

After Covid-19, will seasonal migrant agricultural workers in Europe be replaced by robots?

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Summary

The covid-19 crisis and the ensuing closure of borders has profoundly affected the mobility of migrant seasonal workers. As some European agricultural sectors highly depend on these workers, governments in EU countries have urgently adopted different strategies to avoid disruptions due to their absence. Alternatives seeking to cope without this experienced foreign seasonal labour force, pose two difficulties: their effectiveness is not guaranteed and/or they are accompanied by a significant increase in production costs and therefore in prices. As this large-scale temporary shock may lead to longer-term structural changes in the agricultural sectors concerned, we draw on the UK's post-Brexit vote experience to discuss alternatives to foreign migrant seasonal workers. The covid-19 pandemic may well accelerate the adoption of robots for picking fruits and vegetables in the EU fields.



As early as February, Italy, followed by other European countries, became a new hotspot of the Covid-19 pandemic. After an initial period of uncoordinated measures within the EU space to contain the spread of the virus, EU Member States agreed on 17 March to close the external borders of the European Union and the Schengen area to non-essential travel, for an initial period of 30 days, later extended until 15 June. The European Commission recommended applying exceptions to seasonal migrant workers, by including them in the list of essential workers allowed to travel (European Commission, 2020b).

With regard to restrictions within the Schengen area, the Commission also recommended that Member States adopt green lanes to facilitate the cross border mobility of workers “in particular but not only those working in the health care and food sector (...) to ensure continued professional activity”, as well as for the free movement of goods in the same essential sectors. (European Commission, 2020a).

In spite of this, many EU countries adopted policies (*i.e.*, travel bans and controls at internal borders) that translated into serious limitations on extra and intra-EU movement of goods and people moving for legitimate purposes, including seasonal workers in agriculture (Carrera and Luk, 2020).

A major issue for EU farmers has been to find ways to meet the high need for temporary labour during the harvest season, without seasonal migrant workers. The annual number of seasonal workers is estimated at 70,000 migrants in the UK, 200,000 in France, 300,000 in Germany and 360,000 in Italy.

Governments reacted quickly to avoid disruptions due to this labour shortage. Strategies implemented are quite different and change rapidly from one week to another, showing the depth of the problem and the lack of easy solutions.

In this Policy Brief, we first show the extent to which a number of European agriculture sectors rely on seasonal migrant workers and what their absence implies for farms. We then provide some insight into the main strategies adopted by EU countries until now and discuss their viability and effectiveness in ending labour shortage. Lastly, we address the possibility that this large-scale temporary shock might lead to structural changes in those relevant agricultural sectors. The British post-Brexit vote experience allows us to explore approaches that could be adopted by European farmers faced with lasting foreign seasonal worker shortage.

1. EU farmers in some key sectors rely on seasonal migrants to meet the high demand for short-term labour jobs

Agricultural work is most of the time not evenly spread over the calendar year, with periods of significant intensity followed by relative quiet. Seasonal workers, who account for a sizeable part of salaried employees, are essential to covering labour demand peaks. A significant share of seasonal workers are migrants. We will illustrate these two aspects, using in particular detailed national information from France, Italy and the UK.

1.1. EU Agriculture relies on -mostly seasonal- temporary labour

In 2016, temporary workers¹ accounted for 42% of salaried workers in annual work units (AWU) in agriculture in the EU 15 area (Eurostat).

Their proportion varies across countries. In France in 2016, there were 532 thousand seasonal workers in agriculture, representing 34% of AWU (as compared to 26% in 2010), or 71% in terms of number of salaried employees (MSA data² as in Forget *et al.*, 2019). In Italy's case, in 2016, there were 932 thousand seasonal workers, covering 59% of AWU or 90% of salaried employees (INPS's statistics as in CREA, 2019). In the UK, in 2016, there were 64 thousand seasonal workers, accounting for 37% of salaried employees, a much lower share than in Italy and France (DEFRA³ as in Office for National Statistics). Their average duration of work is longer than in France's and Italy's case, as they accounted for 40% of AWU (Eurostat).

Their proportion also varies greatly from one month to the next and between agricultural sectors. Taking the example of France, Figure 1.a shows that the number of active contracts evolves significantly over the months of the year, with a ratio of 1:1.82 between the month with fewest active contracts (December) and the month with most (September). The adjustment is almost exclusively made through seasonal worker contracts.

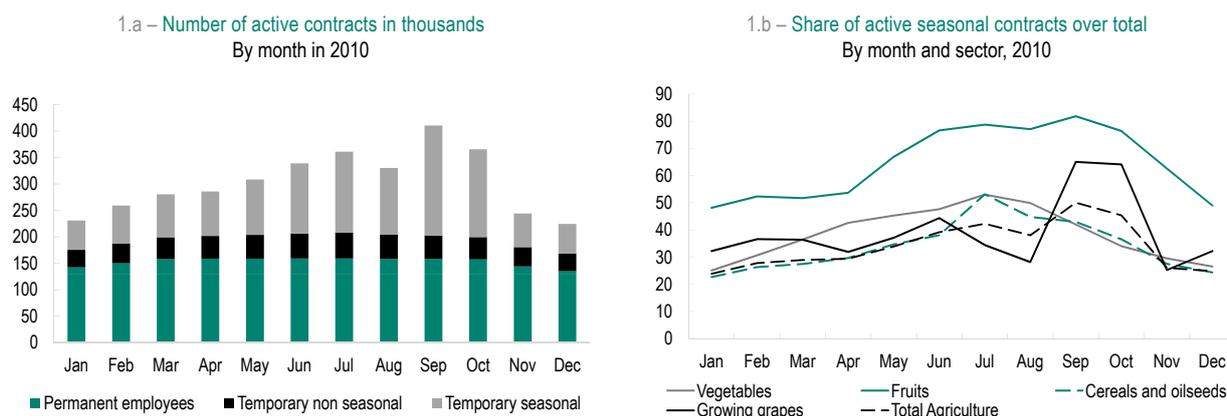
The role of seasonal workers is particularly relevant for some key labour-intensive sectors in agriculture, in the crucial moments of harvesting crops and planting for

(1) The definition of temporary workers depends on national legislations in EU, making international comparisons difficult. For instance, France has two main types of contracts for temporary workers: seasonal workers and temporary non seasonal workers, even though the large majority of temporary workers are seasonal workers (87% in 2016 according to MSA data). Meanwhile, Italy makes no such distinction.

(2) The Mutualité sociale agricole (MSA) is the French compulsory social protection scheme for employed and self-employed persons in the agricultural sector. MSA provides individual data for all the workers in the agricultural sector who pay social security in the country.

(3) Department for Environment, Food and Rural Affairs (DEFRA).

Figure 1 – France: active contracts in agriculture



Source: Mutualité sociale agricole.

the next season (Figure 1.b). In the fruit sector, while seasonal workers are important throughout the year, their role starts increasing in April, peaking during the summer and again in autumn, during which 80% of total contracts are seasonal. In the vegetable sector, seasonal employment starts rising in March, peaking in July-August (50-55%). In the case of viticulture and cereals, seasonal workers are concentrated within fewer months of the year: September and October for viticulture (60% of contracts are seasonal), July for cereals (50%) and August and September for nuts (45%).

1.2. Migrants account for a large part of seasonal workers in EU agriculture

The limited duration of the contracts and the tough work conditions make it difficult for EU farmers to fill these positions and, in particular, cause the rate of applications by natives to decrease overtime (NFU, 2017b; OECD, 2017). A number of agricultural schemes were precisely designed by EU countries (*i.e.*, Germany, the UK, France, Italy, Sweden and Spain) to permit and facilitate the arrival of agricultural migrants,⁴ to fill these temporary labour needs.

Some schemes have a long-standing history:

- Germany seasonal agricultural work programmes date back to the late 19th century. Temporary work permits were introduced in 1890 and remained in place until Polish seasonal workers were largely replaced by forced labour during the Second World War. Following German reunification, seasonal work permits were

(4) The "Directive 2014/36/EU of the European Parliament and of the Council of 26 February 2014 on the conditions of entry and stay of third-country nationals for the purpose of employment as seasonal workers" establishes common standards for seasonal work and working conditions. However, deciding who and how many foreign seasonal workers to admit remains Member States' responsibility. All EU member states have now transposed this directive into domestic law. The implementation is still an ongoing process (Hooper and Le Coz, 2020).

reintroduced in 1991, aimed at seasonal farm workers from Poland and other Eastern European countries. These were initially valid for three months (later extended to six months) per year to cover seasonal demand peaks (Hess *et al.*, 2011).

- In the UK, a Seasonal Agricultural Working Scheme (SAWS) was introduced in response to labour shortage after the Second World War. The SAWS, consisting of a system of quotas allocated on an annual basis, for a period of six months, ended in 2014 when restrictions on the movement of Romanian and Bulgarian workers were lifted.
- France's seasonal migration scheme, initially designed to compensate for the lack of agricultural workers due to rural depopulation, was given a legal framework in early agreements signed with Italy in 1951, Spain in 1961, then Morocco, Tunisia and Portugal in 1963 or Yugoslavia in 1965 (Mesini, 2009).

Instances of restrictive policies towards migrants in agriculture are exceptions.⁵ Even in periods of economic crisis and hostile migration policies, seasonal agricultural migrants were preserved or encouraged to come. In France, after borders were closed and labour migration was interrupted in 1974, the Office for International Migration kept delivering work permits to foreign seasonal workers. Similarly, when Romania and Bulgaria joined the EU in 2007, free labour mobility for citizens from these two countries was delayed for a period of seven years, seasonal migrant workers being the only category of unskilled workers to which some exemptions were applied in many EU countries.

(5) In the case of France, the only instance of restrictive measures towards seasonal agricultural workers took place between 1995 and 2000. In 1995, under the pretence of curbing the rise in unemployment, the French government prohibited the introduction of new seasonal workers, the agreement limiting OMI contracts to those already in existence. OMI contracts are specific temporary contracts of immigration for work, mainly used in agriculture. In 2000 the government decided to remove the quota.

Table 1 – Temporary salaried employees in agriculture by origin in France (in thousands of people)

	2002	2007	2010	2016
National	634.0	565.0	520.8	461.8
Immigrants	130.8	123	121.3	146.6
EU	35.0	30.3	29.5	45.6
Extra-EU	58.0	72.3	70.0	83.3
Not Available	37.5	20.7	21.9	17.6

Source: Mutualité sociale agricole data as in [Forget et al., 2019](#).

Thus, although there is variation between countries, migrant seasonal workers have become an essential part of the workforce needed during harvesting and planting. In France (Table 1), immigrants account for a growing share of temporary workers, in particular from 2010 onwards, rising from 18,8% of total temporary salaried workers in agriculture in 2010 to 24% in 2016. 64% of immigrants came from non-EU countries in 2016, even if the share of EU immigrants increased the most (+54% between 2010 and 2016).

Italy saw a surge of seasonal immigrant workers: +39% in less than ten years, replacing national labour force in seasonal tasks ([CREA, 2019](#)). Seasonal migrants increased from 245.7 thousand in 2008 to 338.8 thousand in 2016, covering 36% of total seasonal employees. They were mainly employed in the fruit and vegetable sectors during picking season, with another few in the livestock sector. Looking at their origin, in 2016 migrants were equally divided between those from the EU (49%) and non-EU (51%).

In the UK, the vast majority of seasonal workers were migrant seasonal workers (between 95% and 99% of total seasonal workers) concentrated in the fruit and vegetable sectors from April until the end of the summer, with a peak in June.⁶ They came mostly from other EU countries, a direct consequence of the way UK managed the agricultural scheme (SAWS) in the past.

It is worth noting that official national data underestimate the role of seasonal migrants in agriculture. These data account

(6) The DEFRA's survey is done in June each year. As such, it would not include those who had worked only between January and May, or those who begin work after June. However, because June is the peak month for seasonal fruits and vegetables employment, and the average length of a seasonal workers' employment is five months, the June Survey capture the majority of workers in these sectors. The significant exception is the poultry industry which employs around 13,000 seasonal workers, the majority of which are migrants, in November and December.

for seasonal workers recruited through service enterprises located on the national territory, but they do not include those outsourced by service enterprises based in other EU countries. In 2017, a specific survey, carried out on behalf of the French Ministry of Agriculture, assessed the number of seasonal workers outsourced from services enterprises based in the EU to 67 thousand people ([Forget et al., 2019](#)). In addition, illegal workers, the number of which is by nature hard to measure, are not accounted for.⁷

Seasonal migrant workers developed specific skills over time, forming a relationship with one or a few employers and often returning year after year in the same place ([OECD, 2019](#)). They often come from rural areas where they already have work experience ([Hooper and Le Coz, 2020](#)). Their rate of returnees is quite high, 49% in France ([Depeyrot et al., 2019](#)) or 69% in the UK until 2016 ([NFU, 2017](#)), thus contributing to so-called circular immigration⁸

seasonal migrant workers developed specific skills over time

([Constant et al., 2013](#); [Graeme, 2013](#); [Dustmann and Görlach, 2016](#)). Even though seasonal workers tend to be classified as low-skilled labour, farmers value the skills and experience that returnee workers bring to the job. Many fruits and vegetables require skilled handpicking to avoid damaging the crops. For example, strawberry pickers need to make constant decisions based on a fruit's ripeness, shape, size, grade, etc. Getting these decisions wrong can create costly rejections from the packhouse or the retailer, damage to plants ([NFU, 2017b](#)). Being cut from these workers exposes farms to production losses and to a risk of a significant drop in productivity.

2. Emergency policies to avoid disruptions due to labour shortage

March and April being the time to start harvesting and planting for the next season, European governments reacted quickly to avoid disruptions due to labour shortage in the fruit and vegetable sector. Different policies have been adopted by EU countries, with rapid changes from one week to the other. In the peaks of the harvesting seasons, other adjustments will likely be proposed by EU

(7) The eradication of this illegal seasonal work is one of the greatest challenges in Europe. For instance, in 2015 more than half of all workers in the Italian agricultural sector (including both nationals and foreigners) were hired without a formal contract ([Corrado, 2018](#) and [Perna, 2019](#)). Italy is an emblematic case, but not the only one in Europe. Projects to evaluate this topic have been launched in four other countries, namely Germany, Spain, France and Sweden ([Hooper and Le Coz, 2020](#)).

(8) Circular migration has been favoured in some European programs, with Tunisian and Moroccan workers often returning to work on the same French farms for multiple seasons; similar dynamics also exist in Spain, the United Kingdom (under its previous SAWS program) and in Sweden ([Hooper and Le Coz, 2020](#)).

countries, depending on the pandemic situation and the degree of success of lockdown-ending policies.

Even though it is too early to precisely assess the impact of the main strategies followed, we wish to provide some clarification on their effectiveness in avoiding labour shortage, using two parameters: the number of workers needed and their skills/productivity. We will also discuss their viability, both politically and economically. To that end, the time horizon is an important factor to take into consideration. On the one hand, short term strategies are hardly sustainable in the long run. On the other hand, some possible viable strategies are not available yet, as we will discuss later.

2.1. Replacing seasonal migrant workers with domestic labour

This solution was the first to be followed by almost all EU countries, mainly due to lockdown measures freeing up a large part of the domestic labour force employed in non-essential sectors. This is clearly France's strategy, which is still in place at the time of writing. The symbol of this policy is Minister of Agriculture Didier Guillaume's 24 March appeal to the "army of shadows", to go to harvest fruits and vegetables. Along with this appeal, a website was set up to put people (*i.e.*, part-time workers, temporary layoffs and unemployed people) rapidly in touch with farmers. The same strategy was adopted by Germany and the UK, and later by Spain and Italy. To encourage such recruitment, all the governments, except for Italy at this stage, allowed employees to combine their agricultural wage with unemployment benefits.

Minister of Agriculture Didier Guillaume's 24 March appeal to the "army of shadows", to go to harvest fruits and vegetables

The large number of applicants suggests that this strategy was successful in reaching enough workers. However, the recruitment rate among those who registered can be very low, as shown by some disappointing first results. On 28 April, out of the 50,000 candidates on the British platform, less than 200 had ended up signing a contract. Only 6,000 people have completed video interviews for jobs on UK farms. The same is true in France, with 843 assignments offered so far, out of 300,000 candidates registered on the platform at the end of April. More than 5,000 people have been offered contracts, but it is not yet known how many have been hired. This is a far cry from the estimated needs for seasonal workers expressed by the British and French Minister of Agriculture upon creating these platforms, respectively 70,000 and 200,000.

Problems stem from both the supply and the demand side. On the supply side, one reason given in the UK for the failure of this strategy was that furloughed workers applied for a very short-term period, as they wanted to be able to return to their usual employment as soon as possible. Recruiting new staff implies training costs for farmers, and a high turnover of workers multiplies these costs. On the demand side, professional organisations, and agricultural lobbies all over the EU, underlined the substantial mismatch of required skills. In Germany's case, a large part of those hired domestically (16,000 out of 20,000) are refugees who had already applied for job offers in the agricultural sector by the end of February. Even without any information about their skills, we can infer that they will remain working for a longer period than many natives who need to go back to their jobs, making the opportunity cost of training more acceptable to farmers.

2.2. Derogating from labour laws to allow current agricultural employees to work more

This strategy consists in increasing working hours for professional workers with suitable skills. Its effectiveness, from a quantitative point of view, depends on the current employee-to-seasonal-migrant ratio.

France, where seasonal migrants account for 24% of seasonal employees, quickly embraced this policy. On 25 March, temporary measures were adopted, derogating to weekly working time and Sunday rest, in essential sectors. For instance, during the state of health emergency, employees are allowed to work on Sundays, on a voluntary basis. They are also allowed to work up to 60 hours a week, which is 25% more than usual. In return, hours worked beyond the 35-hour threshold are payed as overtime.

This strategy needs to be combined with other measures, as working conditions are hard and extra hours cannot be extended beyond a certain threshold without reducing labour productivity. This is especially true the more the peaks of the harvest seasons approach and the current number of farmworkers is reduced for health reasons (farmworkers, who are unable to work because they become infected or because of other policies implemented in response to the coronavirus, specifically school closures that force parents to stay at home).

These steps were rapidly taken probably thanks to a political consensus between unions and the French Government, likely due to the temporary nature of the decision.

Tax exemption measures to reduce extra labour costs have been more complicated to implement. In France, tax exemption limit for overtime hours worked during the state of health emergency, as well as for the social security contributions applying to those hours, was

eventually raised by the Parliament against the initial opinion of the government.

2.3. Organising the arrival of migrant seasonal workers under very strict health conditions

Seasonal migrant workers are much more productive than unprepared natives. Moreover, as they perform tasks autonomously this strategy can be more efficiently combined with extra hours worked by the current workforce. The strong concerns expressed by professionals on substituting seasonal migrants with natives quickly convinced German authorities to do everything possible to bring in the experienced workforce of seasonal immigrant workers despite border restrictions. On March 26, the German Interior Minister banned foreign seasonal workers from entering the country. Less than a week later, on April 2, the same minister and the federal Minister of Agriculture presented a joint plan allowing exceptions to the current restrictions on the entry of seasonal workers before this summer. Up to 80,000 seasonal workers are allowed to enter by the end of May, a target that should save their crops until the beginning of the summer.

The English government also quickly authorised the entry of foreign seasonal agricultural workers into the

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national territory, a move more symbolic than truly strategic. The announced measures concerned only 5,000 foreign workers, who responded to online job offers; not enough to cover for the estimated 70,000 workers needed. Labour shortage in the UK is not only due to the pandemic, it has been an issue since the Brexit vote in

2016, as we will see in the last section.

As compensation for derogations, important health measures were adopted with the reception of these migrant workers, entailing extra costs. In Germany, seasonal migrants, who were used to coming by car or bus, can now only travel by plane. Once they are tested for Covid-19, they work and live separately from other farm workers for the first 14 days in the fields. Employers are responsible for providing accommodation and daily transportation to the worksite, involving additional arrangements to enforce social distancing during the health crisis.

This strategy is also particularly sensitive from a political point of view. The disease spreads through the mobility of people. Though there is no evidence that the mobility of migrants would have a more serious impact than the mobility of other domestic workers, bringing people from far away is a difficult message to deliver, especially with so

many people out of work due to lockdown and the resulting economic crisis.

Political will is necessary but not sufficient. Since the beginning of the crisis, Italy and Spain have been considering the need for foreign seasonal workers a priority. Being the cradle of the epidemic in Europe and the most affected countries, they face seasonal workers' fear of being infected if they come. Despite the important diplomatic efforts with foreign authorities to convince their workers that security measures will be taken, no seasonal workers entered either country until mid-May.

2.4. Regularising irregular migrants within the country

Although their number is hard to assess, many EU economies have a relevant pool of irregular foreign workers already working in agriculture and many others living in the country without a job or employed in other sectors. Regularising those migrants is an appropriate strategy for health and social reasons but is also efficient from an economic point of view. This population could constitute a large amount of available workforce with a low rate of turnover, and high productivity for those with experience in agriculture. This strategy is better suited to the objective of producing at a reasonable price than looking for nationals, who not accept the current working conditions for a long period of time. This also means tax revenues for the government (Boeri, 2020). On the other hand, this would be a politically controversial strategy, especially in countries with restrictive migration policies. Following Portugal's decision on 29 March to grant a residence permit to all immigrants who had already applied for it, at least until 1 July, the Italian Ministers of Agriculture and the Interior forced the government to approve a decree to regularise undocumented migrants living in unsanitary conditions while working in the fields of Southern Italy. They insisted that their immediate regularisation would be a suitable health security measure for the country, while providing appropriate workforce for agriculture, both in the North, where farmers seek to hire only regular workers, and in the South, where migrants would no longer have to fear police checks on their way to work.⁹ After a month and a half of long political debates and the threat of a political crisis within the government majority, a compromise was reached on 13 May. The first draft decree mentioned the regularisation of about 200,000 migrants in agriculture over a period of twelve months; the actual decree affects 600,000 people, 300,000 of whom work in agriculture, but for a period not exceeding six months, until the end of the calendar year's harvest season. Conditions were added, mainly in order to

(9) In the south of Italy there is also the problem of Mafia, putting illegal migrants at risk of being exploited in Mafia-owned fields.

avoid hiring people with legal problems, favouring people linked to the mafia or creating incentives for the arrival of new migrants. It seems unlikely that this strategy will find political consensus beyond this short period.

It is important to assess whether these strategies are economically viable.

In the fruit and vegetable sector, since labour costs make up a large part of the total cost (30 to 50%), any disruption in these costs or in productivity will mean higher prices for consumers. Certainly, all these strategies are preferable to a situation with a shortage of workers, significant income losses for producers, food shortages and prohibitive prices for consumers. However,

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it is too early to assess which strategy is the most effective, *i.e.* which one overcomes labour shortage with the lowest impact on labour costs.

In the short term, domestic producers are protected from the negative effects of a significant increase in their production costs. This is because the Covid pandemic is a symmetric shock, simultaneously affecting all the main producers in the sector, which is highly concentrated (Spain, Italy and France account for 58% of the production in volume and 62% in value¹⁰ – FAOSTAT, average 2016-2018). This limits the availability of imports from those EU countries (European trade in these sectors is largely intra-EU, 80% of exports and 71% of imports – Comext, average 2016-2018), reducing competition.

The higher the price of domestic products compared to imported goods, less available in supermarkets during the crisis, the more consumers are penalized.

This is the case for France; a combination of a drop in labour productivity, higher transport costs, relatively higher labour cost and higher product quality than in other countries (*i.e.*, Spain) accounts for a 9% increase in fruit and vegetable prices over a period of three weeks, according to a survey of supermarket prices carried out by a consumer association (<https://ufc.quechoisir.org/>).¹¹

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Once competition in the sector is restored, agro-business would be undermined by the cheaper imported products.

Should the health crisis persist, finding a strategy that will work in the long run will be a complex task, since it needs to be politically and economically viable, both for producers and consumers.

3. The Covid-19 pandemic may be an accelerator for the development and the adoption of new technologies

There are reasons to believe that this crisis will be a temporary hindrance, eventually leading to structural changes in the way fruits and vegetables are produced.

Considering the uncertainty about future waves of the disease when restrictions are lifted, many countries remain cautious. Deconfinement measures are still extremely strict and some countries, such as France, have suggested keeping borders in Europe closed until October 2020 (Carrera and Luk, 2020). Even though limitations to labour mobility are eased, they are likely to be restored quickly in the case of a second wave. Moreover, there is no certainty that seasonal workers would return so easily to the countries that have seen the most virulent

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outbreaks of the pandemic. Labour mobility will probably be reduced for a longer period, at least until large stocks of vaccines are available to immunise the population, which may not be for another 18 months or more (Ferguson *et al.*, 2020). To avoid losses, farmers in affected countries are likely to try to mitigate the risks associated with their reliance on seasonal foreign workers.

The dramatic episode of Covid-19 shows how vulnerable to disruptions the current fruit and vegetable production model is. Other pandemics are likely to break out in the future, as evidenced by recent episodes like the avian influenza A virus (H5N1) in 1997, the SARS virus in 2002 or the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) in 2012.

Beyond the health crisis, the economic and social crises, which are expected to be severe, may also lead to very restrictive migration policies. History teaches us that these crises exacerbate hostile attitudes towards immigrants and their families, especially when they result of pandemics spread by people on the move (Edo and Umana Dajud, 2020). Restoring the mobility of seasonal workers within the European area is only a partial solution. The possibility

(10) If we add the next five countries, in order of importance, Poland, Greece, Germany, Romania and the Netherlands, we reach 88% of total production.

(11) 120 000 observations over three weeks for the same products in all continental France, between the first week before the lockdown and the end of the second week of the closure.

of tightening migration policies at the Union's borders will affect countries, such as France, Italy and Spain, which still rely on non-EU seasonal workers. Similarly, hostile migration policies make the adoption of solutions such as the regularisation of undocumented migrants (measures often perceived as incentives for long-term immigration) rather unlikely. Lastly, xenophobic attitudes discourage seasonal migrants from coming, as the UK experienced after the Brexit vote.

The case of the UK, which has been facing a shortage of seasonal foreign labour in the fruit and vegetable sector, since the Brexit vote, is an instructive one. It will help us to explore options that could be chosen by European farmers.

Since June 2016, growers have repeatedly warned of damaging labour shortages, with recruiters reporting that Brexit has created the perception among foreign workers that the UK is xenophobic and racist (Rzepnikowska, 2019). The fall in the value of the pound after the Brexit vote has also made the UK less attractive. Businesses have experienced issues in recruiting and retaining seasonal workers even when offering higher wages (+11%) (NFU, 2017). In 2016 the percentage of migrant seasonal workers that voluntarily left employment early increased nearly six-fold from 4.8% in Q1 to 15.9% in Q2 and 27.4% in Q3 (NFU, 2016). The proportion of workers returning to work in the UK also dropped fast, from 41% in 2016 to 29% in 2017. The government, committed to reducing immigration, first rejected calls for the reintegration of SAWS, then introduced a temporary SAWS programme for non-EU citizens (2500 visas) in late 2018, but insufficient in covering farms' needs. Faced with labour shortages and the persistent prospect of restrictive migration policies, the UK farmers have begun to adapt their production methods by exploiting different strategies.

The British government urged farmers to replace foreign seasonal workers with domestic labour. However very few British nationals applied to seasonal work offers. The recent experiences of EU countries during the Covid-19 and the UK after the Brexit vote, confirm the results of past experiences: the use of local labour is an option difficult to follow in the future for EU countries. Clemens (2013) showed from natural experiments on North Carolina farms that "almost all U.S. workers prefer almost any labour-market outcome – including long periods of unemployment – to carrying out manual harvest and planting labour". Under normal conditions, the labour supply of natives for the tasks performed by foreign seasonal workers is close to zero. In order to attract

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natives, higher wages are not sufficient. One possibility is to change the production system from field crops to off-season crops, where the work required is of longer duration and therefore perhaps more attractive to locals. Other things being equal, this will also increase wages. Raising wages will make some businesses unviable. This may explain why farmers seem to adapt to the exclusion of foreign workers by changing production techniques. Clemens *et al.* (2018) studied a U.S. border closure policy that in 1964 excluded approximately half a million Mexican seasonal farm workers (braceros) from the agriculture labour force. The objective was to improve wages and employment of domestic agricultural workers. But the results of Clemens *et al.* (2018) show that instead of turning to local labour to meet the shortage

of seasonal foreign workers, American farmers substituted labour with physical capital, where possible, or reduced their level of production.

This form of induced technological change¹² corresponds to the second strategy encouraged by the British government. After the Brexit vote, the UK government allocated £90 million to a "food production transformation" programme, aimed at exploiting AI, robotics and satellite data to innovate in the agri-food industry; and a £40 million grant to encourage farmers to invest in new technologies, such as robotics.¹³ This technology, which requires large public investments, is not yet operational to replace human harvesters on an economically viable scale. Nevertheless, recent innovations in computer vision, 3D sensors, artificial intelligence and advanced robotics make researchers optimistic. According to engineers working on these techniques, it would only be a matter of a few years (five to ten years) before these first harvesting

robots are found on a large scale in crops (Le Monde, 2019; The Guardian, 2019). It will not be a solution to the seasonal labour shortage in the coming months. But it is clearly an option that will be considered by many EU farmers in the near or more distant future, depending on the speed of technological progress and the scarcity of foreign labour.

(12) It is important to stress that the causal link between labor scarcity and endogenous technical change is not obvious, as argued Acemoglu (2010). For instance, considering France, the beet growers were, around the middle of the 20th century, the first to organise the recruitment of temporary migrant labor (Hubscher, 2005). The work was then carried out by Belgians and Italians. Technical progress, from the 1960s onwards in the sector, sounded the death knell for the entry of these two nationalities and the interest of these type of workers in other labour-intensive agricultural sectors.

(13) Japan and to a lesser extent the State of California in the USA have started investing in this direction.

As the option of new technologies was not available in the short run, some British farmers started setting up new farms in developing countries with favourable climatic conditions. For instance, Haygrove raspberry and blueberry farm in Ledbury, Herefordshire, one of the biggest farmers in the UK, moved some of its growing to Yunnan province in China in 2018. This strategy is certainly more complex than simply importing more from cheap labour countries (*i.e.*, China, Morocco, Kenya). However, it combines the advantage to produce and sell products in expanding local markets and to export to European markets. For fruit and vegetable commodities, perishability considerably increases transport and logistics costs per unit of value, limiting trade over long distances. Higher transport costs could be compensated by the elimination of the European agricultural protectionism, quite complex and prohibitive¹⁴ (see [Disdier *et al.*, 2008](#) and [Emlinger *et al.*, 2008](#)). No European country is likely to propose a broad policy to depend on imports from third countries in the near future, though. As a matter of fact, the coronavirus pandemic and its economic and social consequences have clearly highlighted the issue of national sovereignty in strategic economic sectors, including the food sector.

Conclusion

Covid-19 is a major shock to European agriculture, revealing the fundamental role of migrant seasonal workers for a large number of agricultural products. European public policies to fight the coronavirus pandemic, lead to important limitations on the transport of goods and labour mobility restrictions, which combined with the fear of contamination, stopped the arrival of migrant seasonal workers into the fields of many EU countries. Alternatives seeking to cope without this experienced foreign seasonal labour force, pose two difficulties: their effectiveness is not guaranteed and/or they are accompanied by a significant increase in production costs and therefore in prices. In the longer term, labour shortage could endanger the survival of many businesses. Farmers are likely to reconsider their production methods. Among the possible options for replacing foreign seasonal workers, the one that proposes the use of robots for harvesting is probably the most promising within the next five to ten years. After all, machine technologies penetrated many European agricultural sectors in response to the “lack of arms” of the post-war periods of the 20th century. This crisis, which led to a “lack of foreign arms”, could be an accelerator in the development and adoption of new technologies for picking fruits and vegetables.

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(14) A combination of seasonal tariffs and non-tariffs barriers (tariff rate quotas and sanitary barriers), which prevent third countries from entering the EU market. Without going into much details, seasonal tariffs consist of a floor price at the entrance of the EU market, which fluctuates seasonally. For instance, the entry price of tomatoes changes every ten to fifteen days in some periods and varies between €59.96 per 100 kg (from 1 June to 30 December) and €121.61 per 100 kg (from 1 to 30 April). Presently, entry prices are fixed by the *EU implementing regulation 2019/1776*.

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