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Integration through Subordination.

The Politics of Agricultural Modernisation in Industrial Europe

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This is a highly fragile area, hit hard by erosion, desertification, salinization of agricultural land and fires which destroy the vegetation and result in further soil erosion.

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environmental concerns have made a dramatic impact on the consciousness of historians in the field, while previous findings have been questioned in a critical way and new perspectives have been drawn.

The field known as Rural History remains very much alive, despite the decline of the agricultural sector over the last several decades. Rural History remains fundamental in a Europe which has for so long been kept together by its Common Agricultural Policy and which now has to face the heavy impact of Brussels-based initiatives upon its rural regions, and an unprecedented revision of current agrarian systems and systems of production in the countries which have recently joined the EU. How can the changes taking place in present-day Europe be understood without taking into account a past which is still very present, and which determines both structures and behaviour?

The volumes of this collection are the result of several workshops which have been held during the past years and which have mainly been supported by funds of the European Action COST A 35 and by other institutions like CORN, GDR CNRS Sociétés Rurales Européennes, Universities... The COST Action, which was initiated three years ago, intends to extend the historical analysis of rural society over the last millenium in order to envisage the problems of the countryside in an extended timeframe and also to draw upon the commentary and expertise of specialists from other disciplines (sociology, economics, anthropology). This will enable the first real comparison of Europe from historians from all over the continent, from Scandinavia to the Mediterranean and from the western frontier to the eastern limits. Papers from these meetings are published after a peer-review process, supported by the editorial board and, of course, the work of the authors and editors of the volumes. This collection is constructed upon four main pillars: *Landed property; The management of rural land; Peasant societies; The state, government, politics and peasants*. Each of these brings new perspectives and produce new tools to better understand the changes which are taking place today. In order to ask the relevant questions about the future of these peasantries and rural spaces in transformation, the books of this collection will deal with the *longue durée* and will present either research in progress or a synthesis on a regional or national scale. The cumulative effect of this approach will be to produce volumes, the geographical coverage of which will be the whole of Europe.

The volumes also, of course, take into account the role of history as an explanatory factor for contemporary European Societies. If rural societies have been overthrown, if rural landscapes have been profoundly transformed and if the intervention of the State has considerably strengthened the regulation of production and trade, the contrast between a contemporary rural world in rapid transformation and a traditional rural world with frozen landscapes, petrified societies, immobile economies and lethargic political contexts will be an illusion. It is important, therefore, to detect, to measure and to interpret the range of recent changes by illuminating those that have taken place in past centuries in a European context.

1. The state and agricultural modernisation in the nineteenth and twentieth centuries in Europe

Peter MOSER & Tony VARLEY

I. Introduction

The aim of this book is to deepen our understanding of the causes, nature and implications of agricultural change in Europe since the eighteenth century¹. We examine the political contexts in which agriculture was embedded by considering the appearance of modernising agricultural policies in industrial societies and some of their more consequential impacts. To set the scene – and to explore how notions of broad agricultural change have shifted over time – the first part of this introduction considers the historical development of agriculture in Western Europe. In view of the state's centrality to agricultural policy, an analytical discussion of the capacities of states to induce agricultural modernisation will then follow. The third part of our discussion will compare the variety of agricultural projects pursued in the specific political contexts of concern to the contributors to this volume.

II. Historical contexts

Attempts to tie instances of broad agricultural change to specific historical periods are always potentially contestable as regards their starting and ending points as well as their sources of dynamism. At the same time, an attempt at periodisation is indispensable if we are to impose some order on realities that otherwise threaten to become overly diffuse. While political reasons have often featured in attempts to account for broad agricultural change, by no means have they been the only sorts of reasons deemed consequential. Access to new resources as well as economic, social and technological developments and the creation of new 'useful knowledge' have often been regarded as of equal or greater importance as drivers of change (Hobsbawm, 1977; Crotty, 2001; Mokyr 2002; Sieferle et. al., 2006; Wrigley, 2010).

¹ This volume has its origins in a workshop, the third in a series organised under the auspices of Working Group 4 of the COST Action A 35, held in Möschberg, Switzerland in June 2008. We are thankful to the Swiss National Research Fund for its financial support of this workshop, and to Vicente Pinilla and especially to Jürgen Schlumbohm for their careful reading of the manuscript.

In what sense can periods of broad agricultural change in Europe be described as 'revolutionary'? Although the term 'agricultural revolution' is not universally accepted as accurately describing the broad changes within agriculture (Thirsk, 1987), the term remains viable as long as it is handled carefully. Paul Bairoch (1989) provides an ambitious and – especially if it is combined with an analysis of the issue of agriculture's widening resource base – useful periodisation of transformative change in western European agriculture. Bairoch distinguishes three agricultural revolutions occurring over the last 250 years or so. The first of these, extending from the seventeenth to the middle of the nineteenth century, saw change in agriculture as a matter of a broad re-organisation of the long-established system of using biotic resources on the land. What became definitive in the second agricultural revolution, which extended from the mid-nineteenth century to the 1940s, was the ever-expanding interaction between the new industrial societies and their agricultural sectors. The third agricultural revolution, commencing in the 1940s and continuing to the present day, was by far the most comprehensive and mould-breaking of all three – and therefore qualifies as the most unequivocally revolutionary of the three periods. It is characterised by the sharp drop in demand for human and animal labour and the unprecedented increases in production and productivity as well as a rapidly decreasing biodiversity. Critical to the third agricultural revolution was the newly gained access to the vast, but finite fuel reserves of the lithosphere. Since the 1950s food production, processing and transport have been largely, albeit never fully, based on the consumption of the same fossil fuel reserves that manufacturing industry has relied on since the early days of the thermo-industrial revolution when for the first time in history it became possible to decouple the processes of production and reproduction in the industrial sector (Georgescu-Roegen, 1960; Sieferle *et al.*, 2006; Wrigley 2010).

II.1. The period of the first agricultural revolution 1750-1850: Growth within the limits set by the use of biotic resources

The first of the three revolutionary periods illustrates how change that eventually works to transform the *status quo* can be a long drawn out affair that can be at once continuous with the past while breaking sharply with it. Selective and incremental change aimed at practical improvements has been a feature of agrarian societies for millennia, but a significant awakening to the possibilities of transformative change in the sphere of agriculture can be observed in the last quarter of the eighteenth century in many parts of northern and western – but not southern (Clar & Pinilla, 2009) – Europe. Agricultural change was evident not only in Britain but also in countries like France, Germany, the Netherlands, Sweden and Switzerland, where the interest in changing agricultural matters was stimulated by the rapid pace at which knowledge

was developing and organisational innovations were appearing. The interest in improving food and fodder production was strengthened by a combination of political and economic crisis conditions born out of the 'double experience of war and famine in the 1750/60s and early 1770s (Behrisch, 2008: 51; Stuber *et al.*, 2009).

In France and Germany the desire to achieve fundamental change in agriculture was influenced by the close relationship that developed between the 'absolute' monarchies and the Enlightenment rationalism associated with Physiocracy and Cameralism (Behrisch, 2008). For both schools it was essential that the enlightened absolutist rulers, as a means of enhancing their own political power and relative standing in the emerging competitive state system, supported the project of agriculture-led economic growth. In breaking with the earlier mercantilist ideas both the more theoretical Physiocrats and the rather pragmatic Cameralists shared the view that the growth of national economies would depend on agricultural production undergoing a fundamental transformation. Progress in achieving more output on the land by using the existing resources primarily required the creation and transformation of new knowledge, the application of technical innovations and the cultivation of new plants.

The state – whether organised along monarchical lines or constituted as a city republic – played a crucial role in stimulating agricultural change in order to achieve growth. Political initiatives, in other words, were pivotal in giving impetus to the movement for fundamental agricultural change. But how transformative in practice were the changes occurring during the period of the first agricultural revolution? The growing of nitrogen-fixing plants like clover, the re-organisation of husbandry methods such as stall-feeding and the extension of relatively newly discovered plants (such as the potato) were not revolutionary in themselves. However, when combined they enabled a substantial increase in livestock keeping which provided the essential manure for increased plant production and in turn this generated the basis for expanded livestock keeping (Pfister, 1995a). The closure of the age-old fertilizer gap, a characteristic of all solar-based agricultural societies, not only created the material background for unprecedented economic growth in agricultural production but, probably even more significantly, it opened up a radical new developmental perspective, inducing people to look forwards in their economic expectations (Koselleck, 1979). The preference given to *production* over *trade* by the Physiocrats in France, the Cameralists in Germany and the economic patriots as well as other elite-dominated agricultural improvement societies in many other countries challenged the hitherto dominant perception of agriculture as being an intrinsically static or stagnant form of economic activity.

A crucial feature of this development was the stimulus given to the complex process of creating and applying knowledge with a view to transforming agriculture. Not only did a substantial segment of the educated elite become interested in questions of how farming methods could be improved, but a number of practical farmers began to read and sometimes even write about the new production methods which they were developing, either together or in parallel with the academically educated agriculturalists of the new agricultural improvement societies (Stuber *et al.*, 2009). 'Practice with Science', was therefore a very suitable motto for the Royal Agricultural Society of England (established in 1837) to choose as its rallying cry (Brassley, 2008). Out of the first agricultural revolution arose not only significantly increased production but an institutionalisation of actors and discourses of knowledge within the agricultural departments of universities, agricultural colleges and farmers' clubs as well as within the print media of numerous farming-related publications and periodicals.

The most significant outcome of the first agricultural revolution was a swiftly emerging consciousness of the possibility of transforming agriculture into an increasingly dynamic sector capable of continuous growth (albeit a growth still inherently limited by its use of biotic resources which by nature are bound to cyclical processes of reproduction). In the longer term another, initially unintended, consequence of the first agricultural revolution was its contribution to the disruption of the established social and political order. Not alone did this contribute to hastening the end of the *Ancien Régime* but it facilitated the breakthrough to an industrial society that would bring forth new state elites and private and civil society actors with new interests and ideas as to how transformative change was to be conceived and pursued in the agricultural sphere. In other words, the changes during the first agricultural revolution are of an endogenous character, induced by actors shaping and re-shaping their environment (Boserup, 1965).

II.2. The period of the second agricultural revolution c. 1850-1950: integration of the agricultural sector into the industrial society

In the period of the second agricultural revolution the terms *modern* and *industrial* became increasingly regarded as one and the same. From now on modernising farming primarily meant seeking to emulate the new mode of industrial production in re-organising agricultural production. But since the resource base of agriculture in this period remained primarily the use of living animals and plants, the results of the modernising measures introduced in farming not surprisingly were often significantly different from those in industry. While, for example, the combustion engine rapidly displaced draught animals in industrial production, this source of power became even more important in agriculture as can be observed in the sharp rise of horses

on farms from the middle of the nineteenth century on (Moser, 2012). The same is to be said about wage labour: while it became a constitutive element of industry in the second half of the nineteenth century, it began to shrink in the agricultural sector (Koning, 1994).

The persistence and sometimes the new appearance of elements perceived as surviving from the pre-industrial area, evoked bewilderment in industrial and progressive agricultural circles. Agriculture and quite often those engaged in it, were increasingly seen as deviating from what was now more and more the industrially defined norm. This perception strengthened the pre-existing resolve to modernise farming and those working the land. One way of doing this was to convert peasants into farmers who conformed to the standard set by manufacturing industry. Such a normative ideal was succinctly formulated by the Swiss politician (and farmer) Zacharis Gysel who in 1854 published an important book with the revealing title: *Der Schaffhauser Bauer, wie er sein sollte, und wie er nicht ist, wie er ist, und wie er nicht sein sollte* (literally: 'The Schaffhauser peasant as he should be, and is not, and how he is and should not be') (Gysel, 1854). A growing number of civil servants, scientists and individual farmers became dedicated to modernising agriculture according to the norms followed in manufacturing industry (Sombart, 1902).

Although state interventions took a variety of different forms, as time passed practically every measure strengthened the tendency to integrate agriculture into industrial society by trying to make it look and function more and more like industry (Fitzgerald, 2003). This underlying tendency was often obscured by discourses of the late nineteenth century in which pressure groups, political parties and administrative and scientific interests demanded special treatment for the agricultural sector. So far historians have tended to reproduce rather than analyse these contemporary discourses. Historiography has overwhelmingly interpreted the wide-ranging state intervention in agriculture before World War I simply as attempts to protect the farming population from the negative impacts of the world markets at the cost of the consumers. While the protectionist rhetoric may support such a reading, a careful scrutiny of the actual policies being adopted and the outcomes of these policies suggest a rather different interpretation.

Even the most consciously protectionist measures did not inhibit the integration of agricultural production into the world market. In virtually all European countries the agricultural sector was integrated into the new division of labour dictated by the new global trading regime. It is commonly accepted that farmers in Holland, Denmark and Britain, countries strongly committed to free trade until the 1930s, changed their production patterns from grain to animal husbandry. Yet the very same process is

evident in countries like Switzerland, Germany and France, where governments had opted for a so-called 'protectionist' policy (Aldenhoff-Hübinger, 2002; Baumann, 1993; van Molle, 2008). Based on broadly converging outcomes, there are probably more similarities than differences between Britain after the repeal of the corn laws in 1846 and those Continental states with formally 'protectionist' trade policies in the late nineteenth century. In Switzerland, an early industrialised country like Britain or Belgium, grain-growing decreased just as dramatically as it did in free-trading countries. And productivity growth in Germany (with its agricultural protection) was among the highest in Europe (see Koning, below, Figure 2.3).

The crucial challenge, therefore, is not so much to describe the supposed success of lobby organisations but to analyze and explain why and how the different policies produced broadly similar outcomes in this period. One way forward is to scrutinise more critically the so-called protectionist policies. In Switzerland as well as in Spain, for example, it is much more precise to speak of a 'selective protectionism' than a general 'protectionist' policy (David, Mach & Straumann, 2008; Gallego Martinez & Pinilla, 1996). Such a policy empowered farmers to adapt to changing circumstances more than it protected them in their existing practices. Furthermore, agricultural policy reliant on selective protectionist measures was in its outcomes – as against its justifications or declarations of intent – far more dynamic than static in character. Usually it was accompanied by educational measures as well as by prohibitions and monetary incentives. Those engaged in agriculture were thus enabled to adapt to the new realities created by the transport revolution while simultaneously preserving the potential to produce at least a substantial portion of the food so badly needed when international trade became seriously disrupted during World War I.

In the last quarter of the nineteenth century agriculture had become – along with increasing imports – virtually the sole provider of food for the ever-expanding urban-industrial population whose members were increasingly losing the knowledge, skill and capacity to produce even a small portion of their own nourishment. Simultaneously agriculture also became an essential provider of many of the raw materials such as leather in shoemaking, or plants and wool in the expanding textile and clothes-making industries. And, equally importantly, the demand for industrial goods in farming circles itself grew rapidly in the same period. Agriculture before World War I, in other words, became more rather than less important within the industrial societies of western Europe. It is, therefore, not surprising that it was regarded more as a valuable resource than as a burden. Agriculture not only provided food for the expanding urban population, it also 'contributed in an essential way to modern economic growth' (Federico, 2005). It made as much economic as political sense for the European industrial states to invest in, regulate and protect

this increasingly important sector by pursuing modernising policies that were by no means synonymous with protecting individual farmers.

It is noteworthy that official measures taken in this period still usually took into account the distinctive organising principles (*Eigenlogik*) of the agricultural sphere where the process of production was still closely tied to the process of reproduction. Production in agriculture had therefore to be organised cyclically and seasonally rather than along linear and continuous lines as was now customary in industrial production. Educational institutions and labour policies of the industrial states allowed for the idiosyncrasies of agricultural production by, for instance, establishing so-called winter schools for young farmers or fixing variable summer and winter working hours and minimum wages for farm labourers (Flückiger, below; Collins, 2000).

The purpose of these 'special' measures, deviating from the industrial norm, was (as with selective protectionism) by no means to preserve a pre-industrial peasantry. On the contrary, it was meant to help to bridge the widening gap between agriculture and industry and effect a transition from a peasant to a modern agriculture in practical ways. Instead of turning 'peasants into Frenchmen' (Weber, 1976) the agricultural policies were aimed at transforming 'peasants into farmers', as Ernst Laur, the internationally acclaimed agricultural economist and director of the Swiss Farmers Union expressed it. Laur maintained that one of the most efficient measures to achieve such a transformation was the adoption of systematic book-keeping even on small and medium sized farms. He developed, on a scientific basis, a book-keeping system for peasant farms (Laur, 1911). Laur was convinced, that the practice of book-keeping 'will turn the peasant into a farmer' (Laur, 1907). Right from its inception in 1898 the *Swiss Bauernsekretariat*, the scientific department of the Swiss Farmers' Union, organised book-keeping courses for hundreds of peasants with the intention to transform them into small and medium-sized commercial farmers who closely aligned their cultivation of the land with the demands on the markets and the regulations of the state. Farmers with such abilities were, in many ways, more successful in adopting the new modernising measures than the big estates heavily dependent on wage labour. All over western Europe, as the coal-based transport revolution and the advent of industrial fertilizer broke the Malthusian connection between population and prices (Koning, 1994), these big estates found themselves unable to compete successfully with the medium-sized farms depending mainly on family labour.

For the first time since the beginning of the second agricultural revolution the hazards of relying on global food markets became obvious in the later stages of World War I. In many European societies under the impact of the ensuing food crisis a wide variety of actors (including hitherto liberal-minded free traders and substantial

sections of the political left who had long fought more for cheap food prices than for higher wages) came to realise the agricultural sector's crucial importance for industrial society's continued well-being. Under the new circumstances even societies that had adopted free trade policies in the second half of the nineteenth century now began to opt for an agricultural policy that favoured the production of food over trading in foodstuffs. A whole range of measures – such as compulsory production, educational offensives and price incentives – was implemented in pursuit of this goal. In Switzerland this policy went so far that agriculture became organised along the lines of a public service (Moser, 2012). Even in hitherto free trade strongholds like the United Kingdom or the Netherlands the state intervened heavily in the agricultural sector during the interwar period (Schuurman, below).

The desire to integrate the agricultural sector seamlessly into industrial society was carried to such lengths in the period of the second agricultural revolution that, in light of the difficulties of saying definitively where agriculture ended and manufacturing industry began, contemporary historians have commenced to question the adequacy of the very term 'agricultural sector'. For the very same reason the term agrarian knowledge society (Uekötter, 2010) has been extended and reformulated as 'agrarian-industrial knowledge society'. This is a much more precise (if less elegant) term for analysing the processes of knowledge production, transformation and implementation in agriculture since the middle of the nineteenth century (Auderset, Bächli & Moser, 2012).

In summary then a far-reaching integration of the agricultural sector into the industrial society was achieved during the period of the second agricultural revolution. At the same time it should not be forgotten that agricultural production remained not entirely, but to a large degree, tied to the reproduction cycles of its biotic resources and thereby remained capable of reproducing a substantial part of its own resource base within the process of production.

II.3. The third agricultural revolution: a partially successful attempt to industrialise agricultural production

'The relationship with the environment has always been a distinctive feature of agriculture, but its nature has changed deeply in the recent decades'. To formulate this important observation by Giovanni Federico (2005: 5) more precisely: a *fundamental* change in the 'colonisation of nature and the societal metabolism' (Landsteiner & Langthaler, 2010) occurred in the post-war decades with the widespread adoption of the combustion engine in agriculture. Access to the enormous fuel reserves of the lithosphere – hitherto a resource almost exclusively consumed in industrial production – substantially, albeit never fully, transformed the *cultivation* of soil,

plants and animals into an activity of *converting* mineral resources into food for human consumption. This was the single most important factor that, in the ensuing 'productivist' phase (Ilbery & Bowler, 1998), enabled the historically unprecedented growth in the volume of food production as well as in the productivity of agricultural labour, the latter even beginning to surpass that of the industrial and service sectors (Bairoch, 1989; Halbeisen, Müller & Veyrassat, 2012; Federico 2012).

From the late 1940s onwards it was the versatile, multi-purpose oil-fuelled tractor that truly revolutionised work in Europe's fields. Together with the ready availability of other fossil fuel-based inputs and machinery – mineral fertilizer, pesticides, fungicides and motorised mowing, milking and harvesting machines – a historically unprecedented replacement of people and draft animals was set in train. What is called the replacement of labour by capital in neo-classical economics can more precisely be described as the substitution of living resources by mineral ones, thus permitting the partial decoupling of production and reproduction in agriculture for the first time in history.

But the spectacular increase in food production of the post-war era is the result of a complex process. It cannot be adequately explained by one factor alone. The ready availability of cheap oil (Pfister, 1995b) would hardly have produced these momentous results on its own; a variety of new and old actors were active in intervening and shaping the unfolding process. New knowledge and skills were created, transmitted, acquired and applied to agricultural practice. The outcome would have been quite different had the space left by the declining number of farmers, farm women and farm labourers not been simultaneously filled by the swelling numbers of agronomists, technicians, veterinary surgeons, inseminators, advisers, accountants, salesmen and other actors specialised in interpreting the new (as well as sometimes the old) knowledge needed to exploit the new production possibilities (Uekötter, 2010; Flückiger, below). In other words, the approach of the farming population towards the process of cultivating the land had to be substantially changed. Agricultural institutions and individuals sceptical, reluctant or even hostile towards this form of modernisation found themselves increasingly marginalised. It is only since the late 1980s with the advent of post-productivism, often co-existing with productivism within the same farm, that state institutions and scientists began to take seriously alternative notions of how agriculture should be conceived and practiced.

Largely because of the newly acquired access to the fossil fuel-based resources the same broad project of agricultural modernisation as pursued in the two preceding periods now produced strikingly different results. Alongside the spectacularly growing volume of food and labour productivity stands the loss of social- and bio-

diversity in the countryside. The extent and severity of ecological degradations in the rural world in the second half of the twentieth century illustrates how similar (or even bigger) problems can arise in farming as in industry when it comes to be based on the same resources and is organised according to the same principles and practices as manufacturing industry. The animal welfare issue aptly illustrates in its turn what becomes unavoidable when what is considered 'normal' and desirable in industry (i.e. production on a large scale and the transportation of goods over long distances for cost and market reasons) becomes morally highly objectionable in agriculture on the grounds that it often harms living creatures. Another example of the different results produced in the third agricultural revolution compared to its two predecessors is the loss of energy efficiency and biodiversity. The eighteenth and nineteenth century improvements such as stall-feeding, the introduction of human and animal-operated machinery and improved crop rotations actually increased the energy efficiency of production along with biodiversity. Yet, in the second half of the twentieth century, when agricultural production began to rely increasingly on the consumption of fossil fuel, the efficiency ratio declined dramatically alongside rapidly shrinking biodiversity (Krausmann, 2006).

The policy of integrating the agricultural sector into industrial society gained strong support from the breakthrough that saw the 'social state' being virtually universally accepted by all the relevant political forces. From the 1940s on agricultural policy in almost all European states contained a social dimension in favour of the still numerous segment of the working population toiling on the land. It enabled those surviving in agriculture to realise an income comparable to that earned by those employed in industry and services. The extension of the 'social-democratic' welfare state idea to the rural areas was supported in principle, if not in every detail, by European liberal, social-democratic and conservative governments alike. Similarly the Common Agriculture Policy of what became the European Union contained social, regional as well as economic elements. Individual farmers were encouraged and indeed obliged to increase the volume of their production as well as changing it even more towards animal products in order to meet increasing consumer demand. In some areas production ultimately exceeded demand, thus leading at first to the introduction of costly export-subsidies to dispose of the surplus (Spoerer, 2010; Patel, 2009) and then to production restrictions at the level of the individual farm.

The agricultural policy of practically all European states, within and outside the EU, not only offered incentives to stimulate increased production but also put in place mechanisms to achieve the most radical structural reform ever seen in agriculture. The modernising policy, as Yves Tavernier (1972: 22) had already realised by the early 1970s, literally provided fuel for the machinery of displacing producers. Even

economists fundamentally critical of the European 'high-price' policy stressed the point that it was specifically this policy that forced the farmers to achieve the highest possible productivity (Kleinewefers, 1972). Not surprisingly, it was precisely during the period of this policy that the vast majority of all farms were given up within a generation or two, thus reducing the ever smaller fraction gainfully occupied in agriculture to a tiny minority even in most rural areas. The widespread, endless but ultimately futile demonstrations and protests of European farmers against their displacement from the land in the post-war area are a telling indication that this policy was a much more complex one than has been often depicted in the literature which tends to misread this defensive collective action as an instance of successful 'rent seeking' behaviour (Hofreither, 2009).

Not surprisingly, the numerical, social and spatial contraction of agriculture significantly influenced the agricultural organisations. The once relatively powerful farmers' organisations, which more and more had acquired the role of implementing state agricultural policies during the latter years of the second agricultural revolution, now tended to become the ever more co-opted 'machines of integration', ready to adapt industrial and urban values to a degree that frequently even went far beyond that of sections of the urban elites. This can be seen, for instance, in their hostility towards peasant and organic farming-friendly policy measures in the 1970/80s (Moser, 1994; Vogt, 2000). While serving in the corporatist era to strengthen the policy of integrating agriculture into industrial society almost uncritically, the main farmers' organisations more and more departed from their equally important role of representing the diversity of the agricultural world. The result of this departure has been a weakening of agriculture's position vis-à-vis the agri-industrial world, as is illustrated revealingly by the sharp decline in the prices producers realise since the 1990s even though consumer prices continue to increase (Moser, 2012). The above-mentioned farmer demonstrations directed against state agricultural policy have been a notable consequence of this process of co-optation. Not surprisingly too, they were often aimed in part at their own official representatives. Parallel to the integration of the mainstream farmers' organisations into the agri-industrial complex and the state administration, we can observe the appearance of a great variety of non-governmental organisations (including a number of newly established farmers' organisations) tied to the emergence of different farming styles and production methods (Van der Ploeg, 2003).

Notwithstanding this diversification of agricultural representation in the last three decades, agriculture as a whole has experienced a dramatic weakening on the cultural and symbolic level. Today, even the very term 'agriculture' is fast disappearing from the lexicon of everyday life, as is seen for example when departments of agriculture

are re-named departments of food and rural development or political parties drop any reference to their rural origins so as to remain – or to become – part of the (post)modern world. Agriculture today is more and more incapable of intellectually explaining and politically defending and upholding its own distinctive organising principles (*Eigenlogik*), principles that despite everything still retain their relevance. Even the most advanced forms of industrialised agriculture continue to depend on using plants and animals whose production is tied to the reproduction of its own basis and therefore remains subject to cyclical and seasonal constraints. The abandonment of customised education for agronomists and the way agricultural colleges tend to ignore the seasonality dimension in organising farmers' education today are only two examples of the tendency to ignore agriculture's distinctive peculiarities². At the same time agriculture remains, primarily for food and recreation related reasons, an important factor in European societies even in the early twenty-first century – a fact that is partly mirrored in its continued significance within the European Union's policy regime and also in the attractions it continues to have for young people in spite of the long working hours and relatively low incomes awaiting those who opt to work in agriculture and live from it.

When Wrigley (2010) argued that the energy revolution in manufacturing at the end of the eighteenth century industry opened a Pandora's box, the same must even more forcefully be said of what happened in the attempt to industrialise agricultural production during the period of the third agricultural revolution. It is therefore appropriate that we now turn to look more closely at the forces responsible for giving shape to these changes and for driving them forward.

III. Strong states and agricultural modernisation viewed analytically: four ideal-typical scenarios

It almost goes without saying that this sketch of agricultural development in western Europe over the past 250 years or so can depict only the broad frame. We need, to gain a better impression of the images within the frame, to look more closely at the national level where a variety of natural, social, economic and political conditions and actors, discourses and practices have interacted to influence the development of agriculture in specific cases. But how do we begin to compare variations in agricultural development across nation-states and regions? Taking the centrality

² That seasonality still features greatly in contemporary agriculture can be seen in the hundreds of thousands of seasonal harvest workers drawn from the fringes of Europe (or from outside it) to work mostly on big capitalist farms similar to those that flourished prior to the rise of family farming at the end of the nineteenth century (KONING, 1994).

of states as agents of change in industrial societies as our departure point, we will commence by posing four general questions:

Why do 'state elites', and their civil society allies and agents, choose to intervene in agriculture with a view to modernising it?

What do these elites understand by agricultural modernisation?

What sort of power resources do they believe to be necessary if their efforts are to be effective?

What implications follow for the farming population and farming from these modernising policies?

Our general answers to these four questions will introduce four hypothetical possibilities in the form of elementary ideal-typical scenarios of the aims and capacities of state elites intent on inducing 'agricultural modernisation'. As these ideal-typical scenarios consciously exaggerate and simplify complex historical realities, the pictures they provide us with may be empirically possible, but they are not empirical descriptions or explanations in any strict sense. The prime purpose of our ideal-typical scenarios is rather to provide interpretive benchmarks that can facilitate the reading and comparison of real world cases. Ever since Max Weber's pioneering methodological discussions, modelling *via* ideal-types, or scenario modelling, has been a potentially useful tool in the comparative historical and social sciences (Burger, 1987).

The four general answers are at one in assuming that strong states and their civil society allies and agents, for all their diversity, organisational complexity and irrespective of the bases of their strength, can be regarded as agents for certain purposes. They further converge in assuming that state elites are central to the capacity of states to exercise agency. It is these elites who we will take as finding the prospect of modernising agricultural change appealing and as coming to a clear-headed conception of what qualifies as modernising agricultural change. We will further assume that these state elites can come to a firm view of what sort of power resources the state needs to have at its disposal, and to deploy strategically and skilfully, if it is to have a realistic chance of converting visions of modernising agricultural change into concrete policy and farming realities.

By way of answer then to the question of *why* state elites might desire agricultural change of a modernising kind, we will suggest that our ideal-typical state elites have cogent political (as against economic) reasons for desiring such change in the

first instance. Basically these political reasons reflect the view that a modernised agriculture is a necessary condition of having a stable modern state and a food-secure modern (*i.e.* industrial or post-industrial) society. Couched in functionalist language Eric Hobsbawm (1997: 214) comes at the problem somewhat differently by speaking not of reasons but of the functional contributions agriculture can make to the well-being of modern society. The three specific contributions he identifies cluster around modern agriculture's provision of food and raw materials, labour power reserves and capital.

Our second ideal-typical scenario suggests that state elites take agricultural modernisation to be at once transformative of the *status quo* and historically progressive³. For agricultural change to be transformative it must seek to change the existing system of production (whether in whole or in part) fundamentally as against superficially or cosmetically. Transformative agricultural change qualifies as historically progressive in so far as it is viewed as significantly improving on the past. A broad series of transformative and historically progressive changes may come to be regarded as an agricultural 'revolution'.

Our third ideal-typical scenario addresses the sort of power resources state elites perceive to be necessary if transformative change in agriculture is to be pursued effectively. General and specific forms of infrastructural power are relevant here⁴. General infrastructural power rests on two foundations: the state's capacity to build sufficient consent among its subjects or citizens to underpin its own political authority; and, secondly, its capacity to use coercion (as required) to deal with those who stand in its way. These general consensual and coercive power resources are drawn upon in fashioning the specific infrastructural power resources states rely on in stimulating, regulating and co-ordinating economic activities as well as in planning their future development. A strategically important specific power resource where agriculture is concerned – one resting on the consensual foundations of general infrastructural power – is the state's capacity to co-opt the co-operation of civil society actors and professional and private interests in corporatist partnership-type arrangements

Our fourth ideal-typical scenario suggests that 'subordination' to the values and production logic of manufacturing industry is a major consequence for the farming population and agriculture of the state's modernising efforts. We find

³ This suggestion is in keeping with TIPS' (1973: 202) still valid observation that '...there is general agreement that whatever else it may be, modernisation is a type of social change which is both transformational in its impact and progressive in its effects'.

⁴ MANN (1988: 5) sees the state's infrastructural power is a matter of 'the capacity of the state to actually penetrate civil society, and to implement logistically political decisions throughout the realm'.

an early expression of this subordination thesis in the 1848 remark of Marx and Engels ([1848] 1997: 7) that the countryside would increasingly be subjected 'to the rule of the towns' within the emerging order of global capitalism. Similarly Eric Hobsbawm (1997: 206) observes how, in the 1848–1875 period, 'what a growing part of agriculture all over the world had in common was subjection to the industrial world economy'. The subordination in question here became more pronounced as the farmers' assigned role as cheap food providers developed, the numerical size of the farming population contracted with labour-saving mechanisation, urban employment opportunities opened up to rural migrants and the representatives of organised farming interests became progressively more co-opted by the state.

With these four elementary ideal-typical scenarios of the strong state intent on pursuing agricultural modernisation in hand, we are now ready to consider how modernising agricultural change has actually materialised in the cases the contributors of this volume examine.

IV. The Politics of Agricultural Modernisation

Eight of the contributions to this volume look at efforts to modernise agriculture in Spain, the Netherlands, Greece, Hungary, Germany, Switzerland, Belgium and England at various periods. Four others compare developments in two or more cases in such states as Austria, Portugal, France, Liechtenstein and Italy. The chapters contributed by Fritz Georg von Gravenitz and Niek Koning are distinctive for ranging in scope beyond Europe's geographical borders.

In reviewing these contributions in light of our discussion above, we will begin by asking whether political reasons were uppermost in attempts at initiating agricultural change? The crucial importance of the state for developments in agriculture is at the heart of most of our contributions, as is the centrality of perceived economic and political crisis conditions to the desire of state elites to intervene. Niek Koning argues, in his wide-ranging overview, that the state became significantly more important for agricultural development after the industrial revolution. In the second half of the nineteenth century in particular the transport revolution helped to bring about a fundamental change in agricultural markets that saw periodic chronic scarcity giving way to recurrent oversupply. The ensuing crisis of capitalist agriculture, greatly stimulated by prolonged crisis market conditions, was eventually resolved in favour of family farming. Thus began a long period where, on account of the perceived disadvantages of family farming in the field of scientific research and formal education, 'farm progress became increasingly dependent on government support' (Koning, below).

Crisis conditions threw up a variety of challenges that state elites found difficult to ignore. The rural unrest generated by the agricultural crisis of the late nineteenth century, for instance, induced states in Central Europe not only to re-define their trading policies but, at least as importantly, to establish and support what Jonathan Harwood calls 'peasant-friendly' plant-breeding stations. State elites would also encourage the emergence of new scientifically educated professions such as the agronomists. Daniel Flückiger describes for Switzerland how agronomists influenced agricultural practices directly by taking up farming and teaching upon graduation, and indirectly by staffing the emerging agricultural associations and finding employment in large numbers in the state administration. Another set of newly created professionals became crucial to the food control regulatory arrangements appearing in parts of Spain in the three decades preceding World War I. The Spanish state legislated, according to Gloria Sanz Lafuente, but the law's implementation depended – just as in many other countries – on different arms of the state deploying an increasing number of scientifically trained professionals.

Economic as well as political crisis conditions, Anton Schuurman argues, induced the Dutch state elites to intervene extensively in the 1930s in order to re-shape the agricultural institutional matrix in ways approximating to the sort of extensive state intervention characteristic of the period of 'organised capitalism'. Ernst Langthaler describes how Austria and England alike, in spite of having highly contrasting political regimes, intervened heavily in their agricultural sectors in response to the crisis conditions presented by World War II. Contrary to the common interpretation of the crisis-ridden interwar period as one that saw 'the end of globalisation' (James, 2001), Fritz Georg von Graevenitz conceives of the emerging international sugar regime as moving from non-binding non-governmental accords to binding, governmental pacts, thus providing the foundation for the post-1945 international sugar-trading regime. Effectual internationalism proved, in this account, to be a successful strategy of complementing national economic policies under conditions of severe crisis.

A further manifestation of crisis conditions, in the form of fascism's defeat in World War II, spurred autocratic regimes in Portugal and Spain in the 1950/60s to pursue the contrasting strategies of agricultural modernisation described by Dulce Freire and Daniel Lanero. And the post-war Soviet conquest of Hungary was followed by a crisis for the new autocratic Hungarian state in relation to agriculture in the 1950/60s that ultimately was resolved, according to Zsuzsanna Varga, in ways that paved the way for the 'Hungarian agricultural miracle'.

In what sense (if any) can the contemplated change discussed by our contributors be viewed as 'revolutionary' in the modernising sense of being transformative and

historically progressive? Only two of our authors use the term 'agricultural revolution' explicitly. Niek Koning refers, when using the term, to 'a period of agricultural growth and adjustment of farm techniques'. In spite of its vagueness Ernst Langthaler opts to retain the concept and suggests that agricultural change to qualify as revolutionary must be relatively rapid in its speed, fundamental in its extent and progressive in its direction. Socrates Petmezas reminds us that Greece – along other southern European societies – missed the first agricultural revolution altogether. And it becomes clear from Paul Brassley's figures for the United Kingdom that the increase in agricultural output in the two decades after World War II was 'more than twice the annual rate of increase in the classic agricultural revolution period of the eighteenth and nineteenth centuries' (Brassley, below).

Whether distinctive conceptions of transformative agricultural change emerged in the decades following World War II is a question a number of the contributors to this volume pose. Central to the post-war modernisation that appealed to the Iberian technocratic and economic elites was a desire to exploit the economic opportunities the post-war economic recovery was opening up at home and abroad. Much the same was true of Greece, where breaking the ecological and institutional deadlock Socrates Petmezas identifies depended not alone on a strong state at home but equally heavily on the capacities of the industrial states of western Europe to absorb a large part of the rural population of the South (whose foreign work experience paradoxically often commenced in the agricultural sectors of the industrialised host states).

If the post-war push for agricultural change in southern Europe is explicitly presented as 'modernising', it arguably merits the description 'revolutionary' by virtue of aspiring to be transformative, comprehensive and historically progressive. Certainly the modernisation effort in these southern European cases was motivated by a desire to boost the productivity of land and labour significantly.

Others, of course, had earlier travelled along a similar road to that taken in southern Europe in the post-1945 period. For example, the version of modernisation embraced within the Dutch 'agricultural institutional matrix' from its inception in the late nineteenth century was built heavily upon a normative preference for using science, technology and improved farming practices to make agriculture progressively more efficient, productive and competitive in export markets.

Broadly speaking we find state elites, even when the circumstances they faced differed widely, converging in the view that making agriculture more competitive was historically progressive by virtue of being good for the wider society and for the farming population as well. How to proceed, of course, was another matter and here the political differences between autocratic and liberal democratic states counted for

much. Among the cases considered in this book post-war Hungary is distinctive in opting for collectivised agriculture as the best means of expanding land and labour productivity.

What specific power resources were deployed by state elites in pursuit of agricultural modernisation? Where the state's more general infrastructural power resources to achieve their goals are concerned, the authors agree that much more use was made of consent than of coercion. The most obvious exception here is post-conquest Hungary where for long the state's overriding concern was to use coercion to advance a model of modernisation that entailed re-organising agriculture structurally and ideologically along Soviet-style lines with a view to rendering it better able to supply the food needs of an industrial society.

In all other cases state elites attempted to secure the consent of farmers by appealing to their individual and collective self-interest and to their sense of duty as citizen producers in industrial or industrialising societies. Typically agricultural change was presented officially as good for *all* farmers at *all* times. The broad promise was to increase the incomes and working conditions of the farming population and to emancipate the semi-subsistence peasant from what was often depicted as ignorance, drudgery and poverty. But the pretension to be modern at almost all costs was by no means unique to governing and administrative elites. Quite often, as Daniel Flückiger demonstrates for interwar Switzerland, individuals, sections or even generations of farmers shared this view to a great extent.

In the third quarter of the twentieth century, when the productivist phase reached its pinnacle in agriculture, a political consensus came to be built around the official view, heavily influenced by agri-business, that only an ever-diminishing number of farmers had any realistic chance of staying on the land in the longer term. Indeed, shrinking the agricultural labour force came to be officially accepted as a necessary condition of agricultural progress – even if this was seldom as sharply formulated as in Spain where Rafael Cavestany, Minister for Agriculture from 1951 to 1957, encapsulated his modernising project in the motto 'fewer farmers, more agriculture'. A similar determination, though usually less directly communicated, was practiced in Holland, Switzerland and other already highly industrialised societies.

In the second phase of the productivist era, when significantly post-productivist ideas were already on the rise, Flavio Ruffini and his colleagues argue that off-farm employment creation became central for rural development in the Alpine regions. A question closely related to the growing prominence of 'rural development' policies throughout Europe, but one not pursued by any of the contributions in this volume, is where the 'best' balance between agricultural decline and increasing off-farm

economic activity lies? This question is of crucial relevance since it is still agriculture, through its cultivation of the soil, its use of plants and animals and its maintenance of the landscape, that provides much of the basic infrastructure for rural tourism.

We have already seen how professionalisation, and the deployment of a whole set of new professions (such as the agronomists), became a critically important power resource for state elites intent on changing agriculture *via* building consent for modernisation. Nowhere is this clearer than in the sphere of agricultural education and advice. It was through agricultural education and extension that state elites not only elaborated their conception of commercialised agriculture but provided the detailed instructions as to how the various practices of peasant farming had to be adjusted to the needs of a rapidly growing agri-business, operating on the basis of adding monetary value through the transformation of fresh food into storable commodities.

There were occasions when state functionaries became adept at deploying themselves and their professional approach skilfully and to telling effect in building consent with the farming population. Agronomists as agents of modernisation in Swiss agriculture, according to Flückiger, appealed particularly successfully to young farmers. For many of them to be unambiguously 'modern' became a significant marker of identity that allowed them to distance themselves not only from their parents and their way of farming but even from their teachers who often had a background in practical farming.

How effective were the modernising efforts in agriculture? And what considerations were decisive in accounting for effectiveness and ineffectiveness? To have the consent and support of at least the main farming organisations was something that state elites typically considered to be crucial. Such consent and support had to be won, nurtured and maintained, though it is obvious that in some instances (such as in the Netherlands, England and Switzerland for much of the twentieth century) modernising state elites were simultaneously pushing an open door as well as fighting against opposition when dealing with organised farming interests. The *quid pro quo* for the representatives of farming interests intent on working closely with the state was that corporatist relations with ministries and other state agencies promised to confer on organised farmers a significant influence over agricultural policy-making. Again and again opposition has taken the form of farmer protests and demonstrations against state authorities as well as their main representatives, as Schuurman's account of the Netherlands illustrates.

If the uses of consent were many and varied, the Hungarian case shows that there were definite limits in the longer term to the use of coercion as a power resource in the pursuit of agricultural modernisation. As long as the Hungarian state depended on

dispossessed peasants to work the land, the latter, as Zsuzsanna Varga shows, retained a crucial source of collective power, something that became painfully obvious to the ruling elites as production and productivity slumped on the collective farms. Eventually, in response to this, the central political authorities came to accept at least informally that major concessions to the farming population were unavoidable.

What post-war Hungary illustrates, therefore, is how state-imposed agricultural change could become popularly contested in a way that undermined effectiveness. Under very different circumstances traditional agrarian elites in post-war Portugal, intent on preserving the *status quo*, possessed sufficient power to veto much of the state's modernising efforts⁵. In effect, the Portuguese dictatorship's autonomy was compromised by its dependence on the political support of the traditional elites. That different arms of the state sometimes take different stances and even work at cross-purposes also comes out in Serge Schmitz's discussion of the fate of the Belgian dogcarts. At one point members of the Agricultural Commission were able to veto (albeit only temporarily) a Senate proposal to ban the dogcarts, thus frustrating the covert agenda of suppressing peasant agriculture by invoking a discourse centred on real or imagined animal welfare.

This brings us to the crucial question of whether 'subordination' for the farming population and agriculture was the main consequence of the modernising efforts of European states and their elites? In most of the contributions to this volume we find the desired change in agriculture being presented as good for farmers, especially by promising them easier working lives. Yet even when official modernising efforts argued explicitly in terms of improving the welfare of the farming community, political elites hardly ever lost sight of the primacy of agriculture's role in serving the economic needs of the wider industrial society. On this fundamental question there was no substantial difference between democratic and authoritarian regimes. Matters seem to be more complicated when we encounter that popular strand of political rhetoric that presents agriculture and the peasant population as not only having a special political and cultural value but as being the very backbone of the national economy. Yet when it came to a choice between a policy of modernising agriculture or keeping the peasants on the land, the same pro-modernisation choice was made regardless of the ideological orientation of the ruling elite and their allies within the farming population. It was therefore hardly surprising that the period of post-war accelerated agricultural modernisation was marked by an unprecedented 'drift from agriculture'. Such out-migration came to be considered as one of the necessary

⁵ It has been contended that these elites had little incentive to opt for modernisation as long as they benefited under 'the long-standing policy of remunerative prices and low wages imposed by the Salazar regime' (CLAR, 2008: 184).

conditions for the rapid conversion of agriculture from a low into a very high labour productivity sector. The question therefore arises: were those who packed their bags and left winners or losers? Given that they had no future to speak of by remaining on the land, those who left were, in Socrates Petmezas's judgement, better off even if leaving was 'an extremely painful experience for many emigrants'.

A real impoverishment of the agricultural world occurred as the knowledge-based authority or power to specify how food was to be produced and processed for human and animal consumption was either lost or greatly diminished. In the course of the twentieth century such power of specification was lost to urban-based food safety regulators, agronomists, and the food processing and retail giants. How technological modernisation tipped the balance of knowledge-based power (*qua* authority) away from farmers and the farming population and towards non-farming technical specialists comes across keenly in Paul Brassley's account of the introduction of pig artificial insemination in post-war England where the authority of scientists came to eclipse that of the hitherto authoritative breeders and breed societies.

Can we therefore say that the family farmers who became cheap food producers by virtue of their generally weak market position became accomplices in their own subordination, incapable of taking an independent and critical stance? It would appear that for a long time in the last century organised farmers were perceived (and often saw themselves) faring relatively well as consenting partners with the state in pursuing managed modernisation under corporatist arrangements. Most European states – post-independence Ireland is a notable exception for much of the twentieth century (Moser & Varley, 2012) – did move to incorporate their agricultural sectors, but in conformity with industrial norms and aspirations⁶. Under the prevailing corporatist arrangements the boundaries between the state and organised farmers became somewhat blurred. While it is true that state agencies often acted in defence of agricultural interests, it is equally important to remember that the representatives of organised farmers more often than not assumed the role of implementing the policy of industrial states in the countryside.

Writing of very different circumstances, some of our contributors suggest that farmers (whether or not formally organised) did have a substantial capacity for collective agency that was powerful enough to sometimes win important concessions within a strengthening modernisation process. Jonathan Harwood interprets

⁶ In his classic account Philipp Schmitter suggests that central to the ideal-typical corporatist system of interest representation is the way certain organized interests are selectively 'recognized or licensed (if not created) by the state and granted a deliberate representational monopoly within their respective categories in exchange for observing certain controls on their selection of leaders and articulation of demands and supports' (SCHMITTER, 1974: 93).

the Bavarian plant-breeding stations of the 1890s, designed to meet the needs of peasant farmers, as a concession to the farmer mobilisation provoked by the central governments decision to reduce tariff protection in 1891. Another notable case is post-war Hungary where state elites ruthlessly used coercive power to push through collectivisation only to find that they were still powerless to make collectivised agriculture more productive than the agriculture practiced by family farmers.

V. Conclusions

At the beginning of his contribution Niek Koning writes that the 'relationship between agriculture and the state is as fascinating as it is complex'. This statement captures a great deal while still leaving us with the unavoidable challenge of coming to grips with the complexity of the relationship, at least in some of its many manifestations. While broadly engaging with this challenge this book concurs with the conclusions of earlier volumes in this COST series which stress the specific importance of states, and their civil society allies, to the process of agricultural modernisation over recent centuries (Vivier 2008; Pinilla 2009; Landsteiner & Langthaler, 2010). To say this does not preclude accepting that technological knowledge, commercial incentives and favourable institutional conditions (Olsson & Svensson, 2011) were also necessary to the transformation of European peasantries into a diverse class of commercial farmers who, simultaneously, often regarded themselves and behaved like peasant-minded individuals. But this still incomplete transformation would have been substantially different were it not for the world-changing possibilities opened up, particularly after the Second World War, by access to the vast mineral resources of the lithosphere. This important facet of the history of agricultural modernisation has not been treated by any of the contributors to this volume. It therefore deserves more attention from historians and social scientists in the near future.

The gradual, but eventually substantial, enlargement of the mineral resource base of twentieth century European agriculture is the starting point for our 'integration through subordination' thesis. It provides the crucial material dimension of the context in which states and their civil society allies have sought to integrate their agricultural sectors into the industrial world. Industrial states intervened in agriculture not only to head off crisis conditions but, just as importantly, to define the substance and direction of what was to pass for 'progress' under modern conditions. Herein lies the nub of the 'integration through subordination' thesis. It does not mean that farming was a victim of industrialisation, but rather that the normative ideal of industrial production and its associated practices became centred on transforming agriculture in industrial society into something that would fundamentally rely on the same resource base – and therefore function in the same way and share the same values – as manufacturing

industry since the time of the thermo-industrial revolution. Integrating industrialising agriculture *via* subordination therefore meant displacing peasant farming, not agriculture as such. In this process the farming population lost much of its capacity to represent itself as predicted by Karl Marx. This loss, however, was not primarily because of its own inadequacies but rather because the experience and language of peasant agriculture was neither appreciated nor understood by those powerful elites who looked to industrial modernity for their normative standards (Scott, 1998).

The impressive success of the dominant model of agricultural modernisation is perhaps best illustrated by the unprecedented increase in food production as well as in the spectacular productivity gains achieved mainly in the third quarter of the twentieth century. On the debit side of the equation we see the huge loss of social, animal and plant biodiversity in the countryside as well as the dwindling knowledge in the farming community of how biotic resources can be used in a sustainable way. Modernised agriculture, in other words, presents us with something rather different than simply industrialised agriculture. This conclusion may be disappointing to the technocratic worldview intent on creating a modern agriculture in the image of manufacturing industry, but it gives the historian and social scientist much to ponder and explore further.

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