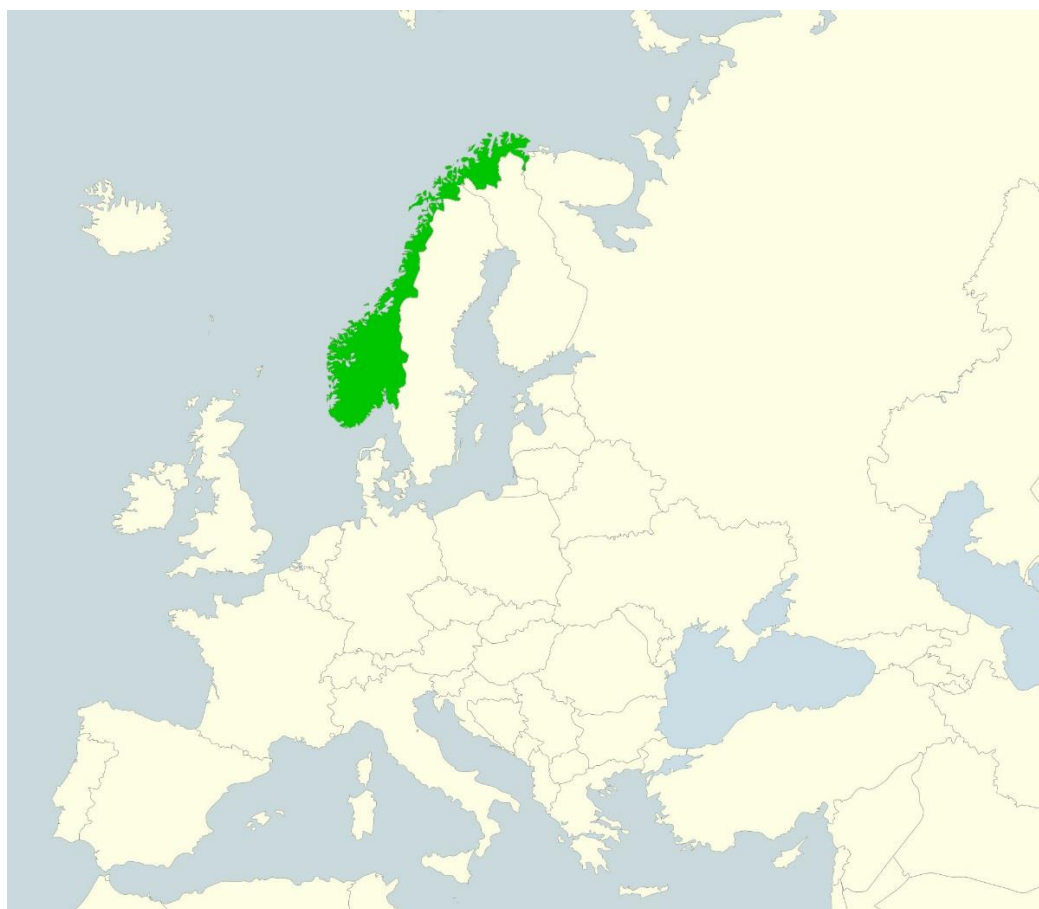


# FROM FAMILY TO DOMESTIC AND GLOBAL LABOUR? A DECADE OF PROLETARIANISATION OF LABOUR IN THE NORWEGIAN HORTICULTURE INDUSTRY

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**Abstract:** This paper analyses the profound structural transformations that took place in Norway's horticulture industry between 1999 and 2010. The aggregate industrial outputs from the industry remained stable in this period. However, the number of horticulture farms dropped by 40.5% and the remaining farms became accordingly larger. We analyse how this development was related to changing labour strategies on Norwegian farms during this period, in part affected by labour market deregulation following the EU enlargements in 2004 and 2007. The analysis utilises Agricultural Census data covering the full population of horticulture farms in Norway in 1999 (N=5,105) and all farms in the country in 2010 (N=46,624, of which 3036 now were horticulture farms). Results suggest that the enhanced availability of inexpensive and flexible global labour is strongly associated with a stepwise proletarianisation of Norwegian horticulture. Family labour is being systematically replaced by wage labour and domestic workers are being replaced by low-wage migrant workers.

**Key words:** agriculture, family labour, horticulture, labour market, migrant work, proletarianization

**Abstrakt:** Artikkelen analyserer de betydelige strukturelle endringene som fant sted i det norske hagebruket mellom 1999 og 2010. Produksjonsvolumet holdt seg stabilt gjennom perioden. Antallet hortikulturelle gårdsbruk ble samtidig redusert med 40,5 prosent, mens den gjennomsnittlige bruksstørrelsen økte tilsvarende. Vi analyserer hvordan disse endringene kan knyttes til utviklingen av hagebrukets arbeidskraftstrategier i denne perioden, blant annet effektene av EU-utvidelsene i 2004 og 2007. Analysene bygger på Statistisk sentralbyrås Landbrukstallinger i 1999 (N = 5101 hagebruk) og i 2010 (N = 3036 hagebruk, 46624 gårdsbruk totalt). Resultatene viser at tilgangen på billig og fleksibel migrerende arbeidskraft fra de nye EU-landene kan knyttes til en stegvis proletarisering av arbeidskraften i det norske hagebruket; først blir familiearbeidskraft erstattes av innenlandske lønnsarbeidere, som deretter erstattes av utenlandske landbruksarbeidere.

**Nøkkelord:** landbruk, familiearbeidskraft, hagebruk, arbeidsmarkeder, migranter, proletarisering

## 1. A decade of horticulture restructuring

During the first decade of the 21st Century, the Norwegian horticulture industry went through major restructuring processes in its production structure. The total output stayed more or less the same. However, the number of productive horticulture farms dropped by 40.5%, from 5105 producing farms in 1999 to 3065 in 2010. The remaining farms grew correspondingly larger. Other important changes were enhanced vertical integration of the value chain, contract farming, reformed state support regimes, market deregulations and novel production technologies (e.g., machinery, biological innovations and knowledge expansion) (see, Almås 2016, Rønning, Vik and Magnus 2013, Rønning 2015, Rålm, et al. 2013).

At the same time, the 2004 and 2007 EU enlargements gave Norwegian horticulture farmers access to a large pool of workers from the former Warsaw bloc countries in Eastern Europe. Due to low wages and high unemployment rates in these countries, a large labour force market opened up to the western part of Europe. Many Norwegian horticulture farmers eagerly recruited labour from this work stock of flexible and inexpensive labour, which challenged the traditional reliance on family

members to farm in Norwegian horticulture. By 2010, workers from abroad, *migrant*<sup>4</sup> labour, which had been only sporadically present until as late as the 1980s (Møller and Jensen 1999), accounted for about 41.8% of total labour input in the Norwegian horticulture industry. Parallel processes took place in other Western European countries (see, for instance, Gertel and Sippel 2014, Corrado et al. 2017, Rye and Scott 2018).

In this paper, we examine these parallel processes of industrial structural transformation and changing access to labour, and discuss how they interrelate. The analysis focuses on the changing composition of family and hired domestic and migrant labour at national, regional and – most importantly – farm levels, and seeks to relate developments to other key indicators of industrial change in the country's horticulture industry in the decade between 1999 and 2010. More specifically, three research questions are discussed through the use of materials from the Norwegian Agricultural Censuses in 1999 and 2010:

- 1) How did labour strategies change on horticulture farms between 1999 and 2010?
- 2) What farm characteristics predicted the use of migrant labour in 1999 and 2010?
- 3) How did farmers' recruitment of migrant labour in 1999 predict the survival of farms over the next decade?

Taken together, we argue that Norwegian horticulture – as a result of access to larger pools of inexpensive migrant workers – experienced a process of proletarianisation, whereby family labour was replaced with wage labour and domestic labour was replaced by inexpensive migrant labour.

The paper is structured into four sections: Firstly, we review the growing literature on migrant labour in European horticulture, which is mature in many regards but lacks analysis of individual farms' strategies for labour recruitment and differences across segments of the horticulture industry. Secondly, we present the context of the study – the Norwegian horticulture industry – and the Agricultural Census data from Statistics Norway that we employ to address the identified knowledge gaps. Thirdly, we present the results of our analysis and discuss the implications of these. In the fourth and final part, we substantiate the paper's main conclusion about the proletarianisation of farm labour.

## 2. Changing supply and demand of labour

The agri-food literature has detailed how the European horticulture industries have changed tremendously over the last years (Gertel and Sippel 2014). There are fewer but larger farms in the industry, while those remaining have transformed their operation by enhanced specialisation and use of novel production technologies in terms of machinery, biological innovations and organisational practices. The agri-food chain literature has further studied how these changes are related to trends towards stronger vertical integration into the food chain (See e.g., Bonnano 1989, Burch, Dixon and Lawrence 2013). More than ever before, farm operations are highly coordinated – and often also directed – by companies that provide input factors for production (e.g., capital, machinery and other technology) or take the production outputs from the farms to the markets (e.g., supermarket chains), or both (Richards et al. 2013). These changes relate to both changing supply and demand for labour. In the next sections, we focus on the emergence of migrant labour in horticulture.

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<sup>4</sup> The definition and operationalisation of the term "migrant" ("immigrant", and "migrant workers/labour" and so forth) is difficult. In this paper, we employ "migrant workers" to refer to persons travelling to Norway from abroad for shorter (seasonal) or longer stays. In some cases (e.g., in the US literature), these would be labelled "immigrant" workers to distinguish them from migrants travelling *within* the nation state (however, the latter represent an almost non-existent phenomenon in Norway and most European countries, and nowadays even in the US).

## **2.1 Increasing supply of willing workers**

The geography of farm labour has changed and the structure of the supply side of the agricultural labour market has been transformed over the last few years. Most significantly, large numbers of international migrant labourers have found their way into the European agricultural labour markets. In particular, the Mediterranean countries developed a pattern of reliance on migrant workers early on (Gertel and Sippel 2014, Corrado et al. 2017). Some rough estimates – exact numbers are difficult if not impossible to establish – suggest that 90% of Greece's and 37% of Italy's agricultural workers are now international migrants (see Corrado et al.'s 2017: 10–11 review). Similarly, the Spanish and French horticulture industries have long been dependent on foreign labour (Gertel and Sippel 2014). More lately, the Northern European horticulture industries have also turned to migrant labour (see Rye and Scott 2018). A novel trend is the influx of third country immigrant workers to the agricultural industries in the eastern parts of Europe. These countries have to date been seen as senders of agricultural migrant workers but now are also hosts to incoming workforces from countries farther to the east (Gorny and Kaczmarczyk 2018).

The enhanced supply of labour migrants in the European horticulture industries reflects general political structural changes across the continent. Critically, the breakdown of the Iron Curtain in the 1990s made the Western European labour markets more accessible to Eastern Europeans in search of economic betterment. For instance, Kasimis and colleagues have detailed how Albanians migrated to the Greek countryside from the 1990s onwards (Kasimis et al. 2003). The EU enlargements in 2004 and 2007 further facilitated westward migration. The EU's common labour market policy gave citizens of ten of the former Communist states the opportunity to travel to the western states for work.<sup>5</sup> At first, the western states imposed different sets of transitional rules to control – and in effect reduce – labour migration. However, these did not hinder several million labour migrants from taking work in the Western European horticulture industries. Moreover, EU and national state immigration and labour market policies have allowed for large scale labour migration from non-EU countries by the use of various seasonal agricultural workers' schemes, for example, the French OFII-scheme (Crenn 2017), or the *Contratación en origen* in Spain (Hellio 2017; Lindner and Kathmann 2014). Finally, there are clandestine flows of migrants to Europe, many of whom first enter the agricultural industries. However, precise estimates of these flows are difficult to provide.

## **2.2 Industrial demand for inexpensive labour**

The demand side of the agricultural labour market has also changed substantially over the last few decades. Several studies have detailed how enhanced competition has forced farmers to find ways to cut production costs and enhance profits (Rye and Scott 2018). For instance, Rogaly's (2008) study of England's horticulture industry details the intensification of farm production in response to market demands. As labour accounts for a substantial share of overall production costs, farmers have turned to migrant workers, who generally represent a less expensive but more compliant labour force. Migrants are often in a disempowered position in the labour market, lacking language and other capital that would allow them to effectively bargain for higher wages (Rye and Andrzejewska 2010). Moreover, migrants' "dual frame of reference" makes them likely to accept low wages abroad as the remuneration is nevertheless seen as generous compared to wage levels at home (Suarez-Orozco and Suraz-Orozco 1995).

Importantly, farmers' labour demands relate to more than purely economic calculations of wage costs. The agricultural migrant farm workers represent a work force that is also attractive due to its willingness to perform very demanding work and accept low/sub-standard working conditions. This is

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<sup>5</sup> The 2004 accession states were Estonia, Latvia, Lithuania, Poland, the Czech Republic, Slovakia, Hungary and Slovenia. 2007 accession states were Romania and Bulgaria. Cyprus and Malta were part of the 2004 enlargement, but are less relevant for the present discussion. Norway, the paper's study case, is part of the European common labour market as a result of the European Economic Agreement (EEA) between the EU and the European Free Trade Association (EFTA), which consists of four non-member states in Western Europe (Norway, Switzerland, Iceland and Lichtenstein).

particularly evident where migrants are either in the host country without documentation (illegally) or on guest worker programmes. Lichter and Waldinger's (2003) concept of "hiring queues" provide a theoretical account of these processes whereby the employers recruit migrant employees based on their group characteristics rather than individual qualifications. In consequence, "ethnic niches" develop at a labour market that is increasingly dominated by migrants. Over time almost only migrants are recruited. Wage and working conditions in these segments of the labour market are poor, and even more significantly, inferior social status is ascribed to occupations and tasks associated with these "immigrant jobs". Domestic workers will avoid these jobs, even in times of unemployment. Piore's (1979) connects these developments with the theory of dual labour markets (Doeringer and Piore 1971) to detail how the growth of a global labour force leads to ethnically divided labour markets in capitalist society.

Migrant farm workers have come to represent a low cost yet attractive labour force for farmers across the European continent. However, the evolving migrant labour phenomenon is anything but uniform or unidirectional. As demonstrated by Rye and Scott (2018) review of migrant labour in the European food industries, the use of migrant labour varies greatly across the European continent; between nations and regions within nations and between different types of production. However, these differences are less systematically explored in the European literature. Moreover, a study of the English strawberry industry over a longer period of time (1910 to 2010) by Calleja et al. (2012) demonstrates how labour strategies are interrelated with other aspects of structural changes in the horticulture industry: for example, investments in machinery and other technical inventions and the overall capital structure. This study clearly demonstrates the need to avoid rushing to conclusions, for instance by ascribing to one factor – such as labour – all explanatory powers of industrial change.

Finally, we acknowledge the extensive US literature on migrant farm labour, which has not been addressed in this section. On the one hand, the US cases reflect the findings presented above, when economically deprived migrants, mostly from Mexico, provide an inexpensive and docile labour force for an increasingly industrialised horticulture sector (Martin 2009, Holmes 2013). On the other hand, there are also key differences, for instance, in the US horticulture industry's far longer history of migrant labour (comprising both internal and international migrants) and different present-day institutional arrangements in terms of agricultural, labour market and immigration regulations (see Rye 2017).

### **2.3 Knowledge gaps**

The research literature provides detailed accounts of the changing geography of labour. It further identifies the main macro-level factors to explain both enhanced supply and demand for migrant labour, as well as the consequences thereof. There are also numerous studies of the migrant farm workers – their motivations to migrate, their experiences as migrant workers, and their strategies to improve working conditions, now and in the future.

However, far less is known about micro-level decisions by farmers – the employers – that aggregate into observed macro-level patterns. While there are apparent implications of industrial sectors turning to global labour, as demonstrated in several studies in the horticulture industry, few studies have studied the phenomenon at the firm level. There is also a notable lack of studies that explore intra-industrial differences. Hence, we know little about the variations between different types of farms and how they are related to the phenomenon of migrant labour. For instance, while the European horticulture industries have largely become increasingly reliant on migrant labour, there are also many farms that operate completely without migrant workers. Similarly, while we have learned about the enhanced reliance on migrant labour in the industry, we know far less about its consequences at the farm level. Further, we have even less knowledge about differences between types of farms. For instance, there are good reasons to assume that there are differences between various types of production in their use of migrant labour. Expectedly, there are also intra-state regional differences in the recruitment of migrant labour.

### 3. The study case – the Norwegian horticulture industry

In this paper, we address these knowledge gaps by detailing developments of farms' labour strategies with an explicit focus on micro-level dynamics and differences between different types of horticulture farms. We employ the Norwegian horticulture industry as an illustrative case (Yin 2009) of changing labour strategies. The case is instructive, both due to its traditional reliance on family farming, which has been challenged by recent changes in labour regulations, and the availability of high-quality Census data detailing these changes.

We shall briefly detail the industrial context of Norwegian horticulture production. Of particular importance is the historical as well as present-day dominance of small scale family farms which are scattered all over Norway, though with the tendency towards regional concentration of different types of production. For instance, horticulture production take place all over the country but is more prominent in the lowlands and southern regions. The decentralised agricultural production structure results from an active state policy, including the use of high levels of state subsidies, price supports and import regulations. The upkeep of a decentralised settlement structure has been a key policy objective and agricultural support has been a main tool for this, but nevertheless the industry has shrunk, both in terms of farm numbers and economic importance in the national economy. The Norwegian horticulture industry, however, stands out from other types of agricultural production in some important ways: 1) The sector is not market regulated, 2) Horticulture producers receive fewer direct subsidies from the state, and 3) Import restrictions are flexible.

Hence, the climate between horticulture producers is more competitive. In contrast, while national level arrangements guarantee dairy farmers set prices and secure delivery, horticulture farmers operate in more volatile markets and may risk not finding buyers for their products. This pattern is strengthened by the increasing use of contract farming and dependence on the large supermarkets, echoing developments in Western European horticulture industries.

Due to Norway's geographic location, the climate is cold and the growing season is short. Horticulture production is inherently seasonal and has therefore always been in demand for seasonal workers. Traditionally, farmers relied on a flexible domestic labour force of family members, rural women, teenagers, and un-/underemployed locals (Rye 2007). As in other countries, this domestic labour source dried up as locals found more attractive work alternatives in other areas. Thus, in the 1990s, the horticulture farmers successfully lobbied for the establishment of a quota programme for work immigration (Møller and Jensen 1999). In its first year, only a few arrived, but by the turn of the millennium some 18,000 migrant workers were working in Norway during the harvest season. Presumably, the quota workers were supplemented by a substantial number of undocumented migrant workers, although the scale of this labour stock was never surveyed.

The EU/EEA enlargements in 2004 and 2007 dramatically altered the supply of migrant labour. Overnight, citizens of the accession states were allowed to travel to Norway for work. In the early years, "transition rules" were implemented to protect migrants from exploitative wages and working conditions. Most importantly, farmers had to pay migrants wages according to the rates bargained by trade unions and the agricultural employers' association. Later, the *General Application of Collective Agreements* had the same effect. The Norwegian labour market is also in other regards characterised by strong regulations, which are negotiated and sanctioned within a tripartite corporative institutionalised framework between the trade unions, employers' associations and the state (see Rye 2017). In other words, the agriculture industry and the general labour market are both strongly regulated by the state, but less so than previously. The following analysis demonstrates the outcomes of these deregulated processes – when horticulture meets the labour market.

### 3.1 The Norwegian Agricultural Census 1999 and 2010

The paper's analysis employs full population register data from the decennial Norwegian Agricultural Censuses implemented by Statistics Norway in 1999 and 2010. The Censuses report detailed information on all farm operations in Norway, on a large number of variables, about the farms (e.g., farm size, production lines and output, labour use, economic variables), the owners (e.g., age, gender, personal income) and the farm households.

The threshold for being included in the Agricultural Censuses is quite modest and covers even the smallest farms. The general criterion is that the farm should cultivate at least 0.5 hectares of land. However, horticulture farms cultivating less than 0.5 hectares are still included in the Census if they have fulfilled one or more of the following criteria: cultivating either 0.03 hectares in a greenhouse, 0.2 hectares of outdoor vegetables, 0.1 hectares of fruit trees, 0.1 hectares of outdoor berries, or 0.1 hectares of nursery production.<sup>6</sup>

Census data were partly retrieved from existing state administrative registers. Significantly, all farmers annually file the *Application for production support* [our transl.], in which they report detailed information on the farm and its operations. Also data from other relevant state administrative registers are merged with the Agricultural Census database (for instance, income and tax registers).

Further, Statistics Norway supplemented these data with survey data. A questionnaire was distributed to all farms asking for information that was not included in the annual applications for production support (for instance, detailed information on labour input). An additional questionnaire was tailored to cover horticulture farms and greenhouses. A final questionnaire was distributed to a few farms that qualified to be included in the Census but did not have any production for which they could apply for production support (3,835 farms in 1999).

The quality of information of the Census materials is considered to be good. Providing information about the farm operation is required in most cases to receive state support for agricultural production and gives a strong incentive to farmers to provide information. Returning questionnaires is mandatory by law and farmers may be fined for not complying. In 1999, only 1% of farms did not respond and for these data were imputed. In 2010, about 3% of the farms did not return questionnaires.

There are some minor differences between the guiding principles for the 1999 and 2010 Censuses, and there are also a few minor issues with samples that may reduce the overall data quality. For instance, some farms changed owners between 1999 and 2010, most often due to generational succession, and some of these takeovers are poorly recorded. However, impacts on results presented in this paper are found to be negligible.<sup>7</sup>

Our analysis employs a data file where the 1999 and 2010 Censuses are combined. The file contains all horticulture farms in 1999 (N=5,105) and all farms in 2010 (N=46,624, horticulture subsample N=3,063). Thus, it is possible to describe and compare the horticulture industry in 1999 and 2010 and to trace the individual farms over the decade. The analysis is divided into three sections:

- 1) Section 4.1 presents an overview of key changes in the horticulture industry's labour input at large (Bivariate descriptive analysis).
- 2) Section 4.2 examines factors that relate to the recruitment of migrant labour at horticulture farms in 1999 and in 2010 (Multivariate ordinary least squares regression analysis).
- 3) Section 4.3 analyses the use of migrant labour in relation to horticulture farms' survival in terms of staying or exiting from horticulture production (Binomial multivariate regression analysis).

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<sup>6</sup> Similarly, small farms (in terms of cultivated land, i.e., less than 0.5 hectares) are included in the Censuses if they meet some minimum criteria of production levels, for instance having at least ten cattle including calves.

<sup>7</sup> For further information on the Census materials, see Statistics Norway's documentation reports (Meen and Rognstad, 2003, Steffenstorpet and Bye, 2013)

## 4. The emergence of a migrant worker-dependent industry

The Census data show there were 5,105 horticulture farm units in Norway in 1999. Over the next decade, 2913 of these abandoned horticulture farming, either in favour of other types of agricultural production (1,156) or by stopping farming completely (1757). In the same period, 844 farms entered the horticulture industry. Thus, there were a total of 3036 horticulture farms in Norway in 2010.

### 4.1 From family to non-permanent hired labour

The Census materials provide evidence of how these farms, at the aggregate level, largely changed their labour strategies over the decade (Table 1). As explained above, there has been a structural development towards fewer and larger farms and more labour intensive farms. Our analysis in Table 1 reveals that the total labour input on farms increased (by 22.8%), particularly in horticulture production (by 46%). In effect, horticulture production accounted for a larger share of these farms' total production.

In terms of labour input sources, three developments stand out. Firstly, the share of family labour decreased. In 1999, two-thirds of farm labour was provided by the farmer and his/her spouse (54.5%) or other family members (9.1%). Ten years later, the percentages had dropped to 34.6% and 7.6%.

Secondly, the share of hired labour input increased, both with regard to labour provided by permanent (from 15.8% to 21.0%) and non-permanent (from 19.3% to 29.2%) workers. In addition, the labour supplied by "others" (e.g., self-employed, contract workers and companies) increased from 1.3% to 9.6%. Thus, in effect on the average Norwegian horticulture farm, wage labour replaced family labour as the main source of labour input.

Tab 1. Labour input on horticulture farms 1999–2010 (N=5105/3036). Source: Statistics Norway's Agricultural Censuses 1999/2010

Labour input on horticulture farms	1999	2010	% change
- total (horticul. and other agricul. production (hours, avg.))	3452	4239	22.8
- in horticulture production (hours, avg.)	2056	3002	46.0
- in horticulture production (share, %)	59.6	70.8	18.8
Share by labour categories (of farm's <i>agricultural</i> prod.)			
- farmer/spouse (%)	54.5	34.6	- 36.5
- other family members (%)	9.1	7.6	- 16.5
- permanent hired workers (%)	15.8	21.0	33.5
- non-permanent hired workers (%)	19.3	29.2	51.3
- others (%)	1.3	9.6	*
Share by migrant workers (of farm's <i>horticulture</i> prod.)			
- share of migrant labour input (estimated hours)	381	1255	299.4
- share of migrant labour input (aggregated numbers, %)	18.5	41.8	125.9
- share of farms employing migrant workers (%)	22.5	37.2	65.3

\* The 1999 and 2010 "others"-category is not directly comparable. The 2010 estimate better captures the use of off-farm service providers, e.g., contractors, which became more commonplace in the industry during the decade.



Third, migrant workers became increasingly important between 1999 and 2010<sup>8</sup>. The average horticulture farm had 381 hours of migrant labour input in 1999. The number increased by about 300% over the next decade. Thus, in 2010 over 40% of the industry's labour was provided by migrants. Yet the drive towards enhanced use of migrant labour does not imply that all farmers recruited such labour. The share of farms with migrant labour, rose from 22.5% to 37.2%. Nonetheless, in 2010 the majority (62.8 %) of horticulture farms still exclusively relied on non-migrant labour, whether provided by family or hired workers. In other words, different farms opted for different labour strategies in 1999 as in 2010.

The Census materials evidence that the trends towards less family labour and more hired/ migrant labour took place in all sub-segments of the industry. Interestingly, however, there are significant systematic variations in the labour strategies of different farms categories. No uniform process applies to all sub-segments of the horticulture industry. For instance, berry farmers had the highest share of migrant labour in 1999 but, in relative numbers, also the most modest increase in the next ten years. There are further regional variations. In Rogaland county the share of farms employing migrant workers rose from 13.8% to 41.6%, while it fell slightly in South-Trøndelag county (from 18.8% to 16.9%). Further, the likelihood of hiring migrants correlates strongly with farm size as measured in labour input: for the third of farms with the *lowest* total labour input, the percentages of farms using migrant labour were 4.6% in 1999 and 11.2% in 2010. For the third of farms with the *largest* total labour input, the use of migrant labour was respectively 39.5% (1999) and 64.1% (2010).

#### **4.2 Intra-industrial differences in labour strategies**

To explore the intra-industrial variation of migrant labour use, we present ordinary least square regression models with share of migrant labour as the dependent variable (Table 2). Separate but equalling OLS-models are estimated for 1999 and 2010. Before commenting on specific results, we should emphasise that the observed *correlations* do not necessarily reflect *causal* relations. For instance, we noted that farms with larger operations recruit migrant labour more than others (cf. above). This suggests that farm growth leads to reliance on migrant labour. However, a causal relationship may theoretically run the other way (e.g., a farmer with knowledge and experience of migrant labour may decide to expand operations).

First and foremost, regression results (Table 2) confirm the strong relationship between the use of hired labour and recruitment of migrants. This is somehow self-evident: migrant labour is only present on farms where the family do not provide the required labour themselves but need to supplement with non-family labour. More interesting is that both shares of permanent and of non-permanent labour are significant. In other words, migrant labour is not only associated with non-permanent (seasonal) labour. The coefficient for permanent labour is almost ten times as strong in 2010. This suggests that while migrant workers in 1999 mostly provided seasonal work, they soon came to replace permanent workers.

Secondly, there are changes in employment of migrant labour in various types of production. Berry farms recruited more migrant workers than other horticulture farms in both 1999 and 2010. Vegetables farms significantly increased their use of migrant labour compared to other farms, whereas greenhouse farms stood out in 1999 as less likely to employ migrants than other farms, and even more so in 2010. Note, however, that these are relative numbers, demonstrating intra-industrial differences. In absolute terms all types of productions experience higher use of migrant labour in 2010.

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<sup>8</sup> In the Census survey, farmers were asked to report their use of "foreign" workers ["utenlandsk"]. As noted by Statistics Norway, there are some conceptual uncertainties related to the definition of "foreign". For instance, some immigrants, having acquired Norwegian citizenship, may be conceptually seen as "foreigners" in the lay discourse. However, we assume that information provided by the farmers neatly corresponds to the paper's operationalisation of "migrant workers" (the question of formal citizenship is less relevant for the present discussions).

Tab 2. Use of migrant labour (Linear regression – ordinary least squares). Dependent variable: Share of migrant labour input (%) (N5105/3036). Source: Statistics Norway Agricultural Censuses 1999/2010

	1999			2010			Sig. diff. b 1999-2010
	b	beta	sig	b	beta	sig.	
Constant	3,145		**	3.165			
Share permanent labour (% of total agr. labour input)	0,047	0,042	***	0,422	0,275	***	***
Share non-permanent labour (% of total agr. labour input)	0,624	0,497	***	0,689	0,514	***	***
Vegetables (dichotomy, 1=yes)	-0,514	-0,011		3,985	0,060	***	***
Greenhouse (dichotomy, 1=yes)	-4,510	-0,079	***	-9,239	-0,122	***	***
Fruits (dichotomy, 1=yes)	-3,738	-0,078	***	-1,298	-0,020		
Berries (dichotomy, 1=yes)	7,879	0,171	***	6,858	0,104	***	
Nursery (dichotomy, 1=yes)	-6,287	-0,058	***	-5,249	-0,039	***	
Regions (ref. cat. SE Norway)			***			***	
- South Norway	-3,487	-0,065		0,790	0,010		***
- Western Norway	-0,182	-0,004		0,099	0,001		
- Mid-Norway	-1,642	-0,021		-4,079	-0,034		
- Northern Norway	-10,41	-0,113		-11,30	-0,085		
Volume of production (standardised, NOK 100,000)	0,081	0,102	***	0,046	0,065	***	***
Profitability (agricultural income, NOK 100,000)	-0,225	-0,070	***	0,055	0,045	***	***
Specialisation (% of ag. income from horticulture production)	1,357	0,020		1,409	0,015	**	
r2(adj.)	0.365			0.378			

Sig.levels: \* < 0.050; \*\* < 0.010; \*\*\* < =0.001

Thirdly, the model taps into regional differences. South Eastern Norway serves as a reference category and had the highest levels of migrant labour in 1999. Northern Norway stands out as the region with the lowest share of migrant labour in 1999 and 2010. Farms in mid-Norway had fewer migrants compared to farms in South Eastern Norway in 1999, and more distinctly so in 2010. For Southern and Western regions, results changed from fewer (1999) to more (2000) migrants. While specific results are more indicative than definite, the overall effects of the dummy variable set are statistically significant, both in the 1999 and 2010 models. This suggests the presence of regional variation, both in terms of levels and of change.

Fourthly, the model suggests that farm size – here measured in terms of production value – has significant impacts on farm recruitment strategies. In 1999, for every increase of 100,000 NOK (about 12,000 USD); the share of migrant labour increased by 0.08 percentage points. The effect diminished, however, over the next decade. The profitability coefficient changes more radically. In 1999, the less the profitability of the farm, the higher the use of migrant labour. In 2010 the relationship is reversed and the more profitable farms are more likely to employ migrants than others.

Fifthly, the variable measuring farms' profitability is statistically significant. Interestingly, however, the effect changed over the decade. In 1999, farms with higher profitability on average employed

fewer migrant workers, while in 2010 the effect was reversed and farms with higher profits recruited more migrants.

Sixth and finally, farms with more specialised horticulture production (measured in terms of percentage of farm income stemming from horticulture activity), employ more migrants. However, the result is statistically significant in the 2010 model only.

In total, the model demonstrates the large variability in horticulture farms' recruitment of migrant labour. Some parts of the industry are very likely to recruit migrant farm workers; others are not. Furthermore, recruitment processes follow partially different types of logic in 1999 and 2010.

### **4.3 Survival analysis – labour strategies and industrial exits**

The next section elaborates the analysis by tracing the *individual* horticulture farms over the decade. The question is: To what extent did employment of migrant labour in 1999 predict survival or exit from the horticulture industry during the next decade?

In Table 3, we present a binomial logit regression analysis. The first model is a bivariate model estimating the effects of migrant labour strategies on farms' likelihood for staying in the horticulture industry during the period from 1999 to 2010. The independent variable is operationalised as share of migrant labour measured in percentages and, thus, theoretically varies between 0 (no migrant labour) to 100 (only migrant labour). The model estimates a logit b-value of 0.011, which is statistically significant at a 0.001 level. The result shows that farms employing migrant workers in 1999 were far more likely to stay in horticulture over the next decade. The odds ratio value is 1.0116, which means that each percentage increase in the share of migrant labour on the farm enhances the odds of survival in the horticulture industry by 1.16%. The effect is multiplicative and, thus, a farm where migrants accounted for 30% of labour input in 1999 had 40.87% higher odds of staying in business compared to a farm with 0% migrant labour.

The second model introduces effects of the farms' overall labour strategies, i.e., in terms of the balance between family and wage labour input, the latter specified in permanent and non-permanent labour. The effects of employing migrant labour have – as expected – clearly decreased from the first model: 0.011 to 0.007. This is compensated by effects of farmers' use of wage labour, either permanent or non-permanent. However, use of the latter (non-permanent work) in 1999 is a stronger predictor for farm survival. These results are expected given that migrant workers in Norway exclusively work on farms as hired labour and, except in theory and in very few cases, are never members of the farming family. It is not surprising either that farms with wage labour were more likely to keep up horticulture farming. The surprising finding, thus, is that these variables produce significant effects independently of each other: Farms with more migrant labour were more likely to survive – *regardless* of the ratio of family/wage labour.

The third model includes more control variables. These are not of interest themselves (cf. the paper's research question's focus on labour strategies). The interest lies in the variables' ability to isolate the effects of the labour variables. Interestingly, this model re-establishes the stronger effect of the use of migrant labour for the survival of farms over the period 1999 to 2010. In other words, when comparing farms with similar structural and production characteristics, the effect of migrant labour is slightly stronger than in Model 1 (0.012 vs 0.011).

Tab 3. Predictors of farm survival (binomial logit regression). Dependent variable: Likelihood of farm survival (N: 5,105). Source: Statistics Norway Agricultural Censuses 1999/2010

	Model 1		Model 2		Model 3	
	b (logit)	sig	b (logit)	sig.	(logit) b	sig.
Share migrant lab. (percentage of total horticulture labour input)	0.011	***	0,007	***	0,012	***
Share permanent labour (% of total agr. labour input)			0,006	***	0,004	**
Share non-permanent labour (% of total agr. labour input)			0,011	***	0,006	**
Vegetables (dichotomy, 1=yes)					0,669	***
Greenhouse (dichotomy, 1=yes)					0,654	***
Fruits (dichotomy, 1=yes)					1,397	***
Berries (dichotomy, 1=yes)					0,112	
Nursery (dichotomy, 1=yes)					0,730	***
Regions (ref. cat. SE Norway)						***
- South Norway					0,113	
- Western Norway					0,663	
- Mid-Norway					0,063	
- Northern Norway					0,156	
Land grown (standardised, hectares)					0,020	***
Profitability (ag. inc., NOK 100,000)					0,037	***
Specialisation (% of ag. income from horticulture production)					0,304	**
Constant	-0,399	***	-0.512	***	-2.310	***
Cox & Snell	0.016		0.026		0.148	
Nagelkerke's	0.021		0.035		0.198	

Sig.levels: \* < 0.050; \*\* < 0.010; \*\*\* < =0.001

Our analysis clearly demonstrates that employment of migrant labour in 1999 impacts the likelihood of farms' survival. However, effects are modest. For Models 1 and 2, values for indicators Cox & Snell and Nagelkerke's lie between 0.016 and 0.035. This indicates that knowledge of the use of migrant labour on farms has only low power to predict farms' survival. Model 3, which includes information about the structural characteristics of farms, has a far stronger predictive power (0.148 and 0.198 respectively). This suggests that farms' labour strategies did have some impact but were not decisive for survival of farms in the period. Other structural characteristics were far more important in this regard. For instance, we would expect that the balance between farmers' income opportunities at the farm and at the general labour market strongly would impact on their labour investments at the farm, including the likelihood of exiting horticulture production completely. As noted in the literature review, enhanced demand for migrant labour reflects changes at domestic labour markets. In the Norwegian case, the period from 1999 to 2010 was characterised by low unemployment levels, also during the global financial crisis in 2007–2008, and many farmers would find good jobs outside of agriculture if they wanted. In addition, other aspects may have contributed to reduce the relative attractiveness of the horticulture industry, for instance the social status of farming and urbanisation. The models in Table 3 do not intend to – nor could they, due to data availability – account for how such contextual factors influenced farms' survival through the 1999 to 2010 period.

## 5. Emerging proletarianisation of horticulture labour

The presented analyses detail the profound structural changes to Norwegian horticulture production between 1999 and 2010 and how the changing labour strategies were integral to these transformations. We will particularly point to three concluding points concerning the horticulture industry at large:

Firstly, the enhanced use of migrant labour occurred alongside other transformative processes in Norway's horticulture industry. The industry has undergone processes of rationalising the production structure, where the number of farms has been greatly reduced while those remaining are becoming bigger and more labour intensive. Changing strategies of labour input seem to be intrinsic to these transformations, in two separate steps: Family labour diminished substantially and migrant labour replaced domestic labour, the latter reflecting a change from permanent to non-permanent employment. Taken together, the combination of these developments means that family labour is gradually replaced with non-permanent migrant labour. We argue that the liberalisation of the European labour market following from the 2004 and 2007 enlargements, which allowed workers from Eastern European countries to migrate to Norway, contributed in a major way to these changes. However, it is difficult to conclusively determine the causal relationships between labour market regulations and farm labour strategies. Nonetheless, the paper's analysis of factors affecting the recruitment of migrant workers in 1999 and 2010 confirms that migrant work relates to the industrialisation of horticulture farms. The use of migrant labour goes hand in hand with developments towards larger farms, which are far more likely to employ migrants. Furthermore, the use of hired farm labour was important for farm survival. The analyses demonstrate that as much as larger farms are more likely to recruit migrant labour, the use of such labour impacts the farm's sustainability. However, the effects should not be overestimated. The results are interpreted as a sign of the proletarianisation of the Norwegian horticulture industry, whereby the family farm model of horticulture production over time is replaced by industrialised farming. Our multivariate analysis revealed correlations between large, profitable and specialised horticulture farms and the employment of more migrants. This pattern was strengthened in the binomial logit regression of farm survival and, when controlling for types of production, we found that the pattern occurs within all types of production.

A second conclusion refers to the variation within the horticulture industry. Changes are not uniform but vary across and within regions, types of production and other structural variables. Some farms shift their labour strategies more eagerly than others, but there are also farms – the majority – that farm without using hired (domestic or migrant) labour. In other words, the proletarianisation of horticulture is also variegated. Despite the fact that dominant trends point towards the proletarianisation of farm labour, there is still a long way to go before horticulture farms totally, even mostly, conform to the logic of capitalist industrialism, where labour is recruited from the labour market. In Norway's horticulture system, family labour is still the major source of labour, and the numerical majority of farms still do not recruit migrant workers. Still, given that structural changes will continue in favour of even fewer and even larger horticulture farms, proletarianisation is likely to increase.

Thirdly, at a more general level, the paper's analysis illustrates the interrelations between agricultural change and labour market regulations. While we do not know the counterfactual (what if the EU enlargements had not happened?), it is reasonable to interpret the major changes in labour strategies as reflections of a changing regulative context.

Previous research has highlighted employers' tendencies to choose migrant labour based on group characteristics (e.g. Lichter and Waldinger 2003). In this paper, we have not been able to extract clustering of specific national or ethnic groups, yet have connected increased migrant labour with EU enlargements. Current debates on horticulture farming's need for labour in season address this issue as a conflict between domestic and migrant labour. Labour conditions, wages and workers' rights, important aspects of the proletarianisation concept, are part of this picture. Future research should investigate the effects of this in the horticulture sector and the communities they are part of.

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