capital goods, financial assets endure over time demanding an interest rate for its mere existence as

debt-based 'virtual wealth' even before any real production, consumption and excretion cycle begins, and whatever its outcome—unless they become burst, also virtually, in the panic of a financial bubble—. Financialization has become a salient feature of the economic trends during the third food regime. Yet, financial assets can only grow through the biophysical turnover of the real economic life driven by human labour, capital goods, natural resources, and ecosystem services coproducing together—analogously to how viruses can only reproduce and spread through infection of living bodies—. Land grabbing, and the corporate advance at the expense of family farms, small food stores, cooperatives, and public food markets and facilities are clear examples of that in today's food system.

It is no coincidence that the productive capacity that mainstream economists ascribe to capital goods and their owners is actually carried out, and sustained, by all the other 'factors of production' that the prevailing commodification of capitalism underestimates as 'cheap' to foster capital accumulation. They include the undervalued human labour, raw materials, energy, and food, together with the unpaid provision of care and reproductive domestic work, as well as of nature-based ecosystem services, which are taken for granted and ignored (Moore, 2015b). As this means that market-driven decisions are blind to the real reproduction, maintenance and reposition needs of all those who actually sustain the economic life of our societies, the prevailing economic rules and functioning inevitably entail a series of unsustainable societal and ecological impacts that lead to conflicts. Here comes a fourth dimension that we label as socioecological impacts (Table 4, Fig. 14), and through which we try to encapsulate impacts of the food system functioning which arise from the previous dimensions. This conforms connection five (Fig. 14). We consider the following impacts of high relevance: expansion of export-led agricultural frontiers and land grabbing, small farm abandonment, ecological unequal

exchange, environmental (un)justice, food poverty & deserts, nutrition related diseases, land degradation & desertification, biodiversity loss, pollution of water, soils & atmosphere, water scarcity and deprivation, and GHGs & climate change (IPCC, 2019; Rockström et al. 2020; Crippa et al., 2021). However, this is not a closed list, and any other impact could be added.

These socioecological impacts further cause discontent among those affected, and eventually led to their mobilisation aiming at pushing governments to act in the opposite direction. This conforms connection six (Fig. 14) and links this dimension with the dimension of governance. Such mobilisations arise within the national boundaries but may be connected with other places also becoming international ones.

We include in our research framework a final sixth dimension of key conflicts and leverages of change, which are highly linked to the socioecological impacts (Table 4, Fig. 14). We understand key systemic conflicts and leverages of change as a single twofold issue, which refers to relations—both within a same dimension or in the intersection of them—that currently push towards a direction that cannot be sustained over time without undermining a healthy reproduction of key components of the life system, either societal, natural, or both. Precisely because of that, they are being contested from social forces or natural environmental changes thus creating contexts, conditions, and opportunities for new societal relations between humans and with nature to be established. They are linked, thus, to the 'contradictions' of the food regimes as named by Friedmann (2005) and McMichael (2009b).

2.5. Conclusions

In this Chapter we put forward a research framework to investigate the complexity of food systems functioning at a national scale taking as a point of

departure the contributions and limitations of food regimes, combined with the approaches of the social metabolism from ecological economics and surplus/reproduction from feminist economics. The results of the critical review of research we conducted help to identify a set of key aspects in the unfolding of food regimes at a national level. When combining them with the above-mentioned approaches, we developed our research framework consisting of six main dimensions that encompass 36 elements, and six cross-cutting connections between aspects. Although we take the national scale as unit as analysis, we do not claim that this scale is the unique or best one; rather, we hope our proposal help advance the investigation at other scales, such as the regional and local, being complementary to the national and global ones.

The core idea underlying the research framework proposed is that cheap food is a prerequisite for capital accumulation, an issue held by food regimes from the very beginning that we found sometimes blurred in the literature. We deem that this has to do with the lack a clarity on the main drivers and nexuses of food regime dynamics combined with a lack of empirical research to get a sounder and more concrete understanding of the actual functioning of food systems. With our proposal we try to address two of the problems that have been raised among food regimes scholars so far: its scale and level of abstraction. In addition, we emphasize the need to adopt a food system approach and link food regimes to food systems (Porter et al., 2019; Rivera-Ferre, 2020). The research framework we propose makes explicit a set of dimensions and aspects involved in the functioning of food systems at a national level, to conform a defined guide to study them from a broader political economy and political ecology of food systems. This means bringing together new approaches and perspectives, as many scholars have called for (Duncan et al., 2019; Moragues-Faus & Marsden, 2017; Taylor & Bhasme, 2019).

We also believe that our research framework proposal will be useful to connect the food regimes approach with the study of the role of food system transformation in resolving the global socio-ecological crisis of our time. Many studies of ecological economics and political ecology provide clear evidence that counteracting the current transgression of planetary boundaries while providing a safe and just space for all to have a good life requires material and energy degrowth to at least close to the levels of consumption per capita that existed in the Global North in the 1970s, precisely when the Second Globalization unleashed by the neoliberal turn was beginning along with the third corporate-financial food regime (Dietz & O'Neill, 2013; Fanning et al., 2020; Hickel, 2019; Hickel & Kallis, 2020; Hickel, Kallis, et al., 2022; Hickel, O'Neill, et al., 2022; O'Neill, 2020; O'Neill et al., 2018; Vogel et al., 2021). Such reflections remain limited across many food regime debates, with scholars writing about capitalist prospects without explicitly acknowledging that being so unsustainable also means that the prevailing corporate food regime cannot be sustained and is leading humanity towards a societal collapse (Steffen et al., 2018; Weis, 2010). The proposed research framework provides a useful tool to integrate the different aspects involved in the functioning of food systems at a national scale and to assess them comprehensively. Furthermore, it identifies six key conflicts and levers of change that can foster such transformation.

Nevertheless, further research needs to be done to provide deeper insights into some pending research questions, as well as to further improve the proposed research framework. We consider the following research questions to be of high significance: How do ruling capital owners and social and rural movements influence state, regional, and local governments, as well as large cities? How do ruling capital owners exert power over the agri-food chain? How can these be accounted for? And how can existing conflicts become levers of change beyond the corporate food regime towards a fairer one for all within planetary

boundaries? Additionally, we highlight the need to investigate the linkages between national, local, and global scales, as well as to advance the incorporation of gender dimensions and improve the biophysical one—already introduced through the socio-metabolism dimension—. On top of this, new connections and dimensions may be envisioned and incorporated.

Annex II.a. Additional Information on the Methods of the Critical Review

In our SCOPUS search, we set additional criteria based on the options provided by the search engine:

- Time: From 1989 to 2022 (inclusive). The search timeline begins in 1989, coinciding with the publication of the seminal work by Friedmann & McMichael (1989), which introduced the concept of 'food regimes'.
- Subject Area: We included 'Social Sciences', 'Agricultural and Biological Sciences', 'Environmental Science', 'Arts and Humanities', 'Economics, Econometrics and Finance', 'Earth and Planetary Sciences', 'Energy', and 'Multidisciplinary'.
- Document Type: We included 'article', 'review', 'book chapter', and 'book'. We excluded 'conference paper', 'note', 'editorial', and 'short survey'.

The selection process was conducted by author Noelia Parajuá. In most instances, the abstracts provided enough information to determine whether the studies met the criteria. If the abstracts were insufficient, the studies were thoroughly reviewed until a decision could be reached about their eligibility.

Table 5. Full list of studies included in the review

STUDIES
1. Broadway, M. J. (2002). The British Slaughtering Industry: A Dying Business? *Geography*, *87*(3), 268–280.
2. Dixon, M. (2014). The land grab, finance capital, and food regime restructuring: the case of Egypt. *Review of African Political Economy*, *41*(140), 232–248. https://doi.org/10.1080/03056244.2013.831342
3. Farina, F. (2017). Japan in the International Food Regimes: Understanding Japanese Food Self-Sufficiency Decline. In A. Niehaus & T. Walravens (Eds.), *Feeding Japan*. Springer Nature. https://doi.org/10.1007/978-3-319-50553-4_14
4. Gaviria, C. (2011) The Post-war International Food Order: The Case of Agriculture in Colombia. *Lecturas de Economía*, (2011), 119–150. Retrieved from https://www.redalyc.org/articulo.oa?id=155222746005Ç
5. Gras, C., & Hernández, V. (2014). Agribusiness and large-scale farming: capitalist globalisation in

Argentine agriculture. *Canadian Journal of Development Studies / Revue Canadienne d'études Du Développement*, *35*(3), 339–357. https://doi.org/10.1080/02255189.2014.933702

6. Green, W. N. (2021). Placing Cambodia's agrarian transition in an emerging Chinese food regime. *The Journal of Peasant Studies*, 1–24. https://doi.org/10.1080/03066150.2021.1923007

7. Greenberg, S. (2015). Agrarian reform and South Africa's agro-food system. *The Journal of Peasant Studies*, *42*(5), 957–979. https://doi.org/10.1080/03066150.2014.993620

8. Heis, A. (2015). The alternative agriculture network Isan and its struggle for food sovereignty – a food regime perspective of agricultural relations of production in Northeast Thailand. *ASEAS – Austrian Journal of South-East Asian Studies*, *8*(1), 67–86. https://doi.org/doi 10.14764/10.ASEAS-2015.1-5

9. Le Heron, R. & Roche, M. (1995). A "fresh" place in food's space. *Area*, *27.1*, 23–33. https://doi.org/https://www.jstor.org/stable/20003502

10. Mukahhal, W., Abebe, G. K., Bahn, R. A., & Martiniello, G. (2022). Historical Construction of Local Food System Transformations in Lebanon: Implications for the Local Food System. *Frontiers in Sustainable Food Systems*, *6*. https://doi.org/10.3389/fsufs.2022.870412

11. Pechlaner, G., & Otero, G. (2010). The Neoliberal Food Regime: Neoregulation and the New Division of Labor in North America. *Rural Sociology*, *75*(2), 179–208. https://doi.org/10.1111/j.1549-0831.2009.00006.x

12. Pietilainen, E. P. & Otero, G. (2019). Power and dispossession in the neoliberal food regime: oil palm expansion in Guatemala. *The Journal of Peasant Studies*, *46*(6), 1142–1166. https://doi.org/10.1080/03066150.2018.1499093

13. Pritchard, W. N. (1998). The Emerging Contours of the Third Food Regime: Evidence from Australian Dairy and Wheat Sectors. *Economic Geography*, *74*(1), 64–74. https://doi.org/10.1111/j.1944-8287.1998.tb00105.x

14. Ríos-Núñez, S. M. & Coq-Huelva, D. (2015). The Transformation of the Spanish Livestock System in the Second and Third Food Regimes. *Journal of Agrarian Change*, *15*(4), 519–540. https://doi.org/10.1111/joac.12088

15. Roche, M. (1995). New Zealand: The Colonial Farm in the Pacific Century. *Pacific Viewpoint*, *36*(2), 115–127. https://doi.org/10.1111/apv.362002

16. Salzmann, P. (2018). A Food Regime's Perspective on Palestine: Neoliberalism and the Question of Land and Food Sovereignty within the Context of Occupation. *Austrian Journal of Development Studies*, *XXXIV*(1–2018), 14–34. https://doi.org/10.20446/JEP-2414-3197-34-1-14

17. Schermer, M. (2015). From '"Food from Nowhere"' to '"Food from Here:"' changing producer–consumer relations in Austria. *Agriculture and Human Values*, *32*, 121–132. https://doi.org/10.1007/s10460-014-9529-z

18. Soldevila Lafon, V., Rosell Foxá, J., & Viladomiu Canela, L. (2015). Repercusiones de los regímenes alimentarios mundiales en la evolución de la seguridad alimentaria el caso de Mauritania. *Revista Española de Estudios Agrosociales y Pesqueros*, *242*, 13–48.

19. Søndergaard, N. (2020). Food regime transformations and structural rebounding: Brazilian state–agribusiness relations. *Territory, Politics, Governance*, 1–20. https://doi.org/10.1080/21622671.2020.1786447

20. Stringer, C. A. (2000). New Zealand's Agro-Food Trade to Korea. *World Development*, *28*(3), 425–442. https://doi.org/10.1016/S0305-750X(99)00141-2

21. Torrado, M. (2016). Food Regime Analysis in a Post-Neoliberal Era: Argentina and the Expansion of Transgenic Soybeans. *Journal of Agrarian Change*, *16*(4), 693–701. https://doi.org/10.1111/joac.12158

22. Weiler, A. M., Sexsmith, K., & Minkoff-Zern, L.-A. (2020). Parallel Precarity: A Comparison of U.S. and Canadian Agricultural Guest Worker Programs. *International Journal of Sociology of Agriculture and Food*, *26*(2), 143–163. https://doi.org/https://doi.org/10.48416/ijsaf.v26i2.57

23. Werner, M. (2019). Placing the state in the contemporary food regime: uneven regulatory development in the Dominican Republic. *The Journal of Peasant Studies*, *48*(1), 137–158. https://doi.org/10.1080/03066150.2019.1638367

24. Winders, B. (2009). The Vanishing Free Market: The Formation and Spread of the British and US Food Regimes. *Journal of Agrarian Change*, *9*(3), 315–344. https://doi.org/10.1111/j.1471-0366.2009.00214.x

Out of the ten studies that were excluded, four did not primarily use food regimes as their approach, even though their authors connected their research to food regimes scholarship (Roche, 2012; Scott, 2022) or aimed to expand the food regime literature by arguing for the inclusion of local scales (Lapegna & Perelmuter, 2020) and the production relation of paid and unpaid work (Camba, 2019). Five of the studies examined a global scenario, focusing on China's role in the reordering of the global food regime (Belesky & Lawrence, 2019; McMichael, 2019; Scott, 2021; Wesz Junior, Escher, & Fares, 2021) or a local scale (McKenna, Roche, & Le Heron, 1998). The remaining study was excluded because it could not be located.

Table 6. Categories and key words used for the re-examination of the studies included in the review

CATEGORY	KEY WORDS
STATE REGULATIONS	state; regulation
DOMINANT FORMS OF CAPITAL	dominant; control; power; elite; class; family; capital
SOCIAL AND FARMER MOVEMENTS	movement; demand; resistance; social
HETEMONIC AND POWERFUL NATIONS AT A GLOBAL LEVEL	United States of America (US); United Kingdom (UK); hegemonic; power
IDEOLOGICAL PARADIGM	ideology; paradigm; neoliberal; free trade; food aid; protectionism; context
HISTORICAL AND POLITICAL CONTEXT	history; historical
PRODCUTION OF AGRO-INDUSTRIAL INPUTS	inputs; fertilizer; chemical; pesticide; seed; machinery; industry
PRIMARY AGRICULTURAL PRODUCTION	production; produce; output; inputs; intensive; extensive; model; integration; fertilizer; chemical; pesticide; seed; machinery; organic; farm; unit; size; labour; labour; worker; farmer; migrant; employee; employment; peasant; income; reproduction; wage; salary

LAND	land; dispossession
FOOD INDUSTRY	industry; factories; process; food product
MARKETS	export; import; domestic; market; trade; wholesale; wholesaling; retailing; retail; supermarket; concentration
AGRI-FOOD CHAIN	integration; merge; chain
PRICES	price
CONSUMPTION AND DIET	diet; basket; consumption; reproduction; cost; price; cheap; purchasing
SELF SUFFICIENCY	self-sufficiency
FINANCES	finance; credit; investment
IMPACTS	impact; environment; farmer

Annex II.b. Quantification of Aspects and Subaspects Addressed in the Studies of the Critical Review

Table 7. Quantification of Aspects and Subaspects Addressed in the Studies of the Critical Review

Quantification of Aspects and Subaspects Addressed in the Studies of the Critical Review

STUDI / ASPECT	Le Heron (1995)	Roche (1995)	Pritchard (1998)	Stringer (2000)	Broadway (2002)	Winders (2009)	Pechlander & Otero (2010)	Gaviria (2011)	Dixon (2014)	Gras & Hernández (2014)	Ríos-Núñez & Coq-Huelva (2015)	Heis (2015)	Soldevila et al. (2015)	Greenberg (2015)	Schermer (2015)	Torrado (2016)	Felice (2017)	Salzmann (2018)	Pietilainen & Otero (2018)	Werner (2019)	Sonderg aards (2020)	Weiler et al. (2020)	Green (2021)	Mukahhal et al. (2022)	TOTAL	TOTAL (%)
State regulations	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**24**	**100%**
International trade		1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	22	92%
Production	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1			1	1		1	1	20	83%
Land						1	1	1	1		1			1				1	1	1				1	10	42%
Labour																					1	1			1	4%
Domestic market & prices			1								1		1			1				1					5	21%
General			1			1	1	1	1		1		1			1					1				8	33%
Social																1				1					2	8%
Banking																									1	4%
Capital powers		1	1	1	1	1		1	1	1		1		1		1	1	1	1	1	1	1	1	1	**19**	**79%**
Corporations		1	1	1	1			1	1	1		1		1		1	1	1	1	1	1	1	1	1	18	75%
Banks & finances		1	1	1					1	1											1			1	7	29%
Local elites		1				1		1	1	1				1				1	1	1	1		1		10	42%
Mobilisation/Movements		1		1		1	1		1		1	1	1	1	1		1	1	1	1	1	1	1	1	**18**	**75%**
Farmers, rural, etc.		1		1		1	1		1		1	1	1	1			1	1	1	1	1		1	1	16	67%
Social				1			1								1					1		1			5	21%
Global hegemonic nation		1				1		1	1		1						1	1	1	1			1	1	**11**	**46%**
Ideological paradigm		1	1			1	1	1		1			1		1	1		1	1	1	1		1	1	**15**	**63%**
Historical & geopolitical context		1						1	1		1		1				1	1	1	1	1		1	1	**12**	**50%**
Production	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**24**	**100%**
Agro-industrial inputs										1				1										1	**3**	**13%**
Output (what)																									0	0%
Model (how & by whom)										1				1										1	3	13%
Primary agricultural production	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	**21**	**88%**
Output (what)			1			1		1	1	1	1		1	1	1	1	1		1	1	1		1	1	16	67%
Farming model (how & by whom)	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	21	88%
Land	1							1	1	1		1		1		1		1	1	1			1	1	**12**	**50%**
Food industry	1	1	1	1	1				1		1	1	1	1					1	1			1	1	**14**	**58%**
Output (what)	1		1		1															1			1		**5**	21%
Model (how & by whom)	1	1	1	1	1						1	1		1						1		1	1	1	**11**	46%

STUDI / ASPECT	Le Heron (1995)	Roche (1995)	Pritchard (1998)	Stringer (2000)	Broadway (2002)	Winders (2009)	Pechlander & Otero (2010)	Gaviria (2011)	Dixon (2014)	Gras & Hernández (2014)	Ríos-Núñez & Coq-Huelva (2015)	Heis (2015)	Soldevila et al. (2015)	Greenberg (2015)	Schermer (2015)	Torrado (2016)	Felice (2017)	Salzmann (2018)	Pietilainen & Otero (2018)	Werner (2019)	Sonderg aards (2020)	Weiler et al. (2020)	Green (2021)	Mukahhal et al. (2022)	TOTAL	TOTAL (%)
Market	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22	92%
Agro-industrial inputs								1	1		1	1								1	1	1	1	1	8	33%
What is traded								1	1		1									1	1		1	1	7	29%
How & by whom								1				1								1	1		1	1	6	25%
Primary agriculture			1	1		1	1	1	1	1	1	1	1		1	1	1		1	1	1	1	1	1	18	75%
What is traded			1	1		1	1	1	1	1	1		1			1	1		1	1	1		1	1	16	67%
How & by whom			1	1		1						1			1	1			1	1	1		1	1	11	46%
Wholesaling				1																				1	2	8%
What is traded																									0	0%
How & by whom				1																		1		1	2	8%
Retailing			1	1	1				1			1		1	1				1			1		1	9	38%
What is traded					1										1				1						3	13%
How & by whom			1	1	1				1			1		1	1				1					1	9	38%
Undifferentiated	1			1	1													1		1		1		1	6	25%
What is traded	1			1														1		1				1	6	25%
How & by whom	1			1																1		1		1	4	17%
Land market									1	1															3	13%
Agri-food chain			1							1	1	1						1			1				6	25%
Prices				1		1	1	1	1	1	1	1	1		1		1	1	1	1	1		1	1	17	71%
Agro-industrial inputs																				1	1	1		1	3	13%
What																				1	1			1	3	13%
Why																				1	1			1	3	13%
Primary agriculture										1	1	1			1				1	1			1	1	9	38%
What										1	1	1			1				1	1	1	1	1	1	9	38%
Why												1			1				1	1	1		1	1	7	29%
Wholesaling																			1			1			0	0%
What																									0	0%
Why																									0	0%
Retailing												1							1					1	3	13%
What												1							1			1		1	3	13%

ASPECT \ STUDI	Le Heron (1995)	Roche (1995)	Pritchard (1998)	Stringer (2000)	Broadway (2002)	Winders (2009)	Pechlander & Otero (2010)	Gaviria (2011)	Dixon (2014)	Gras & Hernández (2014)	Ríos-Núñez & Coq-Huelva (2015)	Heis (2015)	Soldevila et al. (2015)	Greenberg (2015)	Schermer (2015)	Torrado (2016)	Felice (2017)	Salzmann (2018)	Pietilainen & Otero (2018)	Werner (2019)	Sonderg aards (2020)	Weiler et al. (2020)	Green (2021)	Mukahhal et al. (2022)	TOTAL	TOTAL (%)
Why												1							1						1	3	13%
Undifferentiated				1		1	1	1	1		1		1				1	1	1	1					**11**	**46%**
What				1		1	1	1	1		1		1				1	1	1	1					11	46%
Why				1			1				1		1				1	1	1	1					9	38%
Consumption & diet				1	1	1	1	1	1		1	1	1		1		1		1	1			1	1	**15**	**63%**
Consumption & diet				1	1	1	1	1	1		1	1	1		1		1		1	1			1	1	15	63%
Cost of reproduction											1	1	1												3	13%
Self-sufficiency					1		1	1			1		1			1	1		1	1				1	**10**	**42%**
Finances	1	1	1	1	1				1	1				1		1	1			1	1		1	1	**14**	**58%**
Impacts							1	1	1	1	1	1				1		1	1	1	1	1	1	1	**14**	**58%**
Socio-economic							1	1	1	1		1				1		1	1	1		1	1	1	12	50%
Environmental									1		1	1				1	1		1					1	6	25%

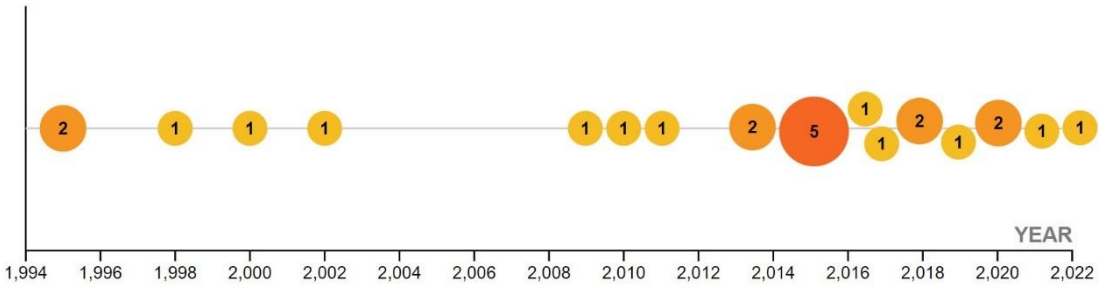
Annex II.c. Results (detailed version)

This annex provides a comprehensive description of the review's findings. Section A delineates the attributes of the scrutinized studies, including the year of publication, the countries under study, the food regimes examined, the primary sources, the terminology employed to define the approach, and the central focus. Section B delves into the aspects of food regimes that were identified in the review. Lastly, Section C mirrors this approach with the connections unearthed by the review.

A. SOME DESCRPTIVE FEATURES

The review shows that the first studies using food regime analysis at a national level were published in 1995 (Le Heron & Roche, 1995; Roche, 1995). In the following years, few studies were published with such characteristics, which then flourished since 2012. In fact, two in three studies reviewed were published in the last decade (see Fig. 15)

Figure 15. Year of publication (number of studies)



Source: Our own, with the dataset explained in the text.

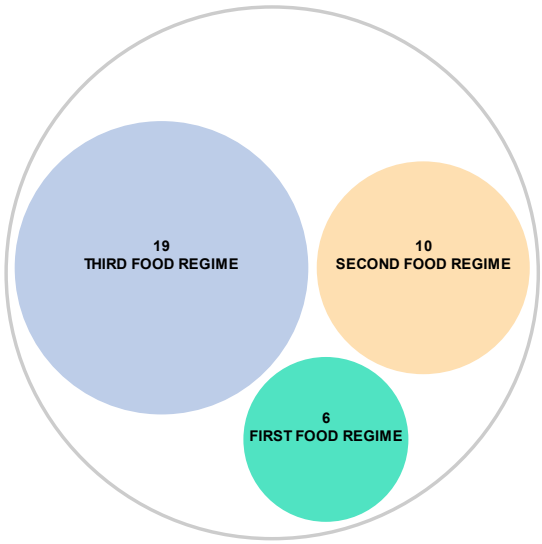
In geographical terms, 21 countries from all over the world are studied (see Fig. 16). America and Oceania are the continents with the highest number of studies, accounting for 38% and 24% respectively. In line with this, the US is the most studied country, with four studies investigating it, followed by New Zealand, which is the subject of three studies.

Figure 16. Countries studied (number of studies by country)

Source: Our own, with the dataset explained in the text.

The period under the 'third food regime' was the one investigated the most by far: 19 studies out of total cover it (Fig. 17). The 'second food regime' and the 'first food regime' are addressed in ten and six studies respectively.

Figure 17. Food regimes studies (by type and by number of studies in which it is addressed)



Source: Our own, with the dataset explained in the text.

In regard to the sources, some studies concisely identify them while others are less precise. Among the former, we find studies based on primary sources, including interviews, surveys, and ethnographic field research (Stringer, 2000; Gras & Hernández, 2014; Heis, 2015; Pietilainen & Otero, 2019; Werner, 2019; Søndergaard, 2020; Green, 2021), which are usually further combined with official statistics, governmental sources, and secondary literature. More specifically, Torrado (2016) uses state planning documents and Weiler et al., (2020) use US and Canadian government websites and employment contracts for guest worker programs, which they combine with a purposive review of the available literature. The remaining studies do not specify their sources, but we can observe the use of secondary literature and official statistics—such as FAOESTAT, national accounts and WTO—to support their arguments.

In addition, we find that there is no homogeneity regarding the terminology used for indicating the approach/methodology followed in the studies. 'Food regime analysis' is the most common, used in eight out of 24 studies. Seven out of the 24 studies refer to 'food regimes perspective' to describe their

'methodology' or 'analysis'. The remaining studies use 'food regimes framework' (one out of 24); 'food regime concept' (three out of 24); 'food regime approach' (two out of 24); just 'food regime(s)' (three out of 24) or a combination of them—'framework of food regime analysis'— (one out of 24).

The review also brings to light that studies reviewed give particular attention to different issues. A number of studies put the focus on a particular industry or sector of the agri-food system: meat industry (Roche, 1995); dairy and wheat sector (Pritchard, 1998); slaughtering industry (Broadway, 2002); livestock system (Ríos-Núñez & Coq-Huelva, 2015); soybean (Torrado, 2016) and oil palm (Pietilainen & Otero, 2019). Others focus on issues related to food security (Soldevila Lafon, Rosell Foxá, & Viladomiu Canela, 2015); self-sufficiency (Farina, 2017); food sovereignty and food production (Gaviria, 2011); and the fight for food sovereignty from a general scope of the agri-food system (Heis, 2015). Land related issues are the main focus in the studies by Salzmann (2018), Greenberg (2015)—addressing the agrarian reform—and Dixon (2009)—linking it to land grabbing, the restructuring of the agri-food system and financialization—. Some others focus on the state, including its role (Werner, 2019); state-agribusiness relations (Søndergaard, 2020); and the interaction between the state and labour, looking at agricultural guest worker programmes (Weiler et al., 2020), or the impact of neoliberal regulatory restructuring on the division of labour in agriculture and food vulnerability (Pechlaner & Otero, 2010). One study particularly emphasizes investment culture (Le Heron & Roche, 1995), another—bilateral—trade relations (Stringer, 2000), and another one consumer-producer relations (Schermer, 2015). Finally, with a more general focus, Winders (2009) studies the foundations of the food regime—in terms of political power—, Green (2021) the Cambodian agrarian transition, and Mukahhal et. al. (2022) the Lebanese food system and agrarian history.

As a concluding remark, the review shows the increasing use of food regimes lens to investigate national scenarios, with most of the studies reviewed being published in the last decade. Additionally, it evidences the wide geographical utility of the approach, being applied in countries all over the world. The fact that the period of study of most of the studies reviewed is the third food regime also points to the relevance of food regimes lens despite the debate over whether a third food regime has already been unfolded or not.

Nevertheless, the review also shows the blurriness around the epistemological nature of food regimes, an issue already raised in the Chapter. Among the studies reviewed, food regimes are considered in many different ways: as an analysis; a concept; a framework an approach; or a mix of the former. Another finding is that the vast majority of the studies reviewed give particular attention to a specific issue within food regimes. Only two of them address agrarian change as a whole.

B. ASPECTS

State regulations

The review shows that all the studies reviewed (24 out of 24) tackle state regulations, thus pointing to the centrality of this aspect. State regulations cover different areas. Regulations on international trade, including trade agreements, tariffs and quotas, subsidies, export supports or the role of institutions such as national producer marketing boards, are addressed in 22 studies; regulations on agricultural production and technology aimed at supporting specific productions or farming models, such as the promotion of Green Revolution technologies or support for small-scale farming, are addressed in 19 studies; regulations related to land, mostly concerning land reform, are addressed in ten studies; regulations related to the domestic market and prices are addressed in

five studies; regulations related to social issues, for example, food based social protection programmes or the promotion of food sovereignty, are addressed in two studies; regulations related to agricultural labour are addressed in one study; regulations related to banking and finance are addressed in one study; and finally, overall state regulations, such as structural adjustment programmes and structural reforms of the whole economy, are addressed in eight studies. It is important to note that state regulations are the main focus of study in the studies by Pechlaner & Otero (2010), Greenberg, (2015), Werner (2019) and Weiler et al. (2020).

Dominant forms of capital

A second aspect identified in the review could be categorized as 'dominant forms of capital'—borrowing Bernstein's (2016) term—, referring to actors other than social and farmer movements that are linked to 'power', 'dominance' and 'control' over the agri-food system. 19 out of the 24 studies reviewed include this aspect. 18 studies tackle corporate dominance, including power exerted by agribusiness, trades, supermarkets, and other related corporate forms. Ten studies tackle dominance by local agrarian elites and capitalist class. For example, Winders (2009) refers to 'agricultural class segments and landowners', Gaviria (2011) to 'elite groups linked with traditional agriculture and urban oligarchic groups and big landlords', Pietilainen & Otero (2019) to 'the powerful agro-industrial family and wealthy ruling class comprised of creole descendants and affluent ladinos', and Green (2021) to 'powerful agrarian capitalists and state elites'. Seven studies tackle banking and financial power, and one study tackles state-capital power—referring to 'Chinese state-capital' (Green, 2021)—.

These four main dominant forms of capital may be intertwined and structured through global-local links. For example, Dixon (2014) explains that "the character of this emergent class of finance capitalists in Egypt illustrates not just

increasingly intimate state–class relations during the last decade or more, but the workings of finance hegemony as elites are connected globally through institutional centers of knowledge production, prestige and so on" (Dixon, 2014, p.239). Similarly, Pietilainen & Otero (2019) refer to "domestic elite-owned oil palm production" (Pietilainen & Otero, 2019, p.3) and explain that "while international elements such as financial institutions and the United States have heavily endorsed Guatemala's oil-palm industry due to its prospects in export markets, it was the large landowners and their alliances with foreign capital who introduced the industry whilst receiving support from state policies and security forces" (Pietilainen & Otero, 2019, p.4).

Paying particular attention to this issue, it stands out the work by Gras & Hernández (2014), in which they investigate agribusiness and large-scale farming in Argentina, showing firm diversity and the "different forms through which they access land and other resources, and the importance of factors other than farm size in their accumulation patterns" (Gras & Hernández, 2014, p.347). Moreover, Gras & Hernández (2014) bring about the fact that these dominant forms of capital eventually may come into conflict between them, showing that "the neoliberal food regime and the 'agronegocio' have also weakened previously consolidated capitalist firms" in the Argentina (Gras & Hernández, 2014, p.354). This feature is also portrayed by Winders (2009), who describes the conflict between landowners and industrial and commercial capitalists, as well as between agricultural class segments in regard to the Repeal of the Corn Laws (Winders, 2009), and by Green (2021) who portrays internal conflicts of the Cambodian Rice Federation.

Social and farmer movements

Resistance movements confronting dominant practices are tackled in 18 out of the 24 studies reviewed. Among them, 16 studies address struggles and

demands by small farmers, peasants, and rural and indigenous communities, and five studies focus on social movements involving health, environment, and social justice concerns. The depth in which these issues are addressed varies. Half of the studies only acknowledge the existence of such movements, while the other half offer deeper insights. The latter is the case with Winders (2009), Pechlaner & Otero (2010), Heis (2015), Greenberg, (2015), Schermer (2015), Salzmann (2018) and Werner (2019). The review also puts forward that, despite the fact that national and/or local movements may be framed within global ones—for example, La Via Campesina—, examining resistance at the country level is essential to understand national trajectories (Pechlaner & Otero, 2010).

Hegemonic and powerful nations at a global scale

11 out of 24 studies look at how global hegemonic and powerful nations influence national paths. Most of these studies are framed in the first and second food regimes, thus considering the dominance of the UK and the US respectively. The number of studies tackling this aspect is lower in the case of studies framed under the third food regime due to the multipolarity that characterizes this period. Despite this, Salzmann (2018) and Pietilainen & Otero (2019) show the critical influence of Washington institutions over Palestine and Guatemala's path, and Green (2021) the determining role of China in the Cambodian case.

Ideological paradigm

15 out of 24 studies take into consideration the ideological paradigm dominating each regime. That is, the free-trade rhetoric in the first food regime, the shared vision of 'food aid'—instead of commodity trade—and 'development' as national industrial growth in the second food regime, and free-market ideology in the third food regime. Søndergaard (2020) gives

particular attention to this and tackles in more detail how neoliberal ideational frameworks were incorporated in Brazil, and particularly within the agribusiness sector.

Historical and geopolitical context

In half of the studies reviewed (12 out of 24), authors highlight the importance of historical and geopolitical events in shaping national trajectories. For example, Gaviria (2011) addresses historical conflicts in Colombia, particularly over land; Dixon (2014) examines the historical frontier-making process in Egypt; Ríos-Núñez & Coq-Huelva (2015) take into consideration the transition from dictatorship to democracy in Spain; Green (2021) offers a short history of Cambodia's agrarian political economy; and Mukahhal et al. (2022) portray historical disputes and war conflicts that occurred in Lebanon and the intervention of the US to restore order and peace.

Production of external agro-industrial inputs

Production of external agro-industrial inputs—fertilizers, pesticides, seeds—is only included in three out of the 24 studies reviewed. In them, authors portray some general features. Gras & Hernández (2014) acknowledge the emergence of agri-food complexes in Argentina, in which input suppliers are a constituent part. However, the authors clarify that they "are not to address fully the relationship between large local agricultural firms and global corporations (which, in Argentina, are mainly located in input supply and export trade)", yet, they "intend to offer a first step by examining large-scale local farming" (Gras & Hernández, 2014, p.341). Greenberg (2015) refers to 'agribusiness expansion' in South Africa and mentions that "South African agribusiness in Africa cover agricultural inputs [Sasol, African Explosive and Chemical Industries (AECI)] and Omnica, not to mention the footprint of Pannar Seed, now owned by Pioneer

Hi-Bred of the US)" (Greenberg, 2015, p.8). In a similar way, Mukahhal et al., (2022) mention for the Lebanese case that "private agricultural input companies have stimulated and maintained the agricultural sector in Lebanon ever since the Civil War" (Mukahhal et al., 2022, p.7). As we will see later, the lack of consideration of production of agro-industrial inputs among the studies reviewed seems to be related to the fact that they are mostly imported in the case studies selected.

Primary agricultural production

21 out of the 24 studies reviewed tackle primary agricultural production, including its output—what is produced—(16 studies) and the farming model—how it is produced— (21 studies). Studies addressing production include figures for national agricultural output (in total or for some specific product or group of products), measured in monetary and physical units (tonnes, harvest area, yield), and in absolutes or relative terms (for example, in relation to Gross Domestic Product [GDP]). However, in some cases only general trends—increases or decreases—are included (Dixon, 2014; Farina, 2017). Particular cases are the works by Greenberg (2015), who provides data on subsistence food production in rural areas, and by Schermer (2015), who acknowledges the increase of organic production in Austria.

The way farming models are addressed significantly varies from study to study. Most of them include changes in technology, mentioning the introduction of the Green Revolution novelties, usually associated with a dependence on external inputs; the character of the farming model—extensive, intensive, export-oriented…—; and data or trends on the number of farms or units of production and their characteristics. Studies by Le Heron & Roche (1995), Schermer (2015) and Heis (2015) give special attention to the move towards more sustainable agriculture and organic production.

In regard to labour, most studies include data on agricultural employment, in absolute or relative terms—in relation to the whole economy, and in comparison to other periods—(Pritchard, 1998; Pechlaner & Otero, 2010; Ríos-Núñez & Coq-Huelva, 2015; Pietilainen & Otero, 2019; Mukahhal et al., 2022). Agricultural wages and income are also included in a few studies, in which general trends are described (Dixon, 2014; Ríos-Núñez & Coq-Huelva, 2015; Salzmann, 2018; Werner, 2019). Only Pietilainen & Otero (2019) include information on wages in the Guatemala's oil-palm firm NaturAceites and provide a rich qualitative description of the working conditions in such firm. Finally, some studies consider migrant labour (Werner, 2019; Weiler et al., 2020).

Land

Land is an aspect of utmost importance for agriculture. Half of the studies reviewed (12 out of 24) tackle this issue, covering land ownership and distribution, including land concentration and leased area (Gaviria, 2011; Gras & Hernández, 2014; Greenberg, 2015; Werner, 2019); land uses (Gaviria, 2011; Gras & Hernández, 2014; Greenberg, 2015; Heis, 2015; Werner, 2019); the right to land (Greenberg, 2015; Werner, 2019); and control of land, understood as 'control-grabbing' (Dixon, 2014; Gras & Hernández, 2014) or related to the concentration of investments (Torrado, 2016). In addition, Torrado (2016) addresses land renting processes in Argentina and the emergence of a "new type of landlord known as 'rentista'" (Torrado, 2016, p.98). Some studies link the aforementioned aspects to 'accumulation by dispossession' and 'land grabbing' (Dixon, 2014; Gras & Hernández, 2014; Salzmann, 2018; Pietilainen & Otero, 2019), and Le Heron & Roche (1995) acknowledge that "land is an internationally saleable commodity (except Maori land)" in the New Zealand case (Le Heron & Roche, 1995, p.27). Finally, it is worth mentioning that land is the main focus of the study by Dixon (2014), in which she investigated "the role

of Egyptian finance capital, and one firm, CitadelCapital, in particular, in appropriating land and other resources in Sudan, South Sudan and other southern neighbours (…) since the 2007–2008 crisis" (Dixon, 2014, p.233)."

Food industry

14 out of the 24 studies reviewed include national food processing or food industry. Similar to primary agricultural production, most of these studies cover food industry output (five studies) and/or its production model (11 studies), while two of the studies only acknowledge the existence or the emergence of food processors (Dixon, 2014; Pietilainen & Otero, 2019) or the absence of them (Soldevila et al., 2015), without providing further details. Studies addressing food industry output include national figures (in total or for some specific product or group of products), measured in monetary and physical units and in absolute or relative terms—for example, in relation to GDP—.

In regard to food industry models, most of the studies broadly describe national food industries by pointing out specific features. For example, Roche (1995) broadly portrays the meat industry in New Zealand, including its restructuring process towards market orientation, the introduction of more flexible work practices, and its integration using the case of Weedel and Co (NZ); Pritchard (1998) mentions the nationally oriented character of New Zealand's dairy processing industry and the fact that it is linked to national raw production, the existence of contract production and branding agreements, and the growth of the feed-grains sector; Heis (2015) mentions that rice milling is the most important industrial activity in Tasothon and describes the case of the Thai agro-industrial multinational enterprise Charoen Pokphang Group; Ríos-Núñez & Coq-Huelva (2015) portray the major role of meat and animal feed firms among Spanish agro-industrial firms, including turnovers of the main five companies; Green (2021) includes an overview of the milling industry in

Cambodia, highlighting the predominance of large-scale firms and their influence on rice producers; and finally, Mukahhal et al., (2022) mentions the monopolistic nature of the sugar beet industry in Lebanon and the "corporate involvement in the food industry" (Mukahhal et al., 2022, p.6).

Only Broadway (2002) and Werner (2019) provide a deeper insight into this issue. The study by Broadway (2002), focused on the slaughter industry in the UK, addresses changes in technology, includes data on the number of slaughters by size—showing increasing concentration—and throughputs, and its geographical localization. Werner (2019) includes information on the production of processed rice by type of producer, differentiating between the private sector, reformed sector collective or individual, and also adds that "school breakfast remains an important source of demand for wheat-based processed products, produced by Dominican agroindustry with imported wheat primarily from the US" (Werner, 2019, p.16)

Markets

22 out of the 24 studies reviewed tackle the agri-food market. To examine the way this aspect is approached in the literature, I differentiate between four main markets: the market for external agro-industrial inputs, the market for primary agricultural products, the wholesale market—including large supermarkets and wholesalers and public hub wholesale markets—, and the retail market—including large supermarkets, retail malls, municipal markets, small retailers, farmers' markets, etc.—.

The review shows that most of the studies reviewed (18) tackle the market for primary agricultural products, including trade figures (16) and the characteristics of the market (11). Studies comprising trade figures mostly provide data on exports and imports, covering all agricultural products or a selection of them,

and accounted for in monetary and/or physical units, in absolute and/or relative terms depending on the case. Some studies also address trade composition, trade partners, trade balance, and export/import dependence (Gaviria, 2011; Soldevila Lafon et al., 2015; Farina, 2017; Pietilainen & Otero, 2019; Werner, 2019; Green, 2021). A specific case is the study by Schermer (2015), in which particular attention is given to the organic market, providing some figures on the share of organic products in regard to total sales.

Studies tackling the characteristics of primary agricultural markets mainly focus on market concentration and organizational aspects. Market concentration is addressed in terms of the number of firms—also differentiation between their national or international nature—and their market share (Pritchard, 1998; Dixon, 2014; Torrado, 2016; Søndergaard, 2020; Mukahhal et al., 2022). Organizational aspects are tackled in various forms. For example, Pritchard (1998) describes the role of national boards and marketing cooperatives in Australia; Stringer (2000) characterizes the Korean import system and investigates the role of national boards and their related joint ventures in Korean-New Zealand agri-food trade; Schermer (2015) addresses the role of food cooperatives and CSAs in the Austrian organic market; Heis (2015) mentions that "organic production has been picked up and heavily co-opted by the corporate sector, mainly for exports for the Global North" in Thailand (Heis, 2015, p.77); and Green (2021) portrays how Cambodian farmers access formal export markets through trade deals organized between China Oil and Foodstuff Corporation, Cambodian Rice Federation members, and national-level officials within the Ministry of Commerce.

Nine out of the 24 studies reviewed tackle the retail market. Only three of the studies include figures: Broadway (2002) reports sales of meat in supermarkets in the UK (in %); Schermer (2015) includes data on the share of organic products

marketed through supermarkets in Austria, and also portrays that "the top retail chain in Tyrol (mPreis) is sourcing 25% of its products from within the region of Tyrol" (Schermer, 2015, p.129); and Pietilainen & Otero (2019) include the share of food sold through supermarkets in Guatemala. Most of the studies addressing the retail market give more attention to its characteristics (nine, including the three former). They mostly acknowledge the emergence and expansion of supermarkets and the market concentration associated with them. Broadway (2002), Schermer (2015), and Pietilainen & Otero (2019) further include data on the number of supermarkets and their market share. Some studies also take into account local and fresh markets: Heis (2015) explains that "In Thailand, fresh markets still provide the major share of fresh fruit and vegetable supply. But the increasing monopolization of the retail market leads to a gradually declining number of independent fresh-market retailers" (Heis, 2015, p.71). Pietilainen & Otero (2019) portray for the case of Guatemala that "Massive Despensa Familiar stores, that is, Walmart's, were located in the hearts of many cities and even smaller towns. Meanwhile, local street markets, previously flourishing, were few and far between" (Pietilainen & Otero, 2019, p.17). Other studies describe specific features of their national retail markets, such as ownership of supermarkets by wealthy local families (Dixon, 2014), processes of merger between supermarkets and local retail stores and integration with family-owned local production (Mukahhal et al., 2022), or the organization of the supply, particularly in regard to purchasing contracts (Broadway, 2002; Greenberg, 2015).

The market of agro-industrial external inputs was included in eight out of the 24 studies reviewed. In them, authors acknowledge the fact that chemicals, seeds, pesticides, fertilizers, and machinery are imported from global markets, but without providing further data details. Only Gaviria (2011) includes some data on imports of fertilizer and chemical inputs in Colombia in tonnes. In regard to

the characteristics of this market, the review shows that studies point to the concentration in the hands of a few transnational corporations and a dependence relation towards them by national producers (Gaviria, 2011; Søndergaard, 2020; Werner, 2019). Green (2021) and Mukahhal et al., (2022) further detail such concentration by including figures on the number of firms and their market share. Heis (2015) describes that "expensive agricultural input is provided to the farmers by large-scale suppliers via a broker and it is often acquired on credit, with no contract, or even specified rates of interest" (Heis, 2015, p.71) in a framework of contract farming, and Mukahhal et al. (2022) that agricultural inputs are "imported through local agricultural inputs companies and sold directly to farmers or agricultural pharmacies" (Mukahhal et al., 2022, p.8).

Only two out of the 24 studies reviewed tackle wholesale markets: Stringer (2000) portrays the functioning of wholesaling markets for the fresh and vegetable sector of New Zealand and Mukahhal et al. (2022) briefly refers to the structure of the fresh produce wholesale market, explaining that "traders dealt with farmers on a consignment basis on a deferred payment basis, paid in the devaluing local currency" and adding that "the fresh produce wholesale market is considered the main contributor to the inefficiency in the horticultural supply chain" (Mukahhal et al., 2022, p.8).

Finally, for six of the studies reviewed tackling agri-food market aspects, it was not possible to fit them into the former market categories. These studies include specific trade figures for certain products—tomato paste (Le Heron & Roche, 1995), dairy (Pritchard, 1998), beef (Stringer, 2000), and meat (Broadway, 2002)—as well as some characteristics of national markets. For example, Salzmann (2018) portrays that "food imports from Israel and Israeli settlements are widespread throughout the Occupied Palestinian Territory. These imports are

problematic, especially during peak harvesting seasons and when their quality is below export standards, as they are channelled into Palestinian markets and this undermines domestic producers, who find themselves unable to compete with such cheaper, and often subsidized, imports from Israel" (Salzmann, 2018, p.19) and Mukahhal (2022) explains that "production capacity potential was gradually replaced with import dependency so that traders would increase profits by selling imported sugar" in Lebanon (Mukahhal et al., 2022, p.5).

Apart from food markets, the review shows that three studies also make references to the land market (see Annex II.b).

Agri-food chain

A phenomenon that is cross-cutting all the activities involved in food production and distribution is their integration within the same firm. This process is included in six of the studies reviewed, yet from different approaches. Gras & Hernández (2014) examine large-scale farming in Argentina, and by doing so, summarize that "farm-scale, vertical and horizontal, national and international, productive, commercial and financial integrations, and risk management strategies have positioned network megafirms as leading actors in Argentina's agriculture" (Gras & Hernández, 2014, p.371). Søndergaard (2020) acknowledges the restructuring of Brazilian agriculture, including vertical integration of the agricultural commodity chain.

Looking at a specific sector, Pritchard (1998) portrays some features of the links between Australian milk production, processing, and regional cooperatives promoted by the government, and between wheat production and consumption for the feed grain sector, including data on the growth of feed grains used by the beef feedlot and dairy cattle sectors. Ríos-Núñez & Coq-Huelva (2015) briefly describe the increasingly vertically integrated model of meat commodity

chains in Spain, led by animal feed corporations and meat agro-industrial companies. In other studies, authors use the experience of a particular firm to exemplify the integration of the agri-food chain. This is the case of Dixon (2014), who portrays the case of Citadel Capital's vertical integration in Egypt, and Heis (2015), who describes vertical integration processes within production activities in Thailand led by transnational corporations using the example of Charoen Pokphang Group.

Prices

The review reveals that 17 out of the 24 studies reviewed consider prices along the agri-food chain. To examine the way they approach this aspect, I differentiate four categories of prices according to the markets' classification used above—prices of external agro-industrial inputs, prices of primary agricultural products, prices in the wholesaling markets, and prices in the retail market or consumer prices—. The main focus is put on the prices of primary agricultural products, addressed in nine out of the 24 studies reviewed. The way they do it is quite general, just mentioning them or pointing to their increase or decrease. For example, Ríos-Núñez & Coq-Huelva (2015) mention the "dramatic rise in cereal prices in the first half of the 1970s" (Ríos-Núñez & Coq-Huelva, 2015, p.532), and Søndergaard (2020) portrays that "as exports resumed, global cotton prices were strongly affected by US support measures, whose cotton producers benefitted from substantially elevated subsidies" (Søndergaard, 2020, p.8). Some studies referred to prices in general, while others refer to a specific product.

Among the nine studies addressing primary agricultural prices, seven of them also point to any reason behind the trends followed by prices, including the entrance into the EU (Schermer, 2015); commodity price inflation (Pietilainen & Otero, 2019); regulations (Werner, 2019; Søndergaard, 2020); exposure to global

competition and trade dependence (Green, 2021); or market power of traders (Mukahhal et al., 2022). Heis (2015) is the only one providing an overview of the mechanism of price setting within Thailand's AAN Isan cooperative.

The prices of external agro-industrial inputs are only tackled by Werner (2019), Søndergaard (2020), and Mukahhal et al. (2022). Similar to the case above, authors just mention their increase or decrease, and briefly point to the drivers behind such trends: regulation freezing prices of inputs (Werner, 2019), reduction of import tariffs (Søndergaard, 2020), and currency depreciation (Mukahhal et al., 2022).

Prices in the retail market are tackled by Heis (2015), Pietilainen & Otero (2019), and Mukahhal et al. (2022), who describe some particular cases. Heis (2015), in her explanation of how prices are set in fresh markets by peasants, explaines that "the prices are chosen to be competitive to those at the other fresh markets" (Heis, 2015, p.81) and "as the low-income population might lose access to fresh foods, which are now generally available at fresh markets for relatively low prices, it might force them to become dependent on cheap convenient foods" (Heis, 2015, p.72). Pietilainen & Otero (2019) describe that "due to the reported commodity price inflation and the rising costs of staples like maize, prices in Walmart seemed considerably higher than at street markets" (Pietilainen & Otero, 2019, p.17), and Mukahhal et al. (2022) report that "20 traders for 80% of citrus products controlled marketing resources, including transportation, storage, and financial resources allowing them to buy products cheaply from producers and sell profitably to consumers" (Mukahhal et al., 2022, p.5).

Finally, 11 out of the 24 studies reviewed refer to prices without specifying the market in which they are set. As in the previous cases, most authors only mention general trends followed by prices and broadly point to the main drivers

behind them. Only Gaviria (2011) includes data on the price of sugar in Colombia ($/Ton), and Soldevila Lafon et al., (2015) provide data on the increase of basic food in the local market in Mauritania's capital.

Consumption and diet

15 out of the 24 studies reviewed tackle food consumption and diet. Studies mostly provide an overview of changes in diet and consumption patterns. For example, Farina (2017) mentions that Japanese "changed from a traditional diet to a westernized one, with an increase in the consumption of meat, wheat, oils, dairy products, and a decrease in the consumption of 'traditional' food, such as rice, that has led to a major consumption of imported food" (Farina, 2017, p.364) and Mukahhal et al., (2022) report the "'wheatification' of diets" and "increased dairy and meat consumption" in Lebanon (Mukahhal et al., 2022, p.6). Some authors further detail changes in consumption adding data. This is the case of Broadway (2002), who includes annual meat consumption per capita (in kg) in the UK, covering five categories; Gaviria (2011), who includes figures of national consumption for ten categories (in g/person/day) in Colombia; Soldevila Lafon et al. (2015), who includes data on national consumption for ten categories (t) per year in Mauritania; and Ríos-Núñez & Coq-Huelva (2015), who includes domestic consumption of meat (kg per capita per year) in Spain.

In regard to food expenditure, only three studies tackle this aspect: Soldevila Lafon et al., (2015) include food expenditure (% of total expenditure) in rural and urban areas in 2008 in Mauritania; Ríos-Núñez & Coq-Huelva (2015) explain that "the ratio of food expenses in household budgets continued to fall, from 29% in 1985 to 22% in 2005" (Ríos-Núñez & Coq-Huelva, 2015, p528), further adding that "although meat consumption per person tripled, the share of meat products in household budgets remained at approximately 10%" (Ríos-Núñez & Coq-Huelva, 2015, p.531) and explaining that the objective of Spanish industrial

livestock was to provide cheap animal calories; and Heis (2015) broadly portrays the changing situation of retail in Thailand and the impact in consumers, unable to access fresh markets and becoming dependent on cheap convenience foods[14]. Apart from that, other authors include other specific information. For example, Schermer (2015) addresses changing producer-consumer relations in Austria, particularly in regard with food cooperatives and CSA and the preference for organic and local food; Werner (2019) mentions that school food programs had an important use of domestic food production in the Dominican Republic (Werner, 2019, p.7); and Green (2021) reports some figures of self-consumption of rice in Cambodia.

Self sufficiency

Ten out of 24 of the reviewed studies take into consideration self-sufficiency—i.e. the capacity of a country to produce enough food to meet its domestic consumption—. Self-sufficiency is measured as the difference between production and consumption [production – (consumption + exports)]; using the ratio imports/total supply or the import dependency ratio (IDR), calculated as [imports/(production + imports – exports) *100]. In some studies, all food products are accounted, while in others only a product or a group of them. The include meat—differentiating by type of meat—(Broadway, 2002); maize, wheat,

[14] More specifically, Heis (2015, p.72) states that "This changing retail situation in Thailand and the expensive pricing of those products may negatively influence consumer food choices and subsequently their options for healthy diets. As the low-income population might lose access to fresh foods, which are now generally available at fresh markets for relatively low prices, it might force them to become dependent on cheap convenient foods with high energy density and low nutrient value (Banwell et al., 2013, p. 609). This development already implies certain inequality in food supply according to customers' purchasing power in Thailand and will further lead to a growing number of people suffering from malnutrition, especially among the low-income populace".

beans, rice (Pechlaner & Otero, 2010); beans, maize, rice, wheat (Gaviria, 2011); cereals and meat (Ríos-Núñez & Coq-Huelva, 2015); cereals (Pietilainen & Otero, 2019); and broiler chicken (Werner, 2019). Self-sufficiency is linked with food insecurity (Dixon, 2014; Soldevila Lafon et al., 2015; Pietilainen & Otero, 2019; Mukahhal et al., 2022) and food vulnerability (Pechlaner & Otero 2010).

Finances

The review puts forward that 14 of the 24 studies reviewed consider the role of finance in the food system. Most of the studies broadly describe foreign investment in different areas: agricultural production (Gras & Hernández, 2014; Torrado, 2016; Werner, 2019; Green, 2021; Mukahhal et al., 2022); food processing (Le Heron & Roche, 1995; Roche, 1995; Broadway, 2002); supermarkets (Mukahhal et al., 2022); along the agri-food chain (Pritchard, 1998; Stringer, 2000; Dixon, 2014; Gras & Hernández, 2014; Greenberg, 2015); land (Dixon, 2014; Gras & Hernández, 2014); or the stock market (Roche, 1995). In addition, Le Heron & Roche (1995) put particular attention to the emerging 'investment culture in New Zealand, taking into account the move towards 'globalisation' and 'sustainability' dimensions (Le Heron & Roche, 1995, p.28).

The other way around, Farina (2017) addresses the Japanese investments in other regions, explaing that "Japan's transnational corporations became the new protagonists of this change and the examples of investments in the agricultural sectors all over the world are innumerable" (Farina, 2017, p. 377) supported by Japanese Government in order to secure food supply in Japan. Other issues addressed are credit in small farming (Werner, 2019; Green, 2021; Mukahhal et al., 2022); contract farming (Søndergaard, 2020); equity financing (Pritchard, 1998; Dixon, 2014); and the introduction of "an array of complex instruments (i.e. derivatives such as swaps, forwards, futures, options)" (Gras & Hernández,

2014, p.350). This latter issue is addressed in more detail by Søndergaard (2020), who investigates the financialization of agriculture in Brazil (Søndergaard, 2020).

Impacts

14 out of the 24 studies reviewed include social and environmental impacts resulting from the food system functioning under each food regime. 12 studies report negative impacts on small and family farmers, peasants or indigenous communities (Gras & Hernández, 2014; Green, 2021; Heis, 2015; Mukahhal et al., 2022). Among them, dispossession (Dixon, 2014; Gras & Hernández, 2014; Salzmann, 2018; Pietilainen & Otero, 2019) and displacement (Gaviria, 2011; Torrado, 2016) stand out, as well as the associated consequences of these processes, such as the lack of access to land, water and food, and ultimately the detriment of food sovereignty (Gaviria, 2011; Pietilainen & Otero, 2019). Werner (2019) includes an overview of the impacts of government programmes on farmers and the whole population, and Weiler et al. (2020) address the outcomes of agricultural guestworker programs for migrants, in terms of work recruitment, wages, deductions, and benefits, access to healthcare and worker's compensation, enforcement of employment and housing standards, security of immigration status and gender-specific concerns.

Six studies tackle environmental impacts. Some authors only acknowledge them (Heis, 2015; Mukahhal et al., 2022) while others provide further detail: Dixon (2014) report widespread contamination of soil, water and crops in Egypt; Ríos-Núñez & Coq-Huelva (2015) include the breaking of "some of the traditional ecological equilibria of traditional agriculture, dramatically enlarging the 'metabolic rift' of Spanish agriculture" (Ríos-Núñez & Coq-Huelva, 2015, p.525); Torrado (2016) reports deforestation, pollution of water bodies and soil due to high use of pesticides and chemicals, and health concerns and illness in communities living in close proximity to plantation sites in Argentina; and

Pietilainen & Otero (2019) include water scarcity and contamination in Guatemala.

CONNECTIONS

1. State regulations result from contestation and influence from dominant forms of capital, social & farmer movements and global hegemonic-powerful nations

There is significant consensus among the studies reviewed that state regulations are the result of influences and contestation from and between dominant forms of capital and social and farmers movements, intersecting the influence of the global hegemonic-powerful nations (Winders, 2009; Pechlaner & Otero, 2010; Greenberg, 2015; Heis, 2015; Schermer, 2015; Torrado, 2016; Werner, 2019; Weiler et al., 2020; Søndergaard, 2020; Green, 2021). This connection is visibly exemplified by Werner (2019), who argues that "the three modalities of agriculture and food regulation that I have outlined in the Dominican Republic's contemporary, 'late' neoliberal era reflect the outcome of intra-state and state-civil society relations. These relations mediate the market-liberalizing agenda advanced by Washington and US agri-business. They also interact with extra-national initiatives to support new-generation social policies, along with new social movements such as the demand for public investment in education, which has led to a massive expansion in the provision of meals to school children" (Werner, 2019, p.17).

Another example is Green (2021), who states that "national market regulation varies based on competing priorities of intra-state actors involved with agro-food production and trade (Pritchard et al. 2016). How export markets benefit domestic agrarian capital over farmer livelihoods is shaped by intersectional terrains of struggle mediated by the state (Jakobsen 2018)" (Green, 2021, p.2). In addition, Pechlaner & Otero (2010) highlight the centrality of the nation-state as

the main sphere of struggle, yet recognizing the importance of international solidarity. They argue that "looking within nation–states will thus allow for studying how and whether their internal sociopolitical dynamics may become independent factors that could alter dominant trends in the world economy from the bottom up" (Pechlaner & Otero, 2010, p.204).

2. State regulations are a central element framing food production, consumption and trade

The review also shows that many studies consider the state as the "cornerstone" of the functioning of the food system at a national level given that it sets the stage on which dominant forms of capital, social and farmer movements and global hegemonic-powerful nations exert their powers. While in some of the studies this idea is not set forward in an explicit way, it is underlined by the importance given to state regulations. On the contrary, some authors clearly address this connection (Winders, 2009; Pechlaner & Otero, 2010; Gras & Hernández, 2014; Ríos-Núñez & Coq-Huelva, 2015; Torrado, 2016; Pietilainen & Otero, 2019). For example, Winders (2009) argues that "in each food regime, particular political conflicts produced a national policy tending towards state intervention or market mechanisms that came to frame the production, consumption and trade of agricultural commodities throughout the world economy" (Winders, 2009, p.341). Similarly, Torrado (2016) states that "not only is the state an important actor in the establishment of neoliberal food regimes, but it also creates the conditions for a corporate-agrarian governance that is centred in biotechnology" (Torrado, 2016, p.698).

Pietilainen & Otero (2019) emphasize the role of the state in regard to land, showing that "land-control grabs have grown alongside the cultivation of flex crops, and the Guatemalan state has played a key role in facilitating those that serve the elite-owned agriexport industries" (Pietilainen & Otero, 2019, p.9) by

"providing neoregulation: suitable policy conditions for investments adjusted laws or institutions to foster dispossessions, or abolished barriers for capital accumulation" (Pietilainen & Otero, 2019, p.11). The review also brings about that state regulations, dominant forms of capital, social and farmer movements and hegemonic and powerful nations at a global level are linked to governance or governances of the food system (Le Heron & Roche, 1995; Stringer, 2000; Pechlaner & Otero, 2010; Gras & Hernández, 2014; Greenberg, 2015; Ríos-Núñez & Coq-Huelva, 2015; Schermer, 2015; Torrado, 2016; Werner, 2019; Søndergaard, 2020).

3. Dominant forms of capital exert power on the agri-food system (including their mechanism)

The review suggests at least two main mechanisms through which dominant forms of capital exert its dominance on the agri-food system: market concentration, which ultimately depends on integration processes, and financial investments. The idea that integration—both vertical and horizontal—led to market concentration, and that this is a way of corporate power over the agri-food system is clearly seen in Pritchard (1998), who states that "economic power has shifted to the highly concentrated retailing sector, which through the promotion of retailer brand labels and generics is exerting intense control over food processors' margins" (Pritchard, 1998, p.67); in Broadway (2002), who portrays that the power of supermarkets "to influence their suppliers has been strengthened by the presence of just five companies with over 60% of the grocery market, and they have used this power to dictate the way food is bought, sold and eaten" (Broadway, 2002, p.272); in Gras & Hernández (2014), who mention the "dominance" exerted by mega-firms in agricultural production in Argentina due to their increasing expansion and thus to their ability to "establish the conditions under which their partners operate" (Gras & Hernández, 2014, p.350); in Torrado (2016), who argues that the reduction of

the number of farms in Argentina resulted in the control of the industry by a only a small number, linking concentration to land with control (Torrado, 2016, p.699); and in Mukahhal et al. (2022), who portrays that concentration in agricultural trade in Lebanon, thus controlling "marketing resources, including transportation, storage, and financial resources allowing them to buy products cheaply from producers and sell profitably to consumers" (Mukahhal et al., 2022, p.5).

The role of financial investments as a vector of power is seen in Dixon (2014), who argues that processes of financialization in Egypt had "both anticipated and precipitated the deepening of corporate control over domestic food economies", particularly linking it to land grab (Dixon, 2014, p.233); by Gras & Hernández (2014), who argue that "the importance of finance in agricultural production has grown and become integral in shaping new productive patterns" in Argentina, further specifying that "different options in local and international futures markets, as well as investment funds directly financing farmers, have rendered financial capital a considerable power of control over agricultural production, reshaping the organisation of business among farms" (Gras & Hernández, 2014, p.354); by Torrado (2016), who links investment in land to control over such land; by Green (2021), who explains that Chinese sovereign wealth funds had increased their control over agro-food production, processing, and distribution industries (Green, 2021, p.4); and by Mukahhal et al. (2022), who argues that the Lebanese food system shift "had been facilitated by increased foreign direct investments, leading to the assimilation of settlers' cultures within the local context" (Mukahhal et al., 2022, p.6). Additionally, Søndergaard (2020) links both phenomena, and states that in Brazil processes of financialization "exacerbated the concentration and verticalization of Brazilian agriculture and reoriented productive activities towards global markets (Søndergaard, 2020, p.8).

4. Social and environmental impacts result from the agri-food system functioning

The review also puts forward that the social and environmental impacts (shown in section B) are linked to the functioning of the food system under each food regime.

5. Social and environmental impacts produce social and environmental movements

Finally, the review shows that such impacts are linked to social and farmer movements, creating resistances and struggles to change them. Schermer (2015) explicitly mentions the "transformative power of social movements over the entire third food regime" (Schermer, 2015, p.130), and explains how the negative consequences of agricultural modernization for the farm structure in Austria led to the change of producer-consumer relation, looking at the different waves of social movements concerned with food provision and consumption, their embedding in national policies of agriculture and food, corresponding to the re-structuring of global food governance and the extent to which alternatives have penetrated the mainstream system and the mechanisms of integration and appropriation (Schermer, 2015). Other examples can be found in Dixon (2014), who explains how counter-agrarian reforms in Egypt precipitated "intense social struggles over the land, as agrarian reform beneficiaries defend their land and livelihoods against a violent land grab" (Dixon, 2014, p.237); and in Salzmann (2018), who states that "the ever more obvious malfunctions of the food regime will further spur resistance movements. People—both in the Global South as well as in the Global North—reclaim their voices within the neoliberal food regime, and live resistance in their everyday practices and struggles" (Salzmann, 2018, p.29).

CHAPTER III. Towards a crisis of reproduction? An empirical exploration on smallholder agriculture and food expenditure in Spain (1980-2021)[15]

[15] In this chapter, I collaborated with Prof. David Soto from the University of Santiago de Compostela to construct the series of macro-economic data of agriculture, the Index of Prices Paid by farmers (IPP), the Index of Prices Received by farmers (IPR), and Annual Working Units (AWU). Prof. Soto shared with me the series for 1960-2017.

3.1. Introduction

The research path followed in this PhD Thesis led me from the empirical study of the transformations of the Spanish agri-food system throughout supply producers to end uses in Chapter I, towards a critical literature review and a research framework proposal to investigate national food systems based on the approaches of food regimes, social metabolism, and surplus/reproduction in Chapter II. This research framework opened such a wide research avenue that, after the long tasks entailed by the two previous Chapters, it became impossible a thorough application to the Spanish case in Chapter III within the time and resources still available before the end of the PhD Thesis. Relying on the research framework of Chapter II, in this Chapter I carry out an initial, tentative exploration on the trends experienced from 1980 to 2021 of the Spanish food system focused on just two aspects: on the one hand, the evolution of smallholder agriculture, and on the other hand, the evolution of food expenditure in household expenditure. These two aspects are fundamental in

the reproduction of the food system, and thus of the capitalist system, which relies on the former. This way, this Chapter continues the work of Chapter I, which focused on the production sphere, by addressing the sphere of reproduction.

Why smallholder agriculture and food expenditure are important aspects in terms of reproduction? Smallholder agriculture is part of the dimension 'agri-food chain' of the research framework of Chapter II, and more specifically, of the element 'primary agricultural production'. Smallholder agriculture—also known as 'family farming'—is characterized by agricultural holdings which are managed and operated by households and where farm labour is largely supplied by those households (Davidova & Kenneth, 2014; HLPE, 2013). In other words, in a family farm, "the family and the farm are linked, co-evolve and combine economic, environmental, social and cultural functions" (FAO, 2014, p.1). Most of small farms are family farms (Gloria Isabel Guzmán et al., 2022), however the 'size' at which they are considered small or not varies across regions (HLPE, 2013).

Small family farms, being part of agroecosystems, develop a fundamental role in the provision of agroecosystem services. Agroecosystem services encompass all the ecosystem and socioeconomic services provided by agroecosystems, which, owing precisely to their dual—social and natural—nature, are highly interconnected (Guzmán et al., 2022). Agroecosystem services are usually classified into four groups: (i) provisioning services—production of food, fuel, fibre—; (ii) regulating services—climate and water quality regulation, flood and disease control, waste decomposition—; (iii) supporting services—processes necessary for soil formation, nutrient cycling, and photosynthesis for example—; and (iv) cultural services—recreational, aesthetic, spiritual, agricultural landscapes, etc.—.

Small family farms are better than big farms in the provision of agroecosystem services because their multifunctional landscapes (O'Farrell & Anderson, 2010) present a higher diversity of birds, pollinators—butterflies, bees, bumblebees, wasps, flies, etc.—and herbaceous plants than large monocultural farms (Altieri et al., 2012; Belfrage et al., 2005; Ricciardi et al., 2021); they are more productive—if total output is considered rather than yield from a single crop (Wilbois & Schmidt, 2019)—and more energy efficient; and present a better water management and conservation and healthier soils (Altieri & Nicholls, 2012; Duru et al., 2015; Ricciardi et al., 2021). Small family farms also keep and transmit accumulated knowledge and experience in the management and use of agrobiodiversity and soil–water resources across generations, being a place of 'cultural heritage' (Altieri et al., 2012; van der Ploeg et al., 2012) which is essential for performing all the beneficial services mentioned above. For all these reasons, small family farms build agroecosystems that exhibit resiliency and robustness to cope with disturbance and change—human and environmental—minimizing risk in the midst of variability, and create more diversified agricultural systems that contribute to local and national food and livelihood security (Altieri et al., 2012; Davidova & Kenneth, 2014; Ortiz-Miranda et al., 2022). Thus, small family farms are considered a 'fund element' from a socio-metabolic perspective (González de Molina et al., 2020b), the reproduction of which is essential to guarantee a better provision of agroecosystem services, including food.

The second aspect of food systems I address in this Chapter is food expenditure. This aspect connects the element 'food consumption' of 'agri-food chain' dimension of the research framework of Chapter II with the element 'social reproduction of the labouring population' of the dimension 'social/reproduction' of the capitalist system. As I explained in section 2.2.2. of Chapter II, food is one of the primary costs for the reproduction of the labouring

population (Araghi, 2003; Moore, 2012; Tilzey, 2019). By looking at the food expenditure, I aim to explore how this cost has evolved over time. It is important to clarify that farmers are also part—yet small—of the labouring population. Thus, farmers have a two-fold role; they are involved in the reproduction of agroecosystems, and also in the reproduction of the labouring population. I will take this into consideration when addressing food expenditures.

In a nutshell, the aim of this Chapter is to explore the evolution of smallholder agriculture—which are critical in the reproduction of agroecosystems—and the evolution of food expenditure in family budgets—which is critical in the household reproduction of the labouring population—in Spain between 1980 and 2021.

To this end, I examine the number of farms in Spain and their characteristics—size, legal form, nature of labour and age of farm holder—, as well economic aspects of Spanish agrarian activity—agrarian income, production, intermediate inputs, amortizations, taxes, subsides, Index of Prices Received by farmers, Index of Prices Paid by farmers, and monthly net monetary income of agrarian households—between 1980 and 2021. I consider these economic aspects help to better understand the path followed my farms, since monetary flows are information that influences farmers' decisions (Gloria Isabel Guzmán et al., 2022). On the other hand, I examine the distribution of expenditure of Spanish households, focusing particularly on the evolution of food expenditure and its differences depending on the occupations of the household main breadwinner.

My study is based on data and microdata from Spanish Agrarian Census (1982, 1989, 1999, 2009, 2020) and the Spanish Household Budget Surveys (HBSs) (1980-1981, 1985-1997, 1998-2005, 2006-2021) from the Spanish National Statistics Institute (*Instituto Nacional de Estadística*, INE), as well as from the Agrarian Yearbooks from the Spanish Ministry of Agriculture, Fishing and Food

(*Ministerio de Agricultura, Pesca y Alimentación*, MAPA). I make use of descriptive statistics, specifically by creating series from 1980 to 2021 based on these data sources.

The evolution of small agricultural holdings in Spain was studied by González de Molina et al. (2020a) between 1900 and 2008; by Arnalte Alegre (2002, 2006) and López-Iglesias (2006) between the 1960s and 1990s and by Etxezarreta, Cruz, García Morilla, & Viladomiú (1995) between 1986 and 1992 linked to the structural adjustment process of agriculture; and by Guzmán et al., (2022) between 1992 and 2017 focusing particularly on the role of small family farms in the provision of agroecosystem services. More broadly, the study of Spanish agriculture was carried out by González de Molina et al., (2020) between 1900 and 2008 from a socio-metabolism approach and by Etxezarreta (ed) (2006) between the mid-1970s and the beginning of the 21st century combining and economic and political economy approach. Food expenditure of Spanish households was studied from an historical perspective linked to food systems transformations by Langreo & Germán (2018) between 1900 and 2000, and also by González de Molina et al. (2020a) between 1900 and 2008. It was also addressed from a sociological approach by Díaz-Méndez & García-Espejo (2012) between 2001 and 2008 and by Brändle Señán (2010) between 1964 and 2005. This chapter contributes to the former literature by providing new data, in terms of variables included and in terms of years covered. Additionally, it frames these data in a more comprehensive, reproductive approach of food systems.

The structure of this Chapter is as follows: after this introductory section, section 3.2. provides a detailed explanation of the data and methods used. Results are presented in section 3.3. and discussed in section 3.4. Finally, I conclude with some remarks in section 3.5.

3.2. Data and methods

In this section, I briefly describe the main sources used in this chapter, which are the Agrarian Census and Household Budget Surveys from the INE, and the Agrarian Statistics from the MAPA. Additionally, I explain the methods followed to create the series based on these sources.

3.2.1. Agrarian Census

The Agrarian Census is a large-scale statistical operation. It is conducted every ten years with the aim of assessing the state of Spanish agriculture, including a directory of agricultural holdings. The Agrarian Census also serves as basis for the formulation and implementation of agricultural policies, particularly the Common Agricultural Policy (CAP) (INE, n.d.).

The Agrarian Census was an international initiative promoted by the International Institute of Agriculture (IIA) in the 1924. The first Agrarian Census was conducted for the year 1930. Yet, Spain did not join the initiative until the 1960s, when the first Spanish Agrarian Census was produced for the year 1962. This Census was followed by the Agrarian Census 1972 and 1982. When Spain joined the European Community (CE) in 1986, the country also joined the community programme of surveys on the structure of agricultural operations. A main requirement of this program was that Agrarian Census must be produced for years that end in 0 or 9. According to it, the following Agrarian Census was released for years 1989, 1999, 2009 and 2020 (INE, 2022). In this chapter, I use data and microdata from the Agrarian Census 1982, 1989, 1999, 2009 and 2020.

The Agrarian Census experienced significant methodological changes over this time (INE, 1999, 2009, 2022; Ruiz-Maya, 1992). A major modification involves the definitions of Utilized Agricultural Area (UAA), agricultural holding (or farm), and the criteria for the population scope, which is affected by changes in the former

definitions. In Table 12 of Annex III.a, I summarize this information for the Agrarian Censuses of 1982, 1989, 1999, 2009, and 2020. One of the major differences is that the Agrarian Censuses of 1982, 1989, and 1999 consider farms with more than 0,1 hectare of land and farms with less than 0.1 hectare of land but with livestock. However, some differences regarding the exclusion of wasteland and scrubland in the UAA of the Agrarian Census 1982 made these three Censuses not perfectly comparable (Ruiz-Maya, 1992). The divergence between these three censuses and the Agrarian Censuses of 2009 and 2020 is much more significant. The criteria set for the population scope in the Agrarian Census of 2009 are wider (see Table 12 in Annex III.a), and even more so in the case of the Agrarian Census of 2020, with the inclusion of farms that have at least 0.1 hectares UAA of vineyards and 0.3 hectares UAA of olive trees (see Table 12 in Annex III.a).

The Agrarian Census of 2020 deserves particular attention. Despite offering information for new categories, data regarding aspects covered in the Agrarian Censuses of 1982, 1989, 1999 and 2009 are reduced or even removed. This is the case of data on the legal form or farms, which are only disaggregated into two categories: natural person and legal entity, which now encapsulates commercial companies, public entities, cooperatives, civil societies, and other legal status (INE, 2022, p.14). Additionally, the classification o farms into 'farms with land' and 'farms without land', which is no longer offered (INE, 2022).

As a result, data from the mentioned Agrarian Censuses are not perfectly comparable. Despite of these, data do show some trends over the period of study of this chapter (1980-2020). I use data from the Agrarian Census in this manner, that is, as an indicator of a trend over time.

Having in mind this aspect, I used data and microdata from the Agrarian Censuses 1982, 1989, 1999, 2009 and 2020 to create series on the number of

farms depending on their size (in UAA), number of farms depending on their legal form, number of farms depending on the age of farm holder, and number of Annual Working Units (AWU) depending on their character (family based or salaried based). AWU is the full-time equivalent employment, i.e., the total hours worked divided by the average annual hours worked in full-time jobs in the country. One annual work unit corresponds to the work performed by one person who is occupied on an agricultural holding on a full-time basis (INE, 2009).

3.2.2. Agrarian Statistical Yearbooks

The Agrarian Statistical Yearbooks—or *Anuarios de Estadística Agraria* or *Anuarios Estadísticos* in Spanish— have been published by the Spanish Ministry of Agriculture, Fishing and Food (MAPA) since 1972—before this, statistical yearbooks were published covering different topics individually—. They include numerous statistics on Spanish agriculture, stockbreeding, forestry and fishing on a yearly basis (MAPA, n.d.). In this chapter I use statistics on the so-called "macromagnitudes agrarias"—macro-economic data of agriculture, stockbreeding, and forestry—which include production, intermediate inputs, amortizations, subsides and taxes, agrarian income, and its components—employee remuneration, net operating surplus, and entrepreneurial income—. I also use data on the Index of Prices Received by farmers (IPR) and the Index of Prices Paid by farmers (IPP), as well as on Annual Working Units (AWU).

The agrarian income is the result of subtracting intermediate consumption from production—whose result is gross value added—, minus depreciation, plus subsides, minus taxes. Agrarian income is also the sum of employee remuneration and net operating surplus. Entrepreneurial income is calculated by subtracting rents, interests, and indirect taxes from the net operating surplus (MAPA, n.d.).

Since 2002, the Agrarian Statistical Yearbooks have only considered agriculture and stockbreeding data on the "macromagnitudes agrarias". Following the work by Prof. Soto [a detailed explanation of the methods used can be found in González de Molina et al., (2020b)], I adjusted the series including forestry. The income of forestry and its components was estimated by calculating its weight for the period 2007-2017, which resulted in an average of 3.6%. The same method was used to adjust the series on production and intermediate consumption.

The series were calculated in current monetary units, and adjusted to constant euros of 2000 using the Consumer Price Index (CPI) published by the Bank of Spain (Banco de España, 2021). The series on intermediate consumption and production were adjusted using the Index of Prices Paid by farmers (IPP) and the Index of Prices Received by farmers (IPR) respectively. I also calculated the ratio between the Index of Prices Received by farmers (IPR) and the Index of Prices Paid by farmers (IPP) adjusting their base to the year 1980. This ratio informs us on the terms of trade between the products sold by farmers and the inputs they buy for carrying out their production along the period of study.

Furthermore, I created series on active population[16] and employed population[17] in agriculture, stockbreeding and forestry based on data from the Labour Force

[16] 'Active population' (also 'economically active population', 'labour force' or 'workforce') includes both employed (employees and self-employed) and unemployed people, but not the economically inactive, such as pre-school children, school children, students and pensioners (Eurostat, n.d.).

[17] 'Employed population' refers to people aged 15 to 89 (in completed years at the end of the reference week) who, during the reference week, were in one of the following categories: a) people who during the reference week worked for at least 1 hour for pay or profit, including contributing family workers; b) people with a job or business who were temporarily not at work during the reference week but had an attachment to their job, where the following groups have a job attachment: persons not at work due to holidays, working time arrangements, sick leave, maternity or paternity leave; persons in job-related training; persons on parental leave, either receiving and/or being entitled to job-related income or benefits, or whose parental leave is expected to be 3 months or less; seasonal workers during the off-season, where they continue to regularly perform tasks and duties for the job or business, excluding fulfilment of legal or administrative obligations; persons temporarily not at work for other reasons where the expected duration of the absence is 3 months or less; and c) people that produce agricultural goods whose main part is

Survey (LFS, *Encuesta de Población Activa* in Spanish). For the period 2008-2020, I used disaggregated data on agriculture, stockbreeding and forestry published by the LFS. However, for the period 1980-2007 the LFS did not published disaggregated data on agriculture, stockbreeding, forestry, and fishing. Therefore, I estimated the active and employed population in agriculture, stockbreeding, and forestry by subtracting the weight of active and employed population in fishing from the total population made up of agricultural, stockbreeding, forestry, and fishing. This weight was calculated as the average percentage of active and employed population in fishing relative to total active and employed population in agriculture, stockbreeding, forestry, and fishing between 2008 and 2020. Based on this, I calculated the agrarian income per employed person in constant euros adjusted to the year 2000 for 1980-2020.

I also constructed series of AWU between 1982 and 2020, using data from the Agrarian Census of 1982 and 1989 and data from the Agrarian Statistical Yearbooks for 2018, 2019 and 2020. Based on this series, I calculated the remuneration of employees per AWU of employee work for the period 1982-2020. Additionally, I calculated the entrepreneurial income per farm for the years 1982, 1989, 1999, 2009 and 2020 by combining data on agrarian income form the Agrarian Statistical Yearbooks and data on the number of farms from the Agrarian Censuses.

3.2.3. Household Budget Surveys

The Household Budget Survey (HBS) mainly offers information about households' expenditures on good and services, as well as many other socioeconomic characteristics of households (INE, n.d.-b). The first HBSs was conducted in Spain by the INE in 1958. This HBSs was of structural character,

intended for sale or barter. This definition follows guidelines of the International Labour Organization (ILO). (Eurostat, n.d.).

and was followed by the HBS of 1964-65, 1973-74, 1980-81 y 1990-91 (of structural character, too). In addition, the INE conducted HBSs of short-term nature from the second quarter of 1977 to the fourth quarter 1983, and from the first quarter of 1985 to the second quarter of 1997 [Household Budget Continuous Survey (HBCS) 85]. Since then, a single survey was conducted: the Household Budget Continuous Survey 97 (HBCS 97) from the third quarter of 1998 to 2005, and the Household Budget Survey 2006 (HBS 2006) from 2006 to 2021 (INE, n.d.-b). Over this period, the HBSs expanded, including more households, and more categories and aspects (INE, n.d.-b, n.d.-a, 1983, 1993).

In this chapter, I used data and microdata from the HBSs 1980-81 and 1990-91, the HBCS 85, the HBCS 97 and the HBS 2006 on annual basis. Despite the HBCS 85 being of a quarterly nature, annual results were published in the INE Yearbooks ('Anuarios'). However, microdata is only available on a quarterly basis. Thus, I only used he annual data from the INE Yearbooks. The HBCS 85 is also of quarterly nature; however, the INE published annual data and microdata. Based on these sources, I created series for the period 1980-2020 for the following: average monthly net monetary income of households by occupation of main household breadwinner; average monthly total expenditure of households; average distribution of household expenditure by main categories of expenditure, including the twelve main groups of classifications; and average share of household expenditure on food and non-alcoholic beverages in relation to total expenditures by occupation of household main breadwinner.

I explain in detail the methods that I used to calculate the average monthly net monetary income of households from the microdata in Table 13 of Annex III.a. Additionally, I deflated the series on the average monthly net income of households by occupation of main household breadwinner and the series on

the average monthly total expenditure of households using the CPI (Banco de España, 2021), adjusting them for the year 2000.

The main twelve groups of classifications of expenditure remained stable despite different classifications were used along the period of study (INE, n.d.-b, n.d.-a, 1983, 1993). These main groups are: 'Food and non-alcoholic beverages' (1); 'Alcoholic beverages, tobacco and narcotics' (2); 'Clothing and footwear' (3); 'Housing, water, electricity, gas and other fuels' (4); 'Furniture, household equipment and routine household maintenance' (5); 'Health' (6); 'Transport' (7); 'Communications' (8); 'Recreation, entertainment and culture' (9); 'Education' (10); 'Hotels, cafes and restaurants and' (11) and 'Other goods and services' (12).

Various classifications of occupations were used, too (see Table 8). Although the ten main occupational groups have remained the same in all three classifications (see Table 14 in Annex III.a), there are differences between them. These differences are smaller between the National Classification of Occupations (CNO) CNO-94 and CNO-11, with the major difference being the transfer between group 1 (Directors and managers) and group 5 (Catering, care, security and retail workers). Catering and retail owner-workers were classified in group 1 in the CNO-94, while in the CNO-11 they are classified in this group when management tasks represent 1/3 of the total worktime. The application of this rule results in the transfer of a significant number of catering and retail owner-workers from group 1 to group 5 (INE, n.d.-b, 2012). In relation to the CNO-79, despite the greater differences it shows with CNO-94 and CNO-11, microdata from HBSs 1980-81 and 1990-91 offer disaggregated information on occupations at the two-digit level. This has allowed me to readjust the ten main groups and better match the equivalences between the three classifications. Table 14 in Annex III.a show these equivalences. Despite this improvement in terms of homogenization, data from HSBs based on different classifications of

occupations are not perfectly comparable. However, I consider it its illustrative of the trends over the period of study of this chapter.

Table 8. Classifications of Occupations, Household Budget Surveys that use them, and their period

Classifications of occupations	HBS	Period
National Classification of Occupations 1979 (CNO-79)	HBS 1980-81	1980-81
	HBS 1990-91	1990-91
National Classification of Occupations 1994 (CNO-94)	HBCS 97	1998-2005
	HBS 2006	2006-2011
National Classification of Occupations 2011 (CNO-11)	HBS 2006	2012-2021

Sources: based on Instituto de Estadística de Cataluña (n.d.)

Furthermore, I could combine these occupations with information of the economic activity thanks to the microdata, allowing me to create two specific categories: 'Directors and managers' in 'Agriculture, stockbreeding, forestry and fishing' (1b), and 'Elementary occupations' in 'Agriculture, stockbreeding, forestry and fishing' (9b).

3.3. Results

This section shows the results from the series build upon the data of section 3.2. First, I present the results on the evolution of farms and their main characteristics. Second, I present the results on agrarian income. And thirdly, I present the results of the structure of household expenditure and the share of food expenditure depending on the occupation of the main household breadwinner.

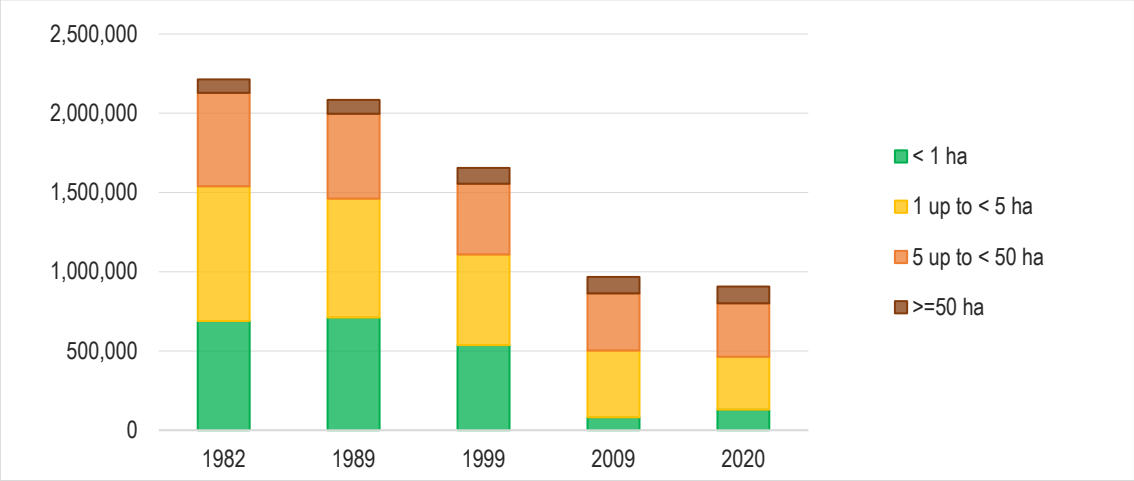
3.3.1. Evolution of the number of farms and their characteristics

3.3.1.1. Number of farms and size

Figure 18 shows the evolution of the number of farms and their size (in UAA) in Spain between 1982 and 2020. It shows a decreasing trend, with 2,375,327 farms

registered in the Agrarian Census of 1982 and 895.027 in the Agrarian Census of 2020. As explained in section 3.2.1., these figures are not perfectly comparable due to methodological changes in the Censuses. Yet, Figure 18 shows a clear sharp decline in the number of Spanish farms during the period.

Figure 18. Evolution of farms by size in UAA (number), Spain 1982-2020



Sources: based on data from the Agrarian Census 1982, 1989, 1999, 2009 and 2020, INE.

However, if we look at the size of farms, we observe different trends. The smallest farms—less than 1ha—suffered the highest decline. On the contrary, large farms—more than 50 ha—increased over the period. This trend can be observed more clearly in Table 9, which offers more detailed information regarding the size of farms between 1982 and 2020. Farms up to 50 ha reduced in number, and the smaller the size, the higher their decrease, both in absolute and relative—compared to the number of farms in 1982—terms. In contrast, farms with more than 50h increased in number, and the larger the size, the higher their relative increase—compared to the number of farms in 1982—. Thus, Figure 19 and Table 9 show a process of shrinking—fewer farms—and concentration— larger farms—.

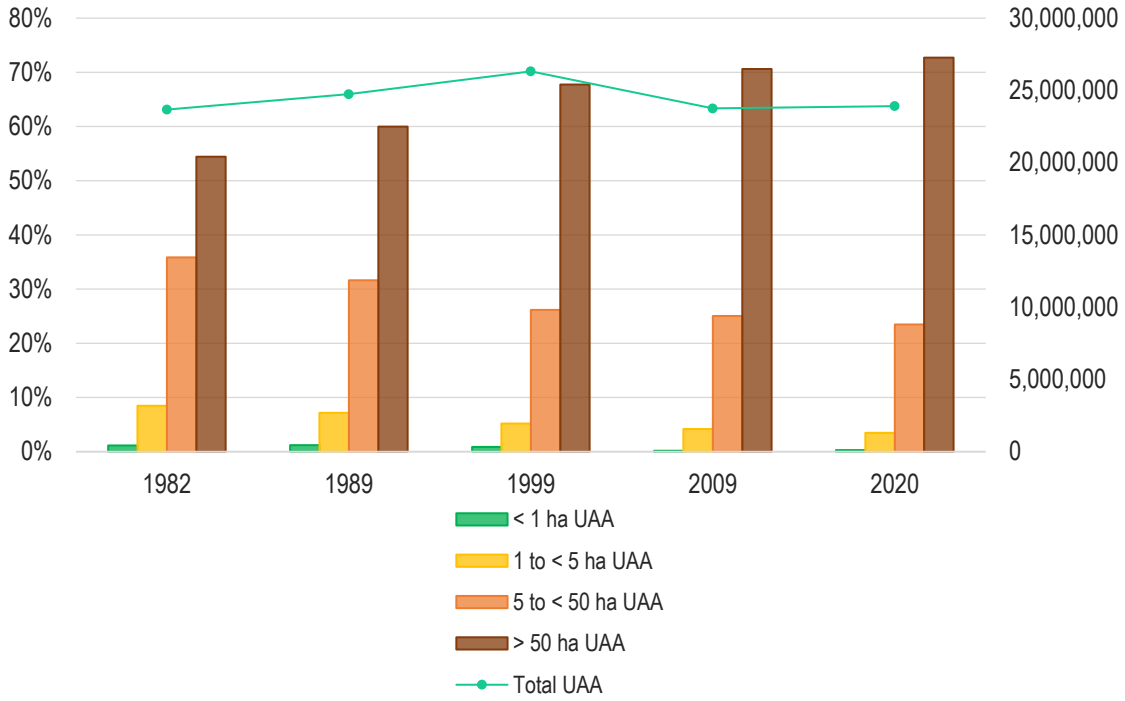
Table 9. Evolution of farms by size in UAA (ha) (number), Spain 1982 and 2020

	0-1	1-2	2-5	5-10	10-20	20-30	30-50	50-100	100-500	≥500	Total farms
1982	851,044	367,334	482,339	274,237	183,155	70,084	62,696	49,103	31,866	3,469	**2,375,327**
2020	133,000	125,467	193,339	131,903	103,593	50,451	51,451	51,029	50,490	4,304	**895,027**

Sources: based on microdata from the Agrarian Census 1982 and 2020, INE.

Figure 19, which shows the evolution in the distribution of Spanish UAA by farm size between 1982 and 2020, confirms this trend. More than the 70% of the total Spanish UAA was under large farms—more than 50 ha—in 2020, compared to a share of 55% in 1982. At the same time, the share of UAA occupied by smaller farms—less than 50 ha, between 1 and 5 ha, and less than 5 ha—reduced in the three cases along the period.

Figure 19. Evolution of UAA's distribution by farm size in UAA (%) [left side of the diagram] and total UAA (ha) [right side of the diagram], Spain 1982-2020

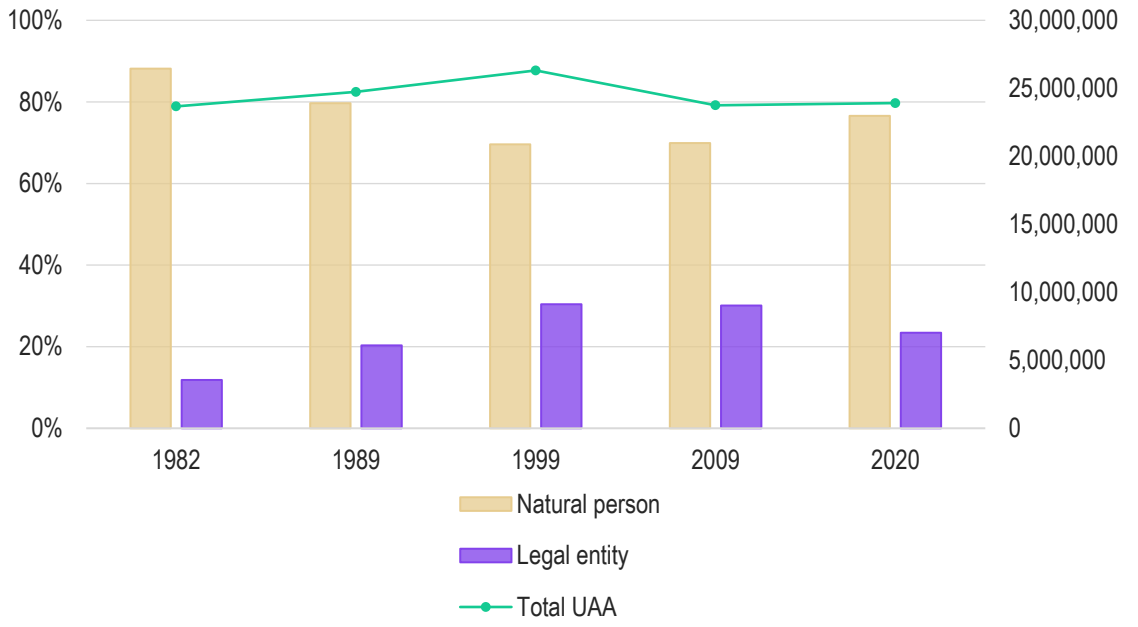


Sources: based on data from the Agrarian Census 1982, 1989, 1999, 2009 and 2020, INE.

3.3.1.2. Legal form of farms

Figure 20 shows the distribution of Spanish UAA by legal form between 1982 and 2020, differentiating between natural person and legal entity—which includes commercial companies, public entities, cooperatives, civil societies and other legal status—.

Figure 20. Evolution of UAA's distribution by legal form of farms (%) [left side of the diagram] and total UAA (ha) [right side of the diagram], Spain 1982-2020



Sources: based on data from the Agrarian Census 1982, 1989, 1999, 2009 and 2020, INE.
Notes: The category "legal entity" includes commercial companies, public entities, cooperatives, civil societies and other legal status.

The share of UAA under the form of natural person shows a downward trend between 1982 and 2009, from 88% to 70%. However, Figure 21 shows a slight increase in year 2020 (77%), yet distant from the share of the year 1982. On the contrary, the share of UAA under the legal entities described an upward trend, from a share of 12% in 1982 to a share of 23% in 2020. The reduction in the information regarding the forms of legal entities which took place from the Agrarian Census of 1982 to the Agrarian Census of 2020—as explained in section 3.2.1.)—makes it complicated to draw conclusions on the evolution within thin this legal form. This, along with the mentioned methodological

changes undergone by the Censuses, certainly hinders the possibility to accurately assess this aspect. Despite this, Figure 20 and Table 10 do show a tendency towards a relative increase in the Spanish UAA under the form of legal entities, at expenses of natural persons, during the period of study.

Table 10. Utilised Agrarian Area (UAA) by legal form (ha), Spain 1982-2020

	1982	1989	1999	2009	2020
UAA (ha)	**23,672,318**	**24,740,506**	**26,316,787**	**23,752,688**	**23,913,682**
Natural person	20,868,000	19,714,000	18,319,104	16,608,517	18,314,322
Legal entity	767,000	1,567,000	2,179,762	2,646,918	5,599,360
Public Entity	1,562,000	2,186,000	2,610,647	1,764,006	
- Municipal	926,000				
- Communal	365,000				
- Other	271,000				
Production clustering	*475,000*				
- Agrarian Transformation Company	331,000		501,111		
- Cooperative	99,000	147,000	200,170	620,874	
- Other	45,000	1,126,000	2,505,993	2,112,374	

Sources: based on data from the Agrarian Census 1982, 1989, 1999, 2009 and 2020, INE.
Notes: boxes in grey indicate that no data is available.

3.3.1.3. AWU and its composition

Figure 21 shows the evolution of total Annual Working Units (AWU) and its distribution depending on the source of labour—family or employee—in Spain between 1982 and 2020.

Figure 21. Evolution of total AWU (number) [left side of the diagram] and distribution of AWU depending on type of workers (%) [right side of the diagram], Spain 1982-2020

Sources: based on data from the Agrarian Census 1982, 1989, 1999, 2009 and 2020, INE.
Notes: No data is published, nor can it be found in microdata, on AWU by permanent vs. eventual employees for year 2020.

Figure 21 portrays a downward trend in the number of AWU, which halved from more than 1 million and a half in 1982 to around 850 thousand in 2020. This trend was accompanied by a change in composition of work, which was primarily provided by families in 1982—almost 80% of total AWU—and reached 50% equilibrium between family work and employee work in 2020 (see Fig. 21). Additionally, if we look deeper within the composition of family work, Figure 21 shows a shrinkage in the case of family support—particularly pronounced in 2020—, while the work by farm holders remained quite stable. As for employee work, no information is provided in the Agrarian Census 2020. For the remaining years, Figure 21 shows a relative increase of temporary or eventual employees, reaching the same share as permanent employees in 2009.

3.3.1.4. Age of farm holders

In regard to the age of farm holders, Table 11 compares figures in absolute and relative terms for six age groups between 1982 and 2020.

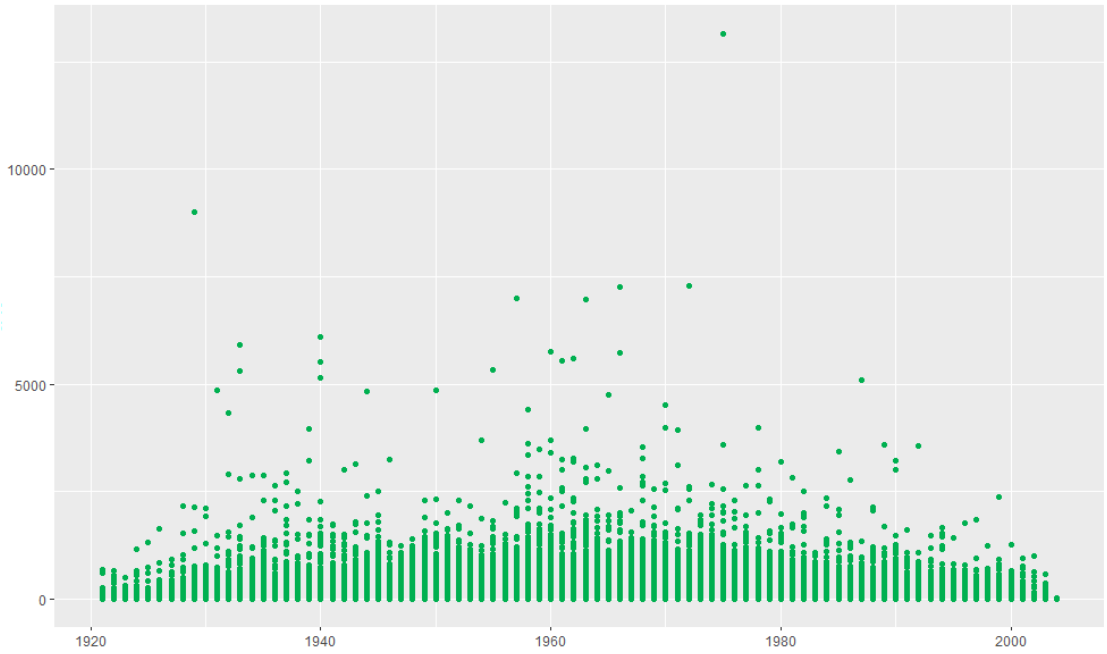
Table 11. Age of farm holders (total numbers and %), Spain 1982 and 2020

	1982	2020	1982	2020
< 25	18,424	4,437	0.8%	0.5%
25-34	130,383	31,045	5.6%	3.5%
35-44	326,009	90,593	13.9%	10.1%
45-54	624,002	174,056	26.6%	19.4%
55-64	643,040	230,871	27.4%	25.8%
≥ 65	601,051	364,053	25.7%	40.7%

Sources: based on microdata from the Agrarian Census 1982 and 2020, INE.

Table 11 clearly shows an aging trend of farm holders. More than 40% of farm holders aged 65 or more years in 2020, compared to a share or 25.7% in 1982. The share of farms holders between 55-64 was slightly higher in 1982 (27.4%) than in 2020 (25.8%). Nevertheless, if we sum the former age groups, figures for 2020 indicate than more than 65% of farm holders will be in pension in the upcoming ten years, thus considerably deepening the aging trend already seen in 1982. The shares of young farm holders—less than 35 years—were quite low both in 1982 and in 2020 (6.4% and 4.0% respectively). However, this difference is significantly pronounced in absolute terms; in 1982, 148,807 farm holders were aged 34 or less, while in 2020 this figure was 35,482. Figures for the group ages 35-44 and 45-55 are consistent with the former trends. No correlation has been found between the age of farm holders and the size (in UAA) of farms (see Fig. 22).

Figure 22. Agrarian Utilized Area (UAA) by farm (axis y, ha) and year of birth of farm holder (axis x, number), Spain 2020



Sources: based on data microdata from the Agrarian Census 2020, INE

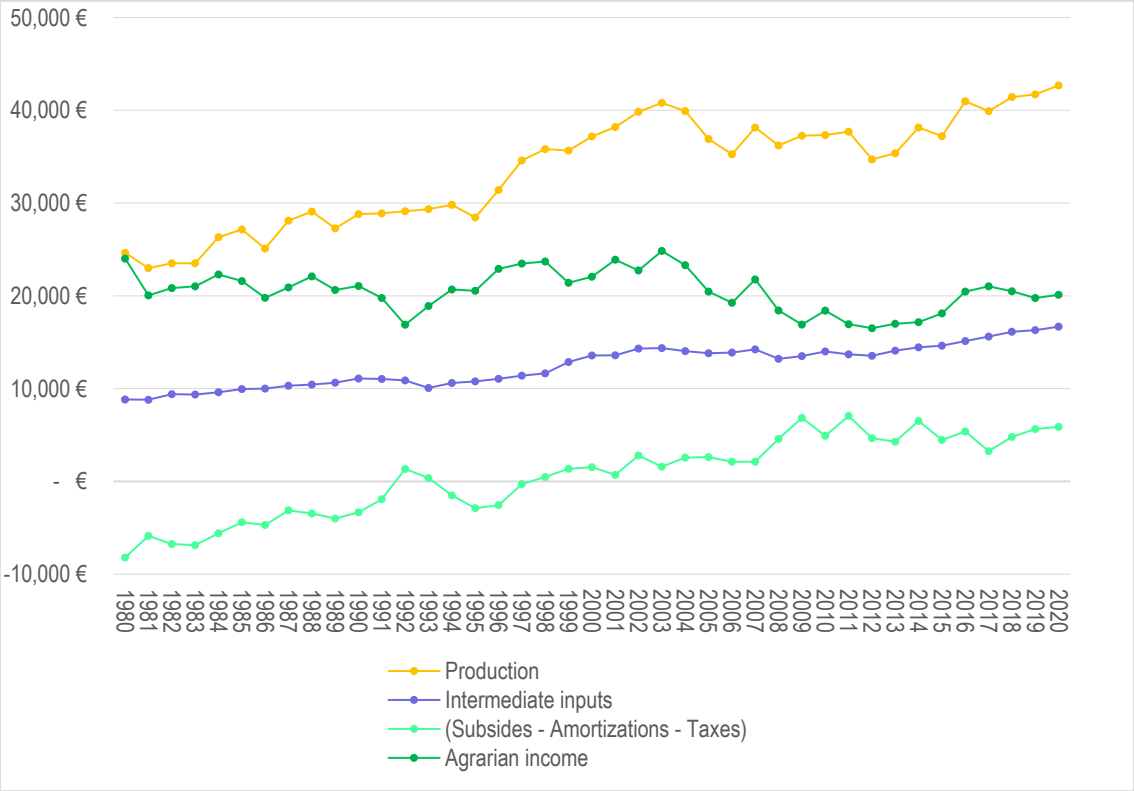
The former figures point to a clear crisis of reproduction of small family farms in Spain between 1982 and 2020. What have been the main drivers of such crises? To seek a first answer, in the following section I explore the evolution of agrarian income and their determinants over the period of study.

3.3.2. Evolution of farming income

3.3.2.1. Agricultural, stockbreeding and forestry production, intermediate inputs, balance between amortizations, subsides and taxes, and agrarian income

Figure 23 shows the evolution of agricultural, stockbreeding and forestry production, their intermediate inputs, the balance between amortizations, subsides and taxes—calculated as subsides less amortizations subtracted less taxes—, and agrarian income, in constant (adjusted to the year 2000).

Figure 23. Agricultural, stockbreeding and forestry production, intermediate inputs, balance between amortizations, subsides and taxes, and agrarian income (in constant millions of euros, adjusted to the year 2000), Spain 1980-2020



Notes: the series on production was deflated using the Index of Prices Perceived by Farmers from the MAPA, the series on intermediate inputs was deflated using the Index of Prices Paid by Farmers from the MAPA and the series on agrarian income was deflated using the consumer price index from the Banco de España (Banco de España, 2021). *(Subsides – Amortizations - Taxes) was calculated as the difference between the agrarian value added (production less intermediate inputs) and the agrarian income.*

Source: based on data from the Agrarian Statistical Yearbooks of the MAPA.

Figure 23 shows how agricultural, stockbreeding and forestry production followed and upward trend between 1980 and 2003, increasing by 66% from 24,632 to 40,799 million of euros. After this, it decreased to 35,259 in 2005, remained quite stable until 2013, and increased again to 42,678 in 2020. Overall, agricultural, stockbreeding and forestry production increased by 73% during the period. The value of intermediate inputs used for such production steadily increased throughout the period, growing at a faster rate than production. Their value was 8,829 in 1980 and 16,679 in 2020, representing an increase of 89%. As for the balance between amortizations, subsides and taxes, we can differentiate two main periods: their balance was negative until the year 1998—expect from

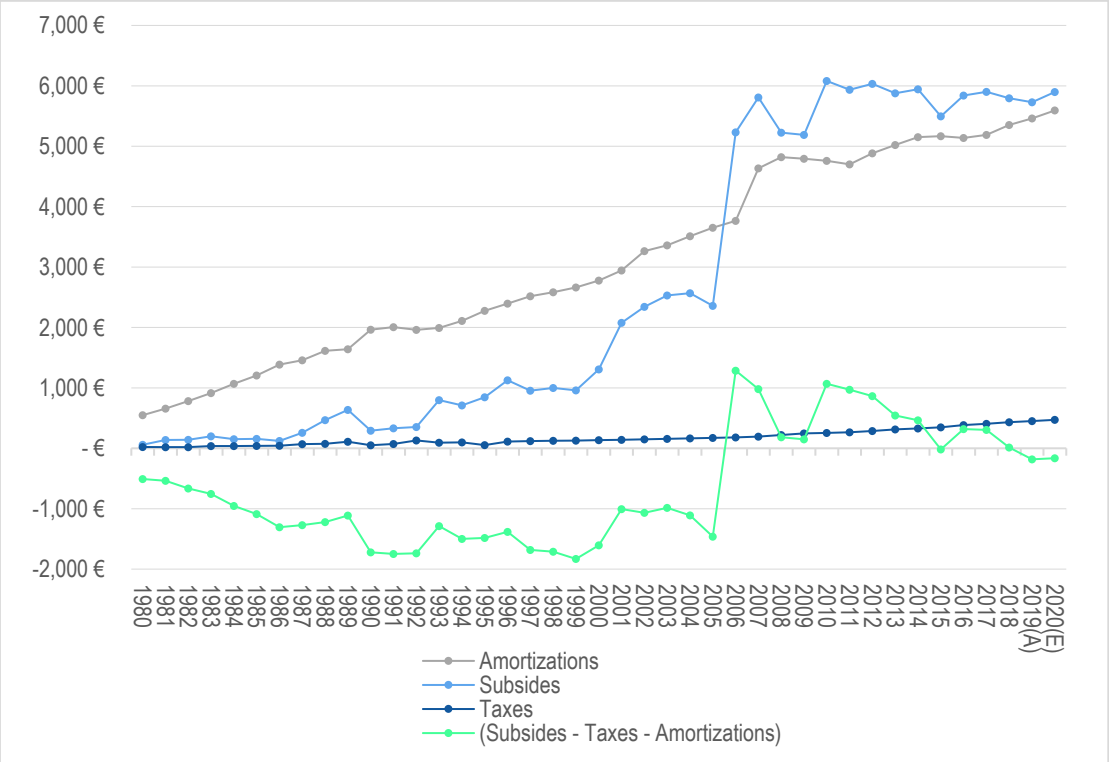
year 1992—, and turned into positive after then (next, I will come back to this issue and explain in more detail how this balance evolved looking individually at the evolution of their components).

The aforementioned trends explain the path followed by the agrarian income[18]. Three main stages can be identified in its evolution: it first decreased from 24,010 to 16,885 million of euros between 1980 and 1992; after this, it increased to 24,835 million in 2003; since then, it decreased to 20,109 million in 2020. Overall, the agrarian income reduced by 4 million during the period, which represent a decrease of 16%.

Coming back to the balance between amortizations, subsides and taxes, Figure 24 shows this evolution in current prices between 1980 and 2020. Amortizations—whose value is deducted from the gross value added of agricultural, stockbreeding and forestry—followed a steady upward trend during the period, increasing tenfold from 548 to 5,592 million. In contrast, the value of subsides increased by a factor of 10, multiplying their value by 100 from 50 to 5,899 in 1980. Since taxes increased at a much slower rate than subsides—from 20 to 471 current millions of euros between 1980 and 2020—, it is the substantial increase in subsides which accounts for the positive balance between amortizations, subsides and taxes. Figure 24 does not take into account amortizations, subsides and taxes on forestry from 1990 to 2020. However, we consider that the trends shown are illustrative for the whole since the value of forestry is of little significance in monetary terms (see section 3.2.2).

[18] Note that these series were deflated with different price indices. Therefore, agrarian income does not exactly equal production minus intermediate inputs minus amortizations plus subsidies minus taxes.

Figure 24. Amortizations, subsides and taxes (and their balance) on agriculture, stockbreeding and forestry (in current millions of euros), Spain 1980-2020



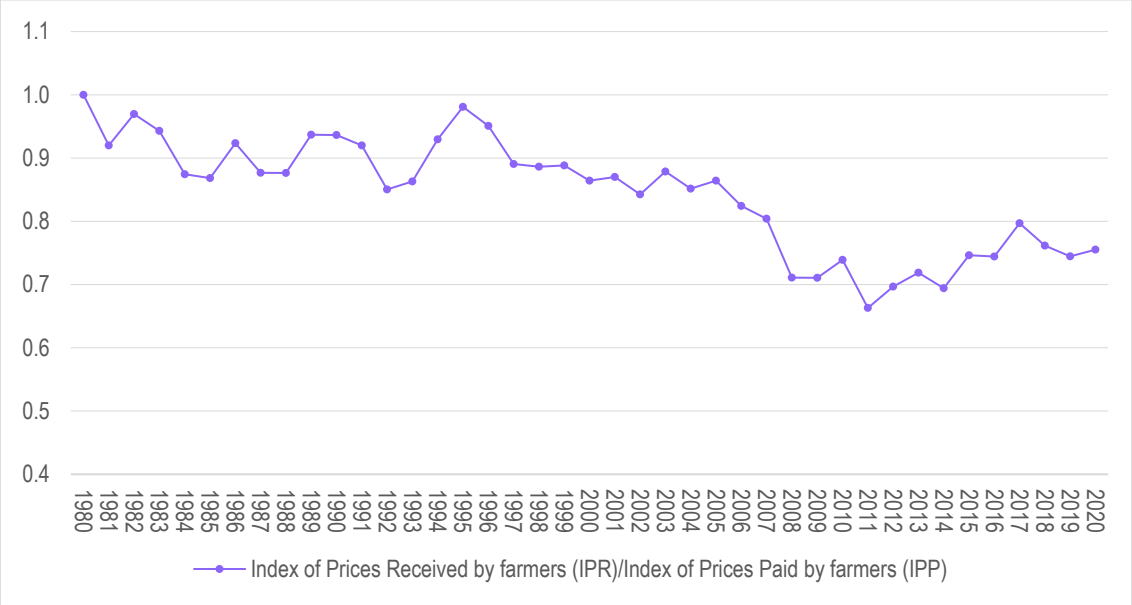
Notes: Forestry is only included for years 1980-1990. (A) denotes advanced figures, and (E) estimated figures by the MAPA.

Source: based on data from the Agrarian Statistical Yearbooks of the MAPA.

3.3.2.2. Ratio between Index of Prices Received and Index of Prices Perceived by farmers

The evolution of the terms of trade between the prices received by farmers for selling their production and the prices they paid for the intermediate inputs required for their production provides insights into the trends observed in agricultural, stockbreeding and forestry production and their intermediate inputs, shown in Figure 23. Figure 25 illustrates the ratio between the Index or Prices Received by Farmers (IPR) and the Index or Prices Paid by Farmers (IPP), with 1980 as the base year. The IPR experienced a deterioration relative to the IPP, with a minimum of 0.7 in 2011. Since then, it slightly recovered with a value of 0.76 in 2020. In the later date farmers had lost 20% relative to 1980 in their terms of the commercial ratio between prices received and paid.

Figure 25. Ratio between the Index of Prices Received by farmers (IPR) and the Index of Prices Paid by farmers (IPP), Spain 1980-2020

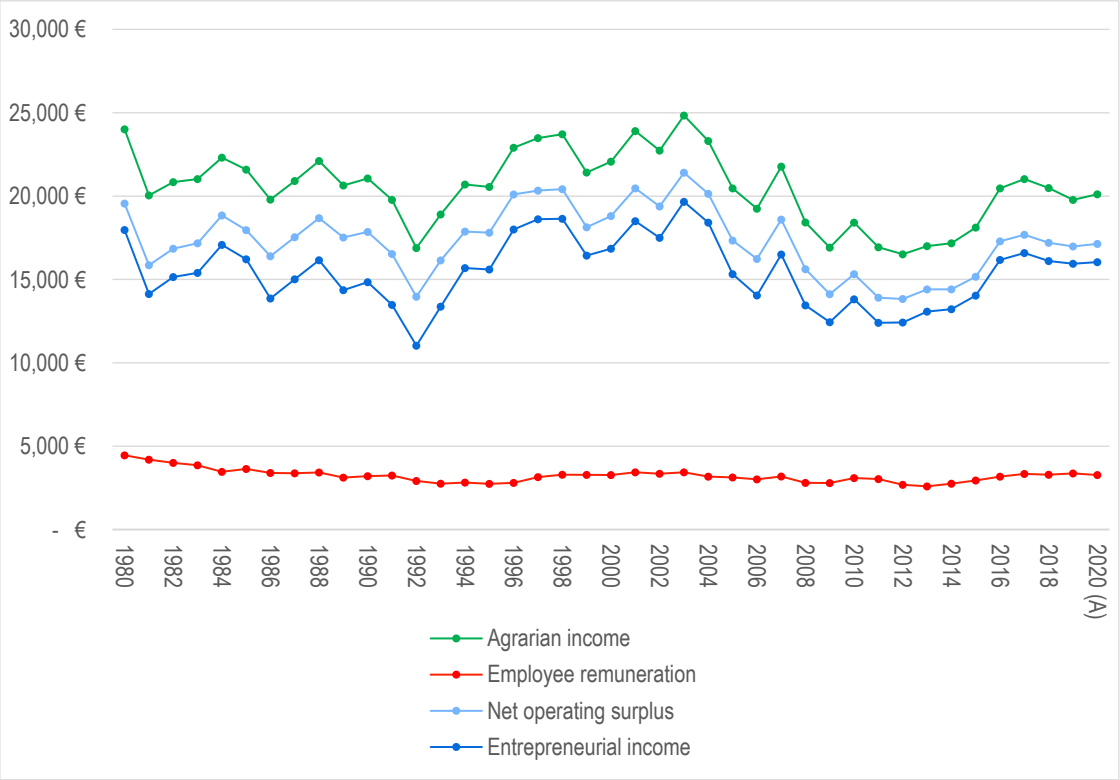


Source: based on data from the Statistical Yearbooks of the MAPA.

3.3.2.3. Agrarian income and its components

After describing the evolution of the agrarian income as a whole, I now focus on the distribution of agrarian income between employee remuneration and net operation surplus. Figure 26 shows their evolution, including also the entrepreneurial income, in constant terms (adjusted to the year 2000) between 1980 and 2020.

Figure 26. Agrarian income, employee remuneration, net operating surplus and entrepreneurial income (in constant millions of euros, adjusted to the year 2000), Spain 1980-2020



Notes: The letter 'A' indicates that the data is an advance estimate from the INE

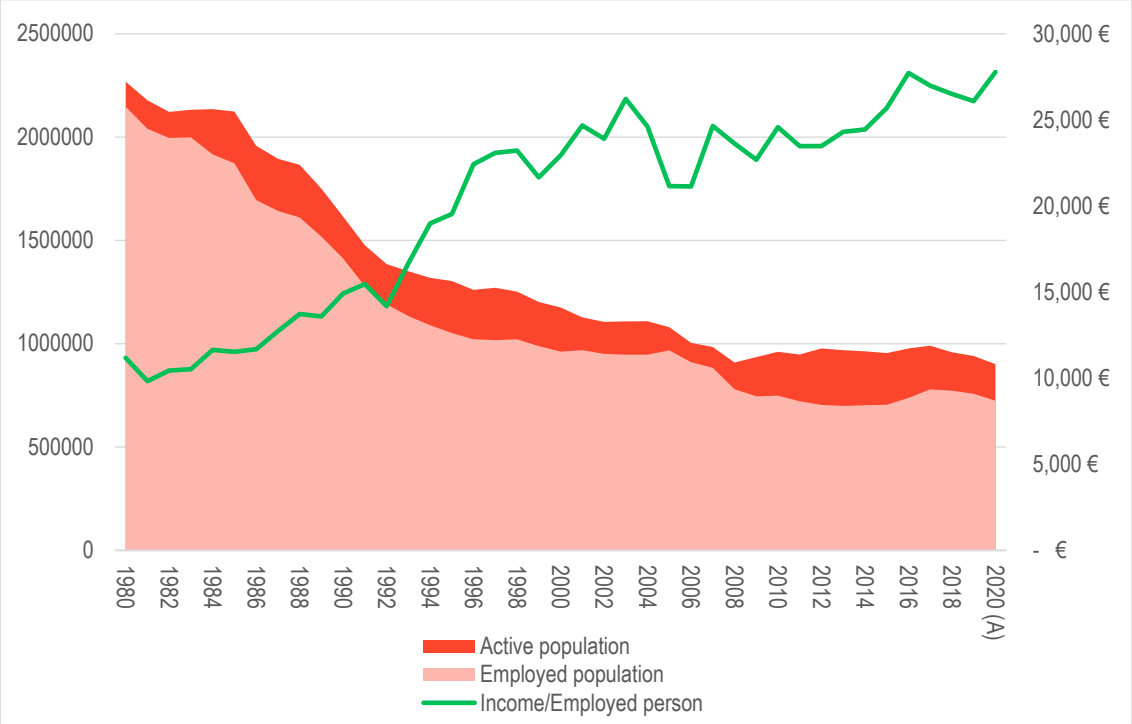
Source: based on data from the Statistical Yearbooks of the MAPA. Series were deflated suing the CPI series from the Banco de España (Banco de España, 2021)

The net operating surplus and the entrepreneurial income followed the same trends as the agrarian income yet moving from a range between 21,404 and 13,829 million in the former case, and between 19,661 and 11,029 in the latter (see Fig. 26). As for the remuneration of employees, it slightly decreased by 39%, from 4,456 in 1980 to 2,740 in 1995; it remained quite stable between 1995 and 2013, and after this, it narrowly increases to 3,275 in 2020. Yet, these variations are minor compared to the changes in trend experience by the net operation surplus and the entrepreneurial income.

3.3.2.4. Agrarian active population and employed population, and agrarian income per person employed

The assessment of the agrarian income is more meaningful when considered in relation to the agrarian population and the number of farms. Figure 27 shows the evolution of agrarian and active population, as well as the agrarian income per person between 1980 and 2020. Both agrarian active and employed populations show a downward trend throughout the period, decreasing by 60% from 2,268,210 to 901,700 in the first case, and by 66% from 2,146,919 to 723,900 in the latter. This reduction was more pronounced between 1980 and 1992 (see Fig. 27). In contrast, the agrarian income per person employed increased by 148% from 11,184 to 27,770 euros between 1980 and 2020. However, this increase was not constant. The agrarian income per person employed followed an upward trend between 1980 and 2003, coinciding with the period in which employed population decreased the most (by 56%). In subsequent years it sharply decreased to 21,135 euros in 2006, and then increased again—albeit not steadily—, reaching the 27,770 euros in 2020.

Figure 27. Active and employed popuations in agricutlure, stockbreeding and forestry (number of people) [left side] and agrarian income per employed person (in constant euros, adjusted to the year 2000) [right side], Spain 1980-2020.



Note: For the period 1980-2007, active and employed populations in agriculture, stockbreeding and forestry were estimated by subtracting the weight of active and employed populations in fishing from the total made up of agricultural, stockbreeding, forestry and fishing active and employed populations. This weight was estimated as the average percentage of active and employed populations in fishing regarding total active and employed populations in agriculture, stockbreeding, forestry and fishing between 2008 and 2020.

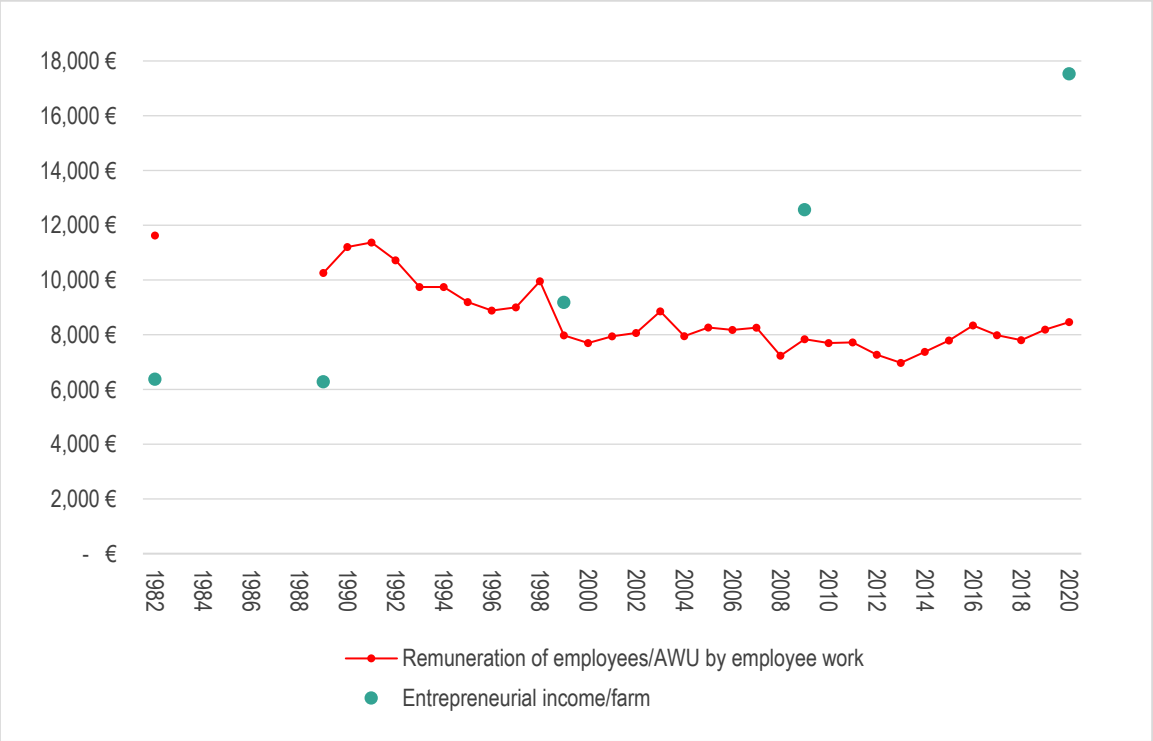
Source: data on agrarian income (agriculture, stockbreeding and forestry) is based on Agrarian Statistical Yearbooks and data on labour force and working population from 'Encuesta de Población Activa', INE

3.3.2.5. Remuneration of employees per AWU of employee work and entrepreneurial income per farm

Figure 28, which shows the agrarian remuneration of employees per AWU of employee work as well as the agrarian entrepreneurial income by farm in constant euros (adjusted to the year 2000) between 1980 and 2020, adds further insights on the evolution of the agrarian income and population. The remuneration of employees per AWU of employee work and the entrepreneurial income by farm followed opposite trends: while the former decreased by 27% from 11,627 to 8,463 euros between 1980 and 2020, the latter increased by

175% from 6,372 to 17,533 euros. Additionally, we observe a trend towards a polarization, that is, the gap between the remuneration of employees per AWU of employee work and the entrepreneurial income by farm was 5,255 in 1980 and 13,079 in 2020.

Figure 28. Remuneration of employees/AWU by employee work and entrepreneurial income/farm (in constant euros, adjusted to the year 2000), Spain 1982-2020



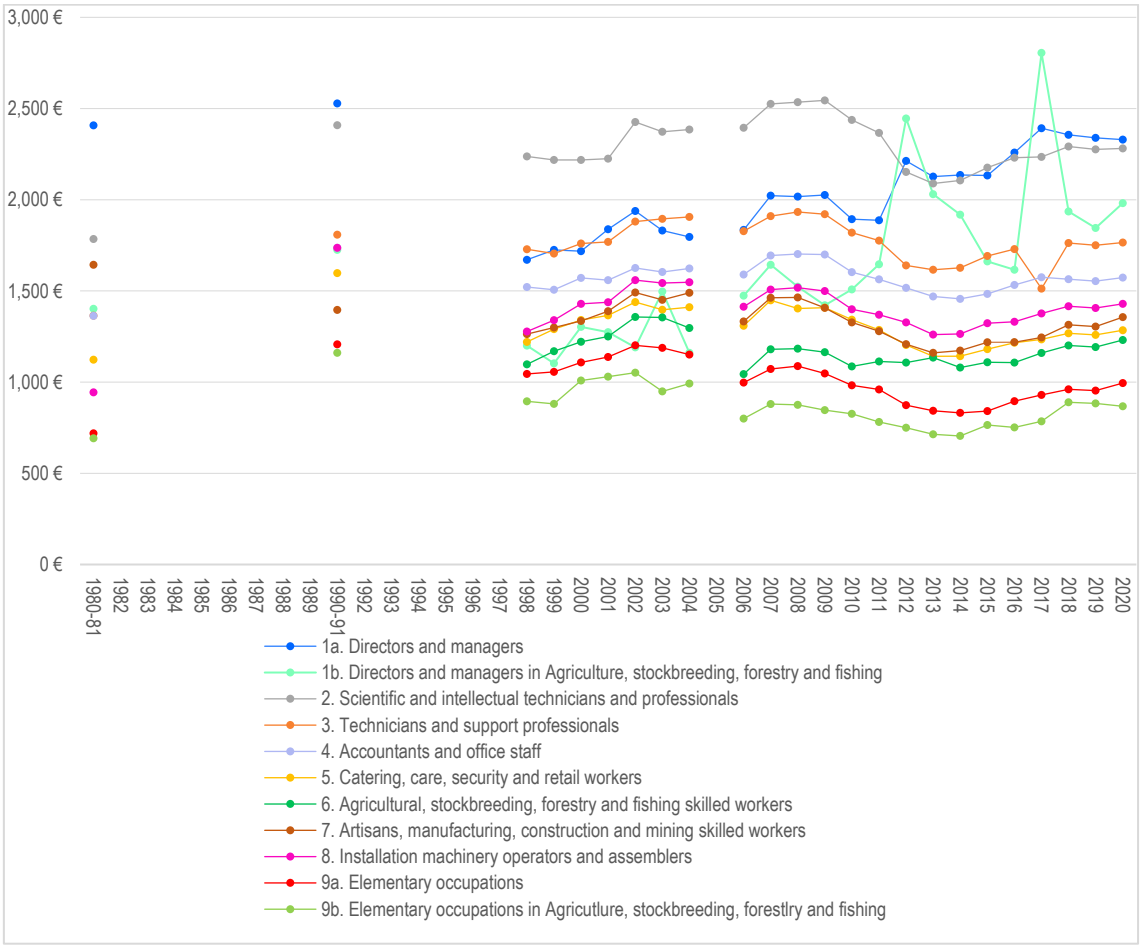
Source: based on Agrarian Statistical Yearbooks and Agrarian Census 1982, 1989, 1999, 2009 and 2020.

The previous figures suggest that the drastic reduction in the agrarian population made it possible for the agrarian income per person employed to increase, despite the overall decrease in agrarian income during the period. However, this increase did not apply to all employed in the sector. Agrarian employees experienced a decrease in their income, while the income received by farms increased. This suggests a deterioration of working conditions for employees, whose share in total AWU reached 50% in 2020, which may have contributed to the increase in income for farms.

3.3.2.6. Average monthly net monetary income of households by occupation of main household breadwinner

Figure 29 provides additional insights into the evolution of income received by Spanish agrarian households, further comparing it with other households. It displays the average monthly net monetary income of households (in constant euros, adjusted to the year 2020) by the occupation of the main household breadwinner, across eleven categories.

Figure 29. Average monthly net monetary income of households by occupation of main household breadwinner (in constant euros, adjusted to the year 2000), Spain 1980-2020



Notes: no data is displayed for group 3 in 1980-81 because results from the microdata of the HBS 1980-81 did not have economic significance. No data was available for group 6 for years 1980-81 and 1990-91

Source: own elaboration based on data from the Spanish HBSs.

Figure 29 shows that the households with the lower average monthly net monetary income were those in which the main breadwinner did elementary

occupations, and particularly the part of them in agriculture, stockbreeding, forestry, and fishing. This feature is constant along the period. In the first case, the average monthly net monetary income was 718 euros in 1980-81, increased by 68% to 1,207 in 1990-91, and since then it has decreased by 18% to 995 euros in 2020. It increased at an overall rate of 39% during the period. In the latter, it followed the same path within a range between 1,161 and 799 euro and increased at an overall rate of 25% between 1980-81 and 2020.

Households in which the main breadwinner did a skilled occupation in agriculture, stockbreeding, forestry and fishing were the third group with the lowest average monthly net monetary income. For the period for which there is available data for this variable (1998-2020), Figure 29 shows an upward trend between 1998 and 2020, increasing by 24% from 1,097 to 1,327 euros. It then decreased by 20% to a similar figure as in 1998 (1,086) and increased by 13% to 1,230 euros in 2020.

Household in which the main breadwinner worked as director or manager (group 1a) and as scientific and intellectual technician or professional (group 2) show the highest average monthly net monetary income during the period. In the first case, it was the highest in 1980-81 (2,407 euros) and also in 2020 (2,329). However, this evolution was not constant; Figure 30 suggest a downward trend between 1990-91 and 1998 (from 2,528 to 1,670 euros, thus reducing by 34%), and an upward trend until 2020 (increasing by 39%) yet additional ups and downs in-between. It stands out that the average monthly net monetary income of group 1 and group 3 describe 'mirror' paths after 2011, coinciding with the changes in classifications (see section 3.2.3). In addition, when differentiating the part of directors and managers which work in agriculture, stockbreeding, forestry and fishing. Figure 30 shows that their average monthly net monetary income was systematically under the whole group 1, except for years 2012 and 2017. Overall, it increased by 41% from 1,401

in 1980-81 euros to 1,981 in 2020. In the case of group 2, it shows an overall increase by 28% from 1,784 euros in 1980-81 to 2,281 in 2020.

In summary, people working in agriculture, stockbreeding, forestry and fishing had worsen economic results in Spain throughout the period compared to those with the same skills who worked in other activities, particularly from 2002 or 2003 onwards. People who work in elementary agricultural occupations were always the lowest paid throughout the period, as well as those who lost the most in the first two decades of the 21st century.

3.3.2.7. Average monthly monetary and total household expenditures and average monthly net monetary income of agrarian households

Figure 30 shows the average monthly total and monetary household expenditure as well as the average monthly net monetary income of agrarian households between 1980 and 2020 in Spain. All of them are in constant monetary units, adjusted to the year 2000.

Figure 30. Average monthly monetary and total household expenditure (in constant euros, adjusted to the year 2000), and net monetary income of agrarian households (in constant euros, adjusted to the year 2000), Spain 1980-2020

Notes: data on the average monthly total household expenditure between 1980 and 1997 were sourced from the 'Anuarios', and between 1998-2020 was obtained from published data of the HSB 1997 and HSB 2006 on the INE website, coinciding with the results obtained from calculations from microdata. Data on the average monthly monetary household expenditure between 1980 and 1997 was estimated as being the same share of the average monthly total household expenditure as for the period 1998-2021 (for which the average monthly monetary household expenditure was 79% of the average monthly total household expenditure). I estimated this value since these data were not published in the 'Anuarios' and results calculated from the microdata of HBSs 1980-81 and 1990-91 were not sound. Data on average monthly monetary household expenditure for 1998-2020 were obtained from published data of the HSB 1997 and HSB 2006 in the INE website, coinciding with the results obtained from microdata.

Source: own elaboration based on data from the Spanish HBSs.

The average monthly total household expenditure followed an upward trend between 1980 and 2008, increasing by 35% from 1,566 euros in 1980 to 2,119 euros in 2008. It then decreased to similar values as in 1980-81 by 2015 and kept quite stable until 2020, when it significantly dropped, by 10% from 1,722 euros in 2019 to 1,542 euros in 2020. The average monthly monetary household expenditure followed the same trend as the average monthly total household

expenditure. According to Figure 30, it increased by 40% from 1,234 euros in 1980-81 to 1,727 euros in 2007. It then reduced to similar values as in 1998 by 2013 (1,239 euros) and remained stable until 2019. By 2020, it reduced by 14% from 1,365 euros in 2019 to 1,172 euros in 2020.

When comparing the average monthly monetary household expenditure with the average monthly monetary income of agrarian households, we can identify some key features. Households in which the main breadwinner had an occupation as an elementary worker in agriculture, stockbreeding, forestry, and fishing received an average monthly monetary income below the average monthly monetary expenditure of Spanish households throughout the period. However, the gap between them was not constant. Based on the available data, this gap was 540 euros in 1980-81, when the Spanish average monthly monetary household expenditure was 1,232 euros and the average monthly monetary income was 692 euros. The gap significantly narrowed by 1990-91, the moment in which it was the lowest; the Spanish average monthly monetary household expenditure was 1,274 euros and the average monthly monetary income was 1,161 euros. After then, the gap increased again, reaching its maximum in 2006, when the Spanish average monthly monetary household expenditure was 1,678 euros and the average monthly monetary income of households in which the main breadwinner was an elementary worker in agriculture, stockbreeding, forestry, and fishing was 799 euros.

As for households in which the main breadwinner had a skilled occupation in agriculture, stockbreeding, forestry, and fishing, data is only available between 1998 and 2020. During this period, their average monthly monetary income was also below the Spanish average monthly monetary expenditure (see Fig. 30), except from years 2002, 2003 and 2020. Nevertheless, the gap was more limited than for elementary workers in agriculture, stockbreeding, forestry, and fishing.

The maximum size of the gap was also in 2006, when the Spanish average monthly monetary household expenditure was 1,678 euros and the average monthly monetary income of households in which the main breadwinner had a skilled occupation in agriculture, stockbreeding, forestry, and fishing was 1,043 euros.

Finally, in regard to households in which the main breadwinner worked as a director or manager in agriculture, stockbreeding, forestry, and fishing, it is difficult to identify a trend since it shows high volatility (Fig. 30). However, Figure 30 shows that the average monthly monetary income of this type of households was over the Spanish average monthly household expenditure most of the years between 1980 and 2020.

Although the reasons behind the reproduction crisis of small family farms need a much deeper analysis than the one here carried out, this evidence provides a first answer to why are so few young people willing to replace their parents in the direction and management of family farms. With these data in mind, perhaps the pertinent research question becomes why and how there are still family farms striving to survive despite that compression of their incomes (Moragues-Faus, 2014).

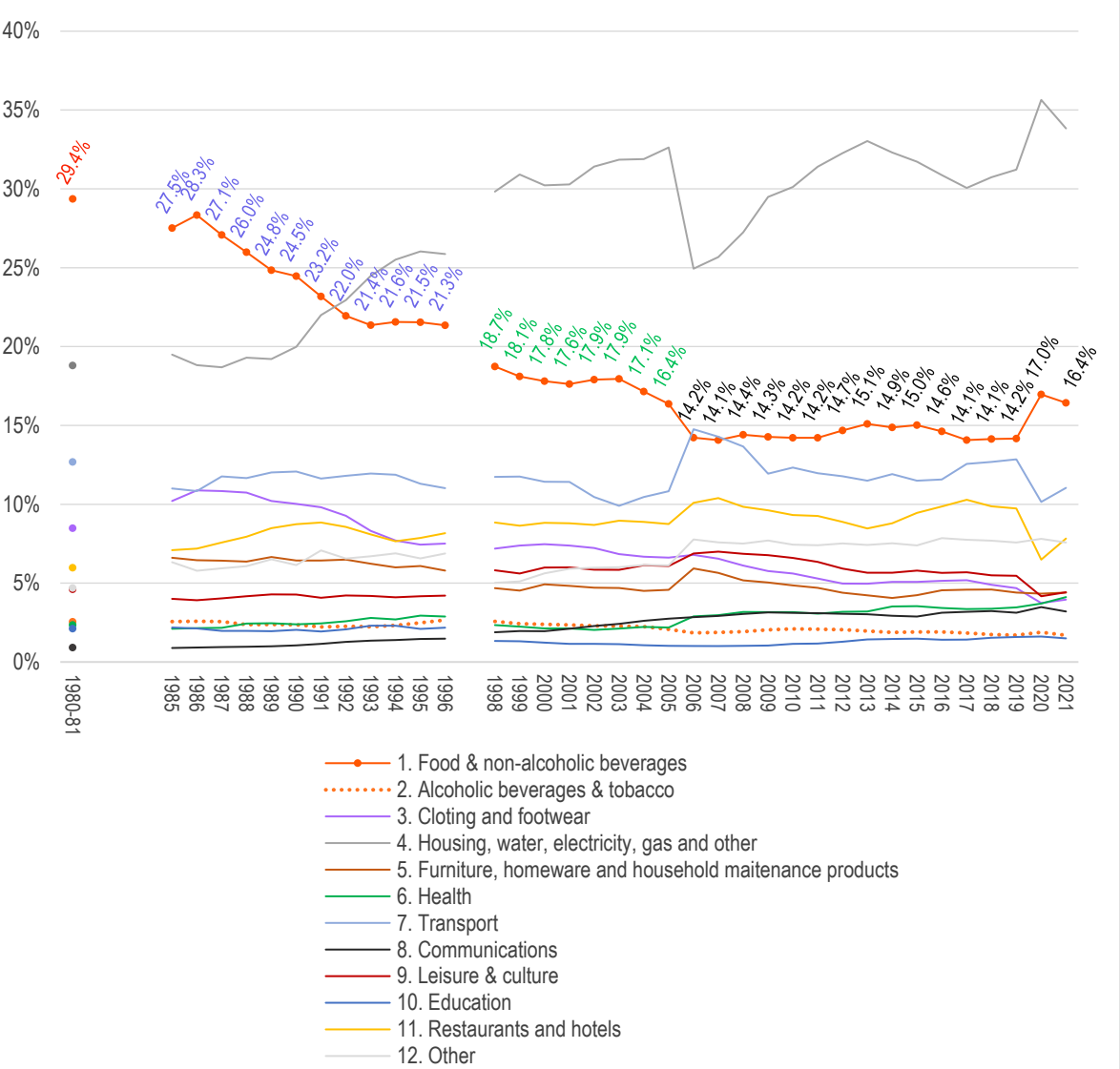
These data lead us to another question addressed from the other side of the coin. Did the compression of income earned by people who remained in agricultural activities, and particularly on small family farms, also mean that food has become increasingly cheaper for the rest of the non-agricultural family budgets over that period? In the following section, I conduct a first exploration of data on this aspect.

3.3.3. Evolution of food expenditure

3.3.3.1. Distribution of average household expenditure by category of expenditure

Figure 31 shows the distribution of average household expenditure by category of expenditure (in percentage) between 1980-2021, including food.

Figure 31. Distribution of average household expenditure by category of expenditure (%), 1980-2021



Notes: original data was based in current monetary units. Data from year 1980-81 was sourced from the HBS 1980-81 (in orange); data for the period 1985-1996 was sourced from the "Encuesta Continua de Presupuestos Familiares" 1985-1996 (in purple); data for the period 1997-2005 was sourced from the "Encuesta Continua de Presupuestos Familiares (ECPF 97)" (in green); data for the period 2006-2021 was sourced from the "Encuesta de Presupuestos Familiares (ECP)" 2006 (in black).

Sources: own elaboration based on data from Household Budget Surveys from INE

Despite the breaks caused by the methodological changes of the HBSs, Figure 31 brings to light clear trends. The item of food and non-alcoholic beverages was the first category of expenditure in relation to the total expenditure of households between 1980-81 and 1991, when it was surpassed by housing, water, electricity, gas and other. This latter category of expenditure was the main one for the remaining period (1991-2021). The average relative weight of food and non-alcoholic beverage in total household expenditures followed a downward trend from 1980-81 to 2007, reducing by 53% from 29,9% to 12,4%. After this year, it has maintained stable, except for years 2020 and 2021 when a small increased is shown. In contrast, the weight of the average expenditure in housing, water, electricity, gas and other expenditures in relation to the total household expenditure described an upward trend, increasing by 88% from 18,0% in 1980 to 33,9% in 2021—a share that averages family units with and without housing of their own—.

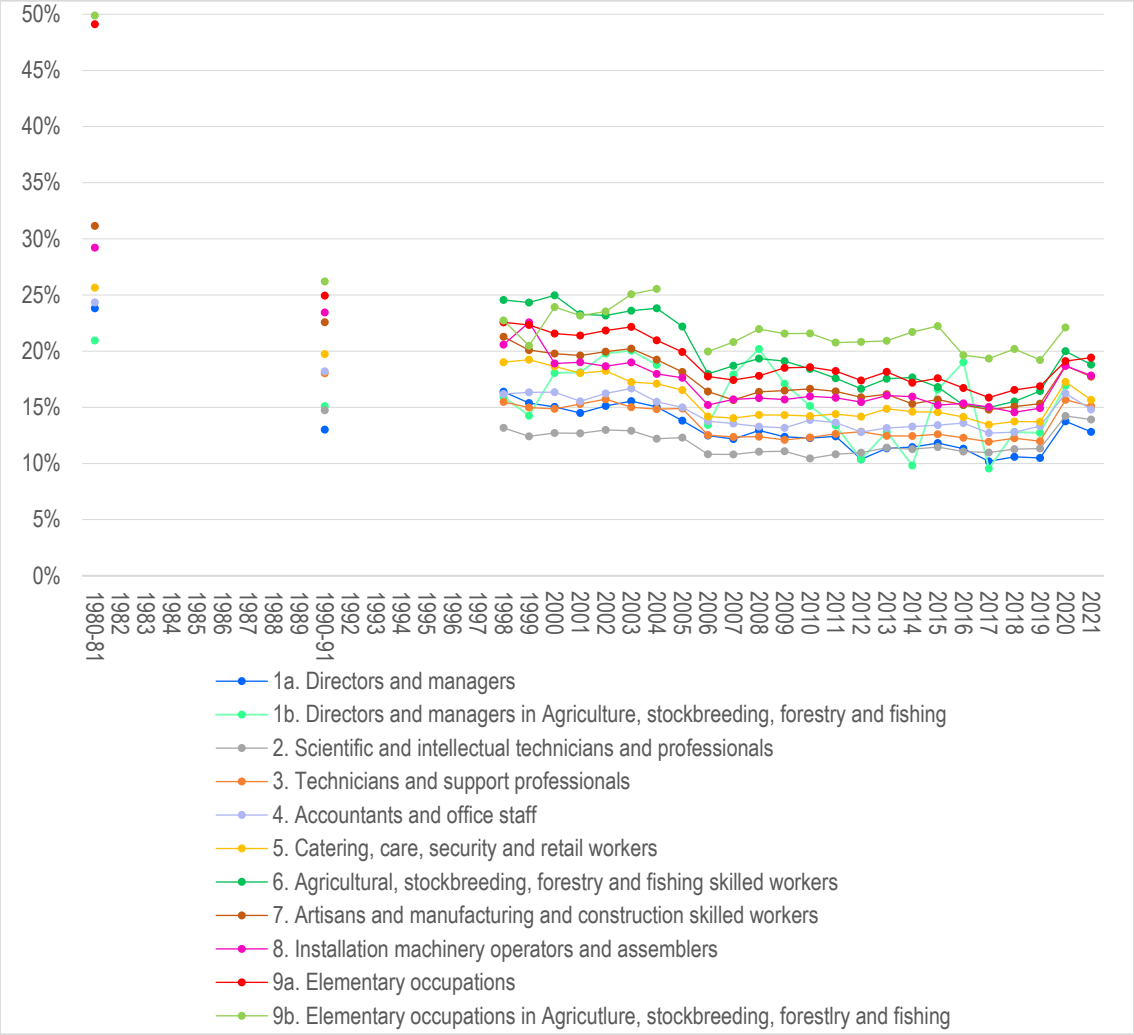
These two categories of expenditure were the ones which experience the most pronounced changes in the distribution of the average household expenditure by far. The remaining categories of expenditure remained quite stable (see Fig. 31), except from clothing and footwear, which considerably reduced its share (by 48%), from 8,5% in 1980-81 to 4,4% in 2021, turning into the position number nine in terms of weight.

3.3.3.2. Average share of household expenditure on food and non-alcoholic beverages in relation to total expenditures by occupation of household main breadwinner

While Figure 31 shows the average trends for Spanish households, the focus of this Chapter is to examine how the composition of expenditure has evolved for the working population, particularly in terms of food expenditure. Figure 32 shows the average share of household expenditure on food and non-alcoholic

beverages in relation of total expenditures depending on the occupation of household main breadwinner (in percentage) between 1980-2021. Thus, it offers more detail information on this trend already explained in the previous section by zooming in on the occupations of the household.

Figure 32. Average share of household expenditure on food and non-alcoholic beverages in relation to total expenditures depending on the occupation of household main breadwinner (%), 1980-2021



Notes: figure 15 was created combining data and microdata from HSBs. No data is displayed for groups 2 and 3 in 1980-81 because results from microdata did not have economic significance. No data is available for group 6 in HSBs 1980-81 and 1990-91. No data could be obtained for group 1b and 9b for year the 2005 because microdata on annual basis is not published, and nor for the year 2021.

Sources: own elaboration based on data from HBSs from INE.

Figure 32 shows that households in which the main breadwinner worked in agriculture, stockbreeding, forestry and fishing as unskilled (group 9b) or skilled

worker (group 6) show the highest share of expenditure in food and non-alcoholic beverages compared with the rest of households. In the first case, the average share of household expenditure on food and non-alcoholic beverages was 49,9% in 1980-81, reducing by 56% to 22,1% in 2020. In the latter, it reduced by 24% from 24,6% in 1998 (first year with available data) to 18,8% in 2021. Following them, households in which the main breadwinner did an elementary occupation (group 9a) presented an average household expenditure on food and non-alcoholic of 40,1% in 1980-81, which reduced by 52% to 19,4% in 2021.

On the contrary, Figure 32 shows that households in which the main breadwinner worked as director or manager (group 1b), as scientific and intellectual technicians and professionals (group 2) and as technicians and support professionals (group 3) present the lowest average share of food and non-alcoholic beverages expenditure in relation to total expenditure. For group 1b, it was 23,8% in 1980-81, reducing by 46% to 2021. For group 2, it was 14,7% in 1990 (first year with reliable data) and reduced by 5% to 13,9% in 2021. For group 3, it was 15,5% in 1998 (first year with available data) and 15,1% in 2021.

Households in which the main breadwinner worked as director or manager in agriculture, stockbreeding, forestry and fishing (group 9b) present pronounced variations, making it difficult to determine a trend over the period (see Fig. 32).

3.4. Discussion

Results from section 3.3. show a clear reduction in the number of farms in Spain, which halved between 1980 and 2020, from more than 2 million to less than 1. However, this reduction affected particularly the smaller farms, while the largest farms increased. Thus, the results confirm a trend of reduction in the number of farms accompanied by a concentration of land in the hands of fewer large

farms. These results are consistent with the results by Guzmán et al., (2022), López-Iglesias, (2006) and González de Molina et al., (2020), and put forward the continuation and deepening of this trend already started in the 1960s. In addition, the results show a change in the composition of agrarian working population towards a higher proportion of employee-based work. Figures on the composition of AWU illustrate how family work, and particularly family support, decreased from around 80% of total AWU in 1980 to 50% in 2020. Thus, family-based and employee-based work achieved a balance at the end of the period. At the same time, the results show a slight trend towards legal entity as legal form, at the expense of natural person. Furthermore, the results show a deepening of the aging trend among farm holders that was already seen in 1980. In 2020, more than 65% of farm holders will be eligible for retirement within the next ten years. This trend jeopardizes the generational replacement of farms, which is central for the transmission of cultural heritage (Koohafkan & Altieri, 2011) and takes places within small family farms (Altieri et al., 2012; van der Ploeg et al., 2012).

All the aforementioned trends evidence the decrease of Spanish small family farms between 1980 and 2020, and the foreseeable deepening of this trend in the following years. This points to the jeopardization of present and future reproduction of agroecosystems in the country.

Building on the fact that monetary flows are information that influences farmers' decisions (Gloria Isabel Guzmán et al., 2022), economic data on the evolution of agrarian income and its components seem to have been a determinant in the former trends. The agrarian income decreased by 14% (in constant terms) between 1980 and 2020. Despite agriculture, stockbreeding and forestry value production increased by 73% (in constant terms), intermediate inputs did in a faster rate (89%, also in constant terms) during the same period. Furthermore,

the ratio between the Index of Prices Received by farmers and the Index of Prices Paid by farmers shows a deterioration of terms of trade between farmers and input providers, from 1.0 in 1980 to 0.75 in 2020, thus worsening the scenario for farmers. We know that the 'terms of trade' between the prices paid and received by farmers have become unrelentingly worse since the mid-twentieth century (Abad & Naredo, 1997; Serrano & Pinilla, 2011; González de Molina et al., 2020). Subsides significantly increased along the period and turned the balance between amortizations, subsides and taxes into positive, yet this was not sufficient to compensate the former trends in average terms—let alone when the internal growing inequality of the sector and the unequal access to those subsidies are taken into account.

In addition, it is essential to consider that the relative low decrease of agrarian income between 1980 and 2020 took place at the same time agrarian active and employed populations sharply decreased. Active population decreased by 60% from 2,268,210 to 901,700 and employed population by 66% from 2,146,919 to 723,900. Thus, the agrarian income per employed person increased by 148%, yet at the expenses of the decline in the total number of employed populations. Furthermore, the results show that the remuneration of employees per AWU of employee work reduced by 27% between 1980 and 2020, while the entrepreneurial income by farm increased by 175%. Considering the combined process of the reduction in the number of farms along with the growth in size of the larger ones, with the increase of employee-based work, such results suggest that large farms are relying on increasingly worse remunerated employees. To this, it should be added the non-accounted precarious labour force which work on the Spanish countryside (Gadea, De Castro, Pedreño, & Moraes, 2015; Garcés Mascareñas & Güell, 2021; López-García, 2023).

Additionally, the results show that agrarian households show the lowest income. Households in which the main breadwinner did an elementary occupation in

agriculture, stockbreeding, forestry, and fishing show the lowest average monthly net monetary income among all households. Besides, households in which the main breadwinner worked as agricultural, stockbreeding, forestry and fishing skilled worker showed the third lowest average monthly net monetary income. This second result is surprising since it shows that despite working as 'qualified', the difference with households in which the main breadwinner did an elementary occupation is of little significance—a particularly relevant feature when considering the lack of substitution by younger people for the main ageing breadwinners who retire on many family farms. This also places the former households with the highest gaps in relation to the Spanish average monetary household expenditure, being below it throughout the whole period in the case of elementary occupations, and most of the years in the case of skilled workers. All of the former results illustrate that the monetary information that farmers have been receiving during the last forty years was negative, explaining to a large extent their decision of abandoning the activity (Gloria Isabel Guzmán et al., 2022). However, the threshold to take such decision cannot be determined yet.

In addition, some recent studies have shown that Spanish small family farmers are reacting to this situation adopting different, and sometimes opposed, strategies (Coq-Huelva, Sanz-Cañada, & Sánchez-Escobar, 2017; Manuel, Rivera-Ferre, & López-i-Gelats, 2023). There has been a polarization between monocropping oriented towards international markets farming—linked to the 'food from nowhere' model—and agroecological farming—linked to the 'food from somewhere' model—. However, there is a wide range of heterogeneity of farms combining elements from both models (Capdevila, 2023)

Focusing now on the weight of food in total household expenditures, results show a stabilization after 2007, with a share ranging between 14.1% and 15.1%,

except for years 2020 and 2021, which show a slight increase. However, since these years were affected by the COVID pandemic, it its necessary to wait for more evidence in the following years to confirm this later trend. The overall results are consistent with previous literature (Díaz-Méndez & García-Espejo, 2012; Gaspar Brändle Señán, 2010; González de Molina et al., 2020; Langreo & Germán, 2018), showing that all households followed this trend regardless the occupation of the main breadwinner. However, the households with the lower average monthly net monetary income showed the highest shares of food expenditure in relation to total expenditures, which correspond to agrarian households and household in which the main breadwinner had an elementary occupation.

The clear brake in the previous steady trend of decreasing weight of food expenditure in relation to the average total expenditure of Spanish household from the 2006 onwards—followed by the later increases experienced in 2020-2021—when at the same time the Spanish small family farmers experienced a clear contraction of their income, points out to a rise in the unequal distribution of the value-added flows along the agri-food chain—a trend already observed in Parajuá (2022)—Chapter I—.

Given that going deep into that question would require much wider research combining all the dimensions and linkages set in the research framework provided in Chapter II, with the preliminary exploration made here there is still not sufficient evidence to prove if there has been an increase in the food cost of the reproduction of labour so far. It would be necessary to examine the evolution of food prices, and also the composition of food expenditure in terms of quantities and products, an issue very linked to the changes in diet. In addition, it would be necessary to examine the former aspects also for the rest of categories of family expenditures, as well as the relation of expenditures with

household incomes. This socioeconomic analysis must be combined with a biophysical one, looking at the simultaneous trends experienced in the availability, costs and prices of energy and materials from a socio-metabolic perspective.

Among all categories of expenditure, I consider of particular relevance 'housing, water, electricity, gas and other', which followed an upward trend between 1980 and 2021 and turned into the first category of expenditure in relation to the total expenditure of households between in 1991, surpassing food. In 2021, its average weight was 33% without discriminating among households with and without own housing and living in areas with strong gentrification processes or not. Although a deeper examination of this issue is needed for reaching a conclusion, this trends suggests a rise in the cost of housing, which would be linked to the rising of platformisation and financialization of housing (Gil, Martínez, & Sequera, 2023).

The joint increase in the share of housing and the end of the decreasing trend of food share in Spanish household total expenditure may have resulted in the increase of the cost of reproduction for labouring families. If so, this would set the stage for a necessary increase of salaries so that such rises in food and housing could be afforded without compressing the effective demand for the rest of components of the household consumption baskets on which the profit shares and reproduction of all the other economic sectors depend. This would anticipate a conflict between capitalist and labouring people, as well as among capitalists themselves—between those who accumulate from housing renting and all those whose accumulation relies on cheap food—.

3.5. Conclusions

This Chapter explores two important aspects of the reproductive sphere of capitalism: the evolution of smallholder farming—critical in the reproduction of agroecosystems on which food production relies—and the evolution of food expenditure in households' budgets—being the food cost one of the major costs in the reproduction of labouring population—. I conduct a first empirical examination of these aspects in Spain between 1980 and 2021.

I used data from the Agrarian Censuses, the Agrarian Statistical Yearbooks and the Household Budget Surveys. The methodological changes undergone by the Agrarian Censuses difficulted the comparison among the years studied, which is one of the main limitations of this study. In addition, the removal of certain variables, such as the owning of land or not by farms, and the desegregation of the legal forms of farms, hindered the possibility to study these important issues until 2020. In this regard, the scientific community interested in this line of research should urge statisticians, and particularly those responsible for the Agrarian Censuses, to ensure that databases remain comparable over time.

Despite all the challenges with the available data, the results provide strong evidence of the decline in small family farms in Spain during the studied period. They also highlight the significant aging process of the remaining ones, thus indicating a threat to the reproduction of agroecosystems in Spain. Furthermore, the results illuminate the economic factors that might have led to this abandonment—specifically, the deterioration of the price ratio received and paid by farmers, the overall reduction in agrarian income and the lower income received by agrarian households compared with the rest of households.

With regard to the weight of food expenditure in relation to total expenditures of Spanish households, the results confirm the end of the decline of this weight

from 2006. However, these results are insufficient are not sufficient to answer the question whether there has been yet a novel increasing trend of the food cost of labour reproduction in Spain, and further research is needed on this aspect. Additionally, the halt in the decrease of food expenditure in household budgets contrasts with the contraction of agrarian income experienced by farmers during the same period—2003/2006-2021—, suggesting that such decrease is not being transferred to the end of the agri-food chain. So, what is happening withing the agri-food chain?

In this way, I believe that one of the main contributions of this Chapter is the identification of many future research avenues. In relation to the evolution of small family farms, it would be useful to examine the share of the agrarian entrepreneurial income that goes to small family farms as compared to large corporate farms and big enterprises of the agri-food chain. Additionally, it would be important to delve into the characteristics of farms to gain insights on the different paths and strategies farmers seem to be taking in order to survive. Furthermore, it would be necessary to adopt gender and feminist approaches to explore the role of women in small farming, both in terms of production and reproductive work, as well as the issue of land and the competition for its use with other growing activities in rural areas such as renewable energy activities.

In relation to food expenditure, it would be a priority to examine the trends of food prices as well as the changes of diet that may be related to them in labouring households, along with the changes of prices of the remaining categories of expenditure and their weight in quantitative terms. The former aspects need to be compared to household income in order to comprehensively assess the cost of food—and any other category—in the reproduction of labour. Additionally, it would be interesting to address the relation between the costs of food and housing—, both from the perspective of labourers and capitalist, as

well as the distribution of value along the agri-food chain, which may be pointing also to a conflict among capitalists.

Annex III.a. Data and methods

Table 12. Definition of Utilized Agricultural Area (UAA) and agricultural holding, and criteria for the scope population of the Agrarian Censuses 1982, 1989, 1999, 2009 and 2020

Agrarian Census	UAA	Definition of agricultural holding/farm	Population scope
1982	Total area taken up by cultivated land, permanent meadows, pastures, and land dedicated to permanent crops. It includes surfaces intended for harvesting during the reference period of the Census.(Instituto de Estadística de la Comunidad de Madrid, n.d.) It excludes wasteland and scrubland (Ruiz-Maya, 1992)	Technical-economic unit from which agricultural products are obtained under the responsibility of an entrepreneur. By exception, lands that continue to have an agricultural vocation but have not been exploited during the census reference period and uncultivated lands are included, even if their only use was hunting (hunting preserves). It includes farms with land (which have more than 1 ha of total surface) and farms without land (which have less than 1 ha but which have livestock) (Instituto de Estadística de la Comunidad de Madrid, n.d.)	It includes the existing agricultural holdings in the Spanish territory as of September 30, 1982, regardless of their legal form (natural person, legal entity, public or private) acting as an entrepreneur and regardless the destination given to agricultural production. Race animals and draft or work animals farming is excluded if the unit is not dedicated to breeding them. Zoos, animal farms for fur and game repopulation (except quails, partridges and pheasants, raised in captivity) and species such as dogs, cats, ornamental birds, etc. are also excluded. Agricultural service activities are not included either. (Instituto de Estadística de la Comunidad de Madrid, n.d.)
1989	The definition is the same as the one used in the Agrarian Census 1982. However, it inlcudes wasteland and scrubland when they are used for livestock breeding. (Ruiz-Maya, 1992)	The definition is the same as the one used in the Agrarian Census 1989.	The definition is the same as the one used in the Agrarian Census 1989
1999	Total area taken up by arable land and permanent pasture. Arable land includes arable crops, fallow land, family gardens and lands for woody crops (INE, 1999, p. 6).	Technical-economic unit from which agricultural products are obtained under the responsibility of a holder. It is characterized by the use of the same means of production: labour, machinery, etc.. The following are not considered agricultural holdings: Riding schools, stables and land used for the exercise of racehorses; kennels; animal shops,	It includes agricultural holdings existing in the national territory, as of September 30, 1999, regardless of the natural or legal person acting as the owner and the destination given to agricultural production (INE, 1999, p. 2).

		slaughterhouses, etc. (without breeding); draft or work animal farms, if the unit is not dedicated to breeding them; zoos, fur animal farms and game repopulation and species such as dogs, cats, ornamental birds, etc.; parcelled land that on the day of the interview is urbanized or urbanization work has begun; agricultural service companies It includes farms with land (which have more than 1 ha of total surface) and farms without land (which have less than 1 ha but which have livestock**)** (INE, 1999, p. 6).	
2009	Total area taken up by arable land and permanent pasture. Arable land includes arable crops, fallow land, family gardens and lands for woody crops (INE, 2009, p. 20)	Unit, from a technical and economic point of view, with a single management that carries out agricultural activities in the Spanish economic territory as both a primary and secondary activity. In addition, the holding may have another complementary (non-agricultural) activity. It is characterized by the common use of labour and means of production (machinery, land, facilities, fertilizers, etc.). This implies that if the plots of the farm are located in two or more municipalities, they cannot be very far apart geographically. (…) The following are not considered agricultural holdings: Riding schools, stables and land used for the exercise of racehorses; kennels; animal shops, slaughterhouses, etc. (without breeding); draft or work animal farms, if the unit is not dedicated to breeding them; zoos, fur animal farms and game repopulation and species such as dogs, cats, ornamental birds, etc.; parcelled land that on the day	It includes agricultural holdings existing in the national territory, as of September 30, 2009, regardless of the natural or legal person acting as the owner and the destination given to agricultural production, meeting the following criteria: All farms that have at least: - 1 ha of Utilized Agricultural Area (UAA) - 0.2 ha UAA dedicated to vegetables and flowers and ornamental plants outdoors or in low shelter or fruit trees (including citrus) irrigated or nurseries or greenhouses - 0.1 ha UAA dedicated to vegetables in greenhouses - 0.1 ha UAA dedicated to flowers and ornamental plants in greenhouses - 0.5 ha UAA dedicated to tobacco - 0.5 ha UAA dedicated to hops - 0.5 ha UAA dedicated to cotton Farms with one or more Livestock Units (LU) and with a Total Standard Production (TSP) equal to or greater than 0.75 European Dimension Units (EDU). These criteria are independent, i.e., at least one of them must be met for the farm to be considered part of the target population. Purely forestry farms are excluded from the census if they do not meet the above conditions, as the census refers to properly agricultural farms. However, when the farm under investigation has some forest mass,

		of the interview is urbanized or urbanization work has begun; agricultural service companies (INE, 2009, p. 16).	it will be collected in the questionnaire." (INE, 2009, p. 14)
2020	It differentiates between open air UAA and UAA in greenhouses. The former is defined as the UAA in 2009, and 2020. The latter is defined as the area of crops which are covered in greenhouses or high covers -both fixed or mobile, whose structures are usually made of wood or metal and the coverage are made of plastic sheet or glass- during their entire vegetative cycle or most of it. (INE, 2009, p. 18)	The definition is the same as the one used in the Agrarian Census 2009 (INE, 2009, p. 12).	It includes agricultural holdings existing in the national territory, as of September 30, 2020, regardless of the natural or legal person acting as the owner and the destination given to agricultural production, meeting the following criteria: All farms that have at least: - 5 ha of Utilized Agricultural Area (UAA) - 2 ha of arable land - 0.5 ha UAA dedicated to potatoes - 0.5 ha UAA dedicated to fresh vegetables and strawberries - 0.2 ha UAA dedicated to aromatic, medicinal and spice plants, flowers and ornamental trees, seeds, seedings and plant nurseries - 0.3 ha UAA of fruit trees, berries, nuts, citrus fruits, other permanent crops excluding trees nurseries, vineyards and olive trees - 0.1 ha UAA of vineyards - 0.3 ha UAA of olive trees - 100 m² of greenhouses - 100 m² of cultivated mushrooms - 1.7 ha of Livestock Units (LU) These criteria are independent, i.e., at least one of them must be met for the farm to be considered part of the target population. Purely forestry farms are excluded from the census if they do not meet the above conditions, as the census refers to properly agricultural farms. However, when the farm under investigation has some forest mass, it will be collected in the questionnaire. (INE, 2022, p. 9)

Sources: own elaboration based on (Instituto de Estadística de la Comunidad de Madrid, n.d.; INE, 1999, 2009, 2022; Ruiz-Maya, 1992)

Table 13. Calculation of the monthly net monetary income of households

HBSs	PERIOD	VARIABLE USED FROM MICRODATA
HBS 1980-81	1980/1981	**'TOTAL INCOME'**, which refers to the total net monetary income obtained by a household over a year [The HBS 1980-81 directly collects net income, that is, "net of taxes and other similar payments" (INE, 1983)]. I divided 'TOTAL INCOME' by 12 to obtain monthly figures. Additionally, I checked that 'TOTAL INCOME' equals the sum of the variables: 'ORDINARY INCOME FROM EMPLOYMENT'. 'ORDINARY INCOME FROM SELF-EMPLOYMENT'. 'ORDINARY INCOME FROM CAPITAL AND PROPERTY RENTS', 'ORDINARY INCOME FROM REGULAR TRANSFERS', 'EXTRAORDINARY INCOME FROM OCCASIONAL TRANSFERS', 'EXTRAORDINARY INCOME FOR OTHER REASONS', 'NON-BREAKDOWN INCOME' from microdata.
HBS 1990-91	1990/1991	**'TOTAL MONETARY ORDINARY INCOME' + 'TOTAL EXTRAORDINARY INCOME'.** [The HBS 1990-91 directly collects net income (INE, 1993)]. I divided the result of the sum by 12 to obtain monthly figures.
HBCS 97	1998-2004	***'INGNETT' = 'NET TOTAL INCOME'***. I divided INGNETT by 12 to obtain monthly figures.
HBS 2006	2006-2020	***'IMPEXAC' = 'EXACT AMOUNT OF THE HOUSEHOLD'S NET MONTHLY INCOME'***

Sources: own elaboration based on INE (n.d.-b, n.d.-a, 1983, 1993)

Table 14. Equivalences of occupations from CNO-79, CNO-94 and CNO-111

	CLASSIFICATIONS OF OCCUAPATIONS		
MAIN GROUPS	**National Classification of Occupations 1979 (CNO-79)**	**National Classification of Occupations 1994 (CNO-94)**	**National Classification of Occupations 2011 (CNO-11)**
1a. Directors and managers	*2 Members and management staff of organs of the Public Administration and Directors and Managers of Companies (Subgroups: 20, 21)*	*1 Management of companies and public administrations*	*1 Directors and managers*
1b. Directors and managers in Agriculture, Stockbreeding, Forestry and Fishing	*60 Directors and managers of agricultural or fishing companies or farms* in Agriculture, Stockbreeding, Forestry and Fishing	*1 Management of companies and public administrations* in Agriculture, Stockbreeding, Forestry and Fishing	*1 Directors and managers* in Agriculture, Stockbreeding, Forestry and Fishing
2. Scientific and intellectual technicians and professionals	*1 Professionals, technicians and similar (Subgroups: 01, 02, 03, 05, 06, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19)*	*2 Scientific and intellectual technicians and professionals*	*2 Scientific and intellectual technicians and professionals*
3. Technicians and support professionals	*1 Professionals, technicians and similar (Subgroups: 04 Pilots and air and maritime navigation officers, 07 Health technical assistants and medical, pharmacy and veterinary assistants)*	*3 Technicians and support professionals*	*3 Technicians; support professionals*
4. Accountants and office staff	*3 Administrative, accountancy and similar services employees*	*4 Administrative type employees*	*4 Accountants and office staff*
5. Catering, care, security and retail workers	*4 Traders, sellers and similar workers (Subgroups: 40-49) 5 Catering, domestic, care and security and similar workers (Subgroups: 50, 51, 52, 53, 57, 59)*	*5 Catering, care, security and retail workers*	*5 Catering, care, security and retail workers*
6. Agricultural, stockbreeding, forestry and fishing skilled workers		*6 Agricultural and fishing skilled workers*	*6 Skilled workers in agriculture, stockbreeding, forestry and fishing*
7. Artisans, manufacturing, construction and mining skilled workers (expect from installation and machinery operators)	*7/8/9 Personnel for mineral extraction, material preparation and treatment, product manufacturing, assembly and handling of machinery and facilities, construction and transportation, except subgroups 96 and 97*	*7 Artisans and manufacturing, construction and mining skilled workers (expect from installation and machinery operators)*	*7 Artisans and manufacturing and construction skilled workers (expect from installation and machinery operators)*
8. Installation and machinery operators and assemblers	*96 Operators of fixed machines and similar facilities 97 Workers for loading, unloading, handling of*	*8 Installation and machinery operators and assemblers*	*8 Installation and machinery operators and assemblers*

	materials, goods and earth movements		
9a. Elementary occupations	*54 Service workers in establishments, households and similar not included in other primary groups* *55 Concierges, porters, building cleaning staff and similar* *56 Workers in washing, cleaning and ironing clothes and similar* *58 Protection and security services personnel* *99 Workers not classified in other groups*	*9 Unskilled workers*	*9 Elementary occupations*
9b. Elementary occupations in Agriculture, stockbreeding, forestry and fishing	*61 Self-employed workers in agricultural and fishing operations 62 Agricultural, livestock and similar workers* *63 Agricultural, livestock and forestry workers* *64 Fishing, hunting and similar workers*	*9 Unskilled workers* in Agriculture, stockbreeding, forestry and fishing	*9 Elementary occupations* in Agriculture, stockbreeding, forestry and fishing

Sources: own elaboration based on INE (n.d.-b, n.d.-a, 1983, 1993)

CONCLUSIONS

In this PhD Thesis, I aimed at advancing understandings of the Spanish food system since 1980 up to the present focusing on its socioeconomic structural changes The research I conducted was primarily motivated by the unsustainability of the current food system and the need to transform it into a more sustainable and just one. It was grounded on the conviction that "history matters" (Enric Tello, 2005) and I sought to gain insights from the processes and dynamics that led us to the current situation to take actions in the present that can shape a better future.

In Chapter I and Chapter III, I provided empirical evidence of the path followed by the Spanish food system in the last forty years. The results from Chapter I, based on the input-output framework of the Spanish National Institute of

Statistics (*Instituto Nacional de Estadística*, INE), showed that the Spanish agri-food system continued to deepen its integration with the industry and services between 1980 and 2016, while further integrating in international markets—mostly within the European Union (EU) market—. The backward integration of agriculture, stockbreeding, forestry, and fishing was explained to a large extent by the increasing dependence of animal feed, linked to the growth of Spanish intensive livestock raising in industrial feedlots. This process was hand in hand with the reduction of the 'reuse rate' of agriculture, stockbreeding, forestry, and fishing, evidencing its decoupling from the land. In addition, the results showed an increase in the weight of trade services in the intermediate input structure of agriculture, stockbreeding, forestry, and fishing. This reached 20% of the total value of inputs in 2015, a rise that stemmed from the increase in trade margins. This last result points to the great market power exerted by large corporations and the impact of pricing dynamics on the value added retained by each of the stages of the agri-food chain. Chapter I also showed that the contribution of Spanish agriculture, stockbreeding, forestry, and fishing to the value added of the Spanish agri-food system—comprised of agriculture, stockbreeding, forestry, and fishing; the food industry; and food and accommodation services—continued to fall from 1980 to 2016. A final outstanding result was that people employed in agriculture, stockbreeding, forestry, and fishing halved while the rate of salaried labour doubled.

Results from Chapter III reinforced and complemented the former outcomes but focusing on the reproduction sphere of the food system. Data from the Agrarian Censuses from the INE and the Agrarian Statistical Yearbooks from the Spanish Ministry of Agriculture, Fishing and Food (*Ministerio de Agricultura, Pesca y Alimentación*, MAPA) showed a decrease in the agrarian and active populations between 1980 and 2020, as well as a decline in the total of Agricultural Working Units. Both reductions were hand in hand with a change in the composition of

work towards an increase in employee-based work at the expenses of family-based one. Additionally, results showed that the number of farms more than halved throughout the period, a decrease suffered mostly by small family farms, while larger ones increased in size. Those farms remaining increasingly underwent an aging process.

The decrease in the number of Spanish farms is explained to a large extent by the evolution of agrarian income, which showed a decrease in constant terms throughout the period. The results suggest that the deterioration of the terms of trade between farmers and input providers, favouring the latter, contributed to this trend. This result reinforces the findings from Chapter I, which demonstrated a decrease in the contribution of agriculture, stockbreeding, forestry, and fishing to the value added of the Spanish agri-food system, as well as the increasing prominence of trade margins in its input structure. Despite subsidies increasing in the last two decades, they were not sufficient to offset the previous trends. The upward trend in entrepreneurial income per farm between 1982 and 2020 seems to be the result of the disappearance of farms combined with the worsening of the remuneration of agrarian employees, which also increased their weight in the agrarian employed population, reaching 50% in 2020. Given the reliance of Spanish agriculture on immigrant informal labour (Gadea et al., 2015; Garcés Mascareñas & Güell, 2021; López-García, 2023), this situation may be much more pronounced in reality than data shows.

Additionally, data from Household Budget Surveys (HBSs) from INE also showed that households where the main breadwinner had a skilled or unskilled occupation in agriculture, stockbreeding, forestry, and fishing had the lowest monthly monetary incomes compared to other households, thus showing the largest gaps in relation to average monthly monetary household expenditure in Spain. Given that monetary flows are important information for farmers'

decisions on their continuity in the activity, results reveal that such information has been negative over the last forty years. This may explain the lack of replacement of farms and the previously mentioned aging process of Spanish farmers. This situation poses a risk for the transmission of the important 'cultural heritage' for the preservation of site-based agroecosystem (Koohafkan & Altieri, 2011; Joan Marull, Tello, et al., 2015). All the former results clearly indicate a crisis in the reproduction of agroecosystems in Spain, of which small family farms are an essential part, which jeopardizes the present and future provision of agroecosystem services, including food production and beyond.

The agroecosystem services that go beyond food production involve many environmental benefits which greatly contribute to environmental sustainability. In the Introduction of this Thesis, I reviewed the many environmental problems Spain is facing, ranging from water pollution to biodiversity loss, which have been largely caused by agricultural activities. Thus, agriculture is part of the problem and part of the solution—depending on the type of agricultural practices, agriculture can contribute to sustainability or to unsustainability. Additionally, agriculture is among the activities that are affected the most by these environmental issues (IPCC, 2019). Since small family farmers are better than big farms in providing agroecosystem services (Gloria Isabel Guzmán et al., 2022), this means that they are key agents in resolving the socio-ecological crises of our times, showing significant potential in terms of contributing to the transformation of food systems to be more sustainable and fair.

In Chapter III, I also examined the evolution of food expenditure in household budgets, as a first exploration of the cost of food for the reproduction of the labouring population. The results showed a stabilization of the weight of food in relation to the rest of household expenditures since 2006, after a downward trend since 1980. However, this result is inconclusive to determine if there was

an increase in this critical cost for labour reproduction. Anyway, this clear break in the previous steady trend of decreasing weight of food expenditure when at the same time the Spanish small family farmers experienced a contraction of their income suggests again a rise in the unequal distribution of the value-added flows along the agri-food chain.

The results from Chapter III were framed in a more comprehensive understanding of food systems—the research framework to investigate food systems at a national level and their role in the reproduction of the capitalist system they are embedded developed in Chapter II. This research framework was grounded on the limitations and contributions of food regimes and integrated the approaches of social metabolism and surplus/reproduction. It consisted of six dimensions, with 36 elements, and six cross-cutting connections between and within dimensions. It also highlighted the core idea of food regimes: the need for cheap to enable accumulation in the capitalist system. Chapter II was different from Chapter I and Chapter III, as it did not present data-based results but a research 'tool'. It emerged as a necessary step on my research, responding to my need to have a more comprehensive view of food systems that went beyond the production-oriented agri-food system of Chapter I. Therefore, Chapter II provided a guide to approach the complexity of national food systems, identifying a set of elements, links between them, and dimensions which interplay in its functioning.

In this regard, this thesis highlighted two main issues. First, the need to study agriculture as part of food systems. Agriculture is not isolated, but increasingly integrated with other sectors, as well as with broader economic, societal, and natural environments in which they are embedded. Therefore, framing it within food systems is essential to better understand its trajectories as well as to assess its future transformations (Porter et al., 2019; Rivera-Ferre, 2020). Second, the

need to investigate food systems from different approaches and perspectives. Chapter II was a first step in this direction, in which I brought together the approaches of food regimes, social metabolism and surplus/reproduction. This is also critical for addressing their current challenges and future avenues for their transformations. Among the approaches, I argue that political economy is especially relevant. Recent studies have shown that a transition towards an agroecological-based food system in Spain is feasible from a resource and technological perspective (Aguilera & Rivera Ferre, 2022). Thus, it seems that the main barriers to such a transformation are political. Delving deeper into food governance and the power relations that shaped and are shaping food systems so far, and their socioeconomic functioning, are critical to this end (Marsden et al., 2018; Rossi et al., 2019; Schebesta & Candel, 2020).

In addition, I consider this thesis can contribute to assess the necessary transformation of current food systems towards fairer and more sustainable configurations (Caron et al., 2018; Gaitán-Cremaschi et al., 2019; López-García, 2023). In Chapter I and Chapter III, I provided insights on the socio-economic transformations and trajectory followed by Spanish agriculture in the last forty years as well as some of the dynamics behind them. In Chapter III, I especially emphasized the important role developed by small family farm in the provision of agroecosystem services, and how their disappearance is threatening such provision. Therefore, Chapter I and Chapter III help to identify key areas of change where actions are needed to transform the current paths. Moreover, the research framework developed in Chapter II provides a broad multi-dimensional view of national food systems functioning in capitalism, putting forward the main elements and connections involved in it, and specifying a set of conflict points which can work as levers of change of current dynamics. I deem it can be very helpful when assessing the complexity of food systems, responding to the call for a more integrated, inclusive and systemic food

systems research (Davies, 2020; Aniek Hebinck et al., 2021; Porter et al., 2019; Rivera-Ferre, 2020).

Overall, with this Thesis I contributed to the agrarian history of Spain in the last forty years, providing new data on many issues, including the linkages within agriculture and between agriculture with the remaining economic activities, the links with international markets in terms of agri-food supply and origin of its intermediate inputs, the evolution of agrarian active and employed populations as well as the number of farms and their characteristics, the agrarian income and its components as well as the relative weight of agriculture in the agri-food system in terms of value added and employment. I also linked these data to the debates of sustainability and crises of reproduction of the third neoliberal food regime. By doing so, I contributed to sustainability science and agri-food studies in Spain. In addition, I added to the expansion of the political economy of food systems by creating a research framework to investigate national food systems incorporating different approaches and perspectives.

However, this thesis has some limitations, which suggest possible directions for future research. I will explain them in detail below:

Regarding Chapter I, the input-output database does not directly provide disaggregated data for the part of trade and transport services involved in the agri-food system. Although I included them in the calculation of the intermediate input structure of agriculture, stockbreeding, forestry, and fishing, the food industry and food and accommodation services, they were not considered as part of the agri-food system, which I defined as consisting of agriculture, stockbreeding, forestry, and fishing, the food industry and food and accommodation services. I think that incorporating them is essential to draw a more comprehensive picture of the agri-food system. Similarly, data for

food and accommodation services is not disaggregated for most of the period between 1980 and 2016. Although that data from the years in which food services and accommodation services were accounted separately confirmed the major share of food services in the aggregated value (83.3% on average in 1995-2009 and 2016), estimating their respective values would improve the accuracy of the research conducted in Chapter I. Finally, as a further step, it would be of high interest to complement results from Chapter I with the study of prices along the agri-food chain, including the role of trade margins, as well as with biophysical data. This would provide valuable information on how the monetary transformations described so far correspond to their biophysical counterparts.

The former results could be better interpreted if framed in the research framework I propose in Chapter II. Particularly, prices formation processes should be addressed considering the governance dimension, which results in specific policies with influence on the functioning of the agri-food asymmetric markets, as well as the power exerted by ruling capital owners over them. The research framework presented in Chapter II provides itself an extensive and expansive research agenda for advancing understandings on the Spanish food system, making explicit dimensions and apsects on which more research is needed. Among them, I consider a priority to research on Spanish food system governance. Although some studies have been published at an urban scale (Vara-Sánchez, Gallar-Hernández, García-García, Morán Alonso, & Moragues-Faus, 2021), studies at a national scale are lacking for the period here considered. This is in line with my former claim regarding the need to adopt political economy approaches, as well as with the interest to assess the governance over food prices and markets (Busch, 2011). Another priority from my view is to further investigate the connections proposed in the research framework, delving into the mechanism through which they operate. The

research framework itself could also be improved and further developed. I highlight the need to investigate the linkages between national, local, and global scales, as well as to advance on the incorporation of gender dimensions and improving the bio-physical one—already introduced trough the socio-metabolism dimension—. On top of this, new connections and dimensions may be envisioned and incorporated to it.

Regarding Chapter III, one of its main limitations concerns the heterogeneity of the Agrarian Censuses used, of which their changing criteria made their data not perfectly comparable. Further research needs to be done in this regard. Additionally, the Agrarian Censuses do not provide economic data of holdings, while the Agrarian Statistical Yearbooks offer macro data on the agrarian income, only differentiating between remuneration of employees and entrepreneurial income. This hindered the possibility to assess the agrarian income depending on the size and characteristics of each farm, which would be very relevant to understand the different paths and strategies small family farms are taking to survive (Capdevila, 2023; Coq-Huelva et al., 2017; Manuel et al., 2023). Assessing the characteristics of small family farms would be also very important to gain insights on their contribution to the provision of agroecosystem services and sustainability. The National Agrarian Accountancy Network (*Red Contable Agraria Nacional*, RECAN) seems a promising source to overcome this limitation. In the evolution of agriculture holdings in Spain, it would be of high relevance to investigate the role of women, both in terms of productive and reproductive work.

About the food cost of labour reproduction, further research is needed to determine if such cost has increased or not over the last decades. Advancing on the results I provided in Chapter III would require examining the trends of food prices as well as the composition of food expenditure, which is linked to

changes in diet and consumer preferences. Changes in diets and consumer preferences may respond to changes in prices, thus this inter-relation needs to be tackled with caution. Additionally, it would be necessary to study the changes in prices of the remaining categories of expenditure and their weight, as well as comparing food cost not only with total expenditures but with household income. By doing so, significant steps would be given towards improving the approach of the evolution of food cost in labour reproduction. For further expanding this area of research, it would be relevant to examine the remaining costs of labour reproduction, and particularly housing ones, as results from Chapter III highlight the significant increase of housing expenditure about total household expenditures, being the main category of expenditures since 1992 so far. Finally, results from Chapter III also put forward the need to further investigate food distribution—i.e. commercial and transport services—along the agri-food chain—an issue already brought to light in Chapter I—if we are to understand how and by whom value is distributed—and appropriated—along the agri-food chain, and how prices are built from producers to consumers.

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