What Does Ecological Farming Mean for Farm Labour?

Que signifie l'agriculture écologique pour le travail agricole ?

Was bedeutet die ökologische Bewirtschaftung für die landwirtschaftliche Arbeit?

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For some decades now, the EU Common Agricultural Policy (CAP), and more recently the Green Deal, has explicitly recognised that farms are capable of, and are expected to deliver, not only marketable revenues but also multiple public goods and ecosystem services. One ecological approach to farming, defined by Rega *et al.* (2018; also see Rega *et al.*, this issue), is labelled 'low-input' farming, also referred to as 'low intensity' or 'reduced input' farming, which reduces the pressures that agriculture places on the environment, including greenhouse gas emissions and water pollution, through reduced reliance on external inputs derived from fossil fuels. Another type of farming considered in this article is organic farming. Whilst previous research has investigated the impact of adopting ecological farming on farm performance, it has rarely focused on the impact on labour, whether in economic terms (returns to labour) or in social terms (working conditions).

Increased returns to labour when farms employ high-input intensity practices

A move towards low-input farming will, by default, result in changes in the proportions of factors used by farms (Montt and Luu, 2020). Our focus in the first part of this article is on how low-input farming practices, i.e. one of the ecological approaches to farming, could alter the returns to labour on farms. From a policy point of view, it is important to determine the effect of policies conducive to the adoption of ecological approaches on economic returns to labour. However, farms are heterogeneous with respect to their implementation of ecological practices, and socio-economic outcomes may vary significantly along the continuum from conventional to the most ecological farming.

The link between low-input ecological practice and returns to farm labour was studied with data from the EU Farm Accountancy Data Network (FADN) for the period 2004–2015 (this was the most recent period made available by the European Commission to H2020 LIFT project at the time of analyses). The study covered four European countries – France, Hungary, Poland and the UK, a mix of Southern, Central European and North Western countries, with farms operating in different climatic and other environmental conditions.

Three petrochemical-derived inputs formed the focus of this study – fertilisers, crop protection chemicals and fuel. We considered the value of revenue that is attributed to a unit of expenditure on a particular input (called in this article input intensity) and the way it affects the value of

Dairy farmer in Puy-de-Dôme, France © INRAE / Maitre Christophe

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revenue produced by an hour of labour input (see Box 1).

The results indicate a consistent pattern across the countries studied, i.e. a hockey-stick shaped relationship between the combined intensity and the impact of a specific input intensity on the change in the revenue per unit of labour. Figure 1 illustrates the results for the UK with the horizontal axis showing the combined input intensity, and the vertical axis showing the effect on returns to labour of individual input intensity (fuel, crop protection chemicals and fertilisers).

This relationship means that when input intensity is low, adding more of a specific input reduces returns to labour. Thus, there are internal economic incentives which appear to reinforce a farm's use of low-input farm practices. However, when a certain threshold in the combined intensity is reached the relationship changes direction. Beyond this threshold, increases in fossil fuel input intensity lead to an increase in labour returns. In this case, internal economic incentives stimulate an increase in input intensity. The threshold is country-specific but there are no large differences (see Table 1).

This relationship reveals that higher-intensity farms can increase their returns to labour by increasing the use of fossil fuel inputs, which, in turn, further increases their combined input intensity. Such processes likely lie behind decades of agricultural intensification which have been based increasingly on the use of such inputs.

Furthermore, the labour returns are greater when farms intensify, compared to the extensification route. In addition, a much smaller share of farms in the country samples are on the low-input side (the left segment in Figure 1) of the relevant thresholds (see Table 2).

It seems that the use of low-input farming remains rather limited. Our results suggest that for many farms, the internal economic incentives, at

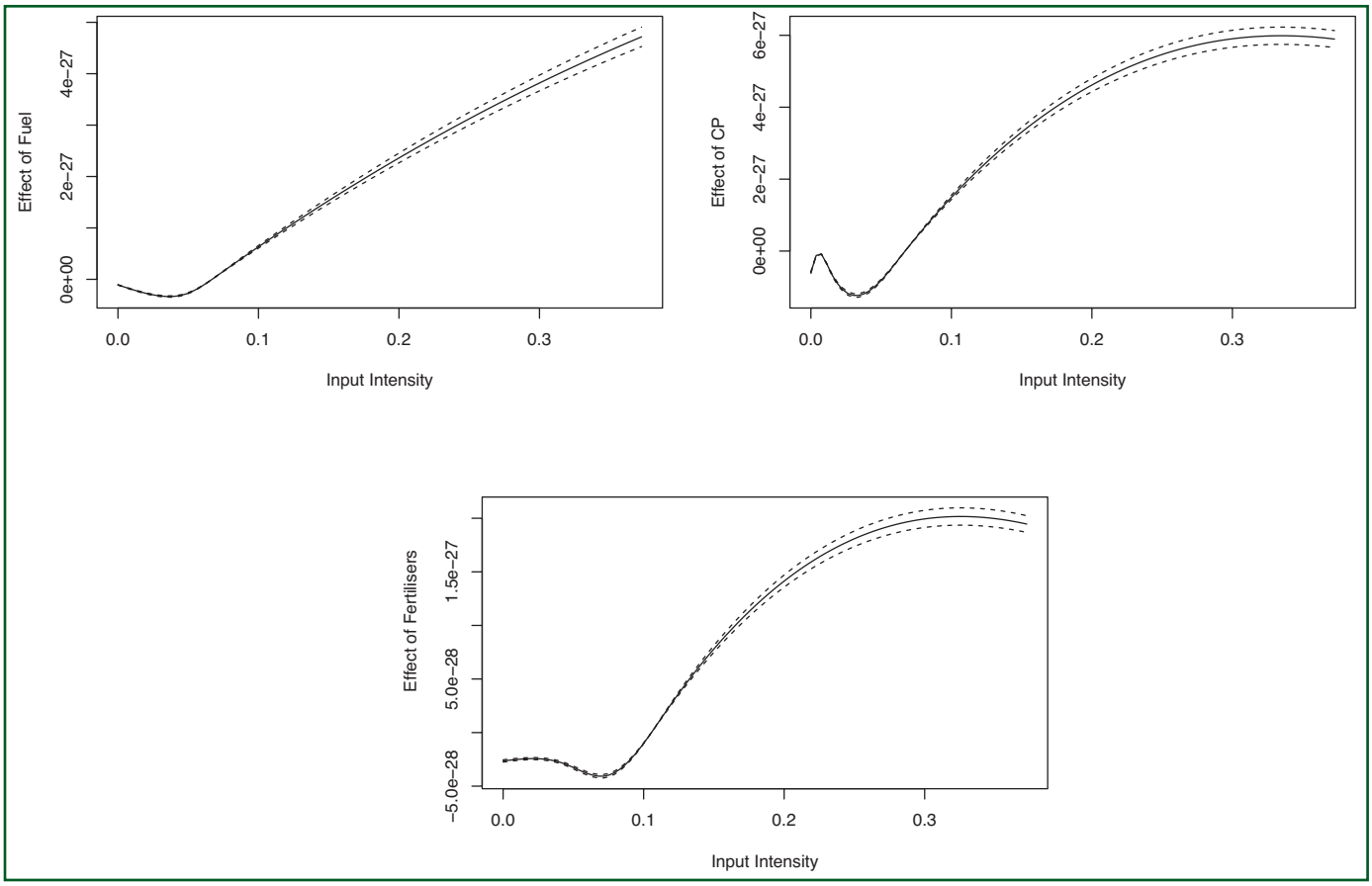
Box 1: Economic analysis of the returns to labour with FADN data

The analysis was based on a formal model investigating how the ratio of revenue to labour use (the latter in hours) varied depending on expenditure on fuel, fertiliser and crop protection chemicals. In order to remove the impact of farm size, all expenditures on inputs were standardised by dividing them by total farm revenue. In the article the standardised ratios are referred to as input intensities.

The ratio of revenue to labour use can be viewed as a measure of returns to labour, in that, conditional on the input intensities (i.e. the farm production structure), it measures the marketable output attributable to an hour of labour. A combined input intensity is calculated as the sum of all three input intensities as explained above. This combined intensity characterises farm production, representing a continuum according to the extent to which farms rely on petrochemical derived inputs (see Davidova *et al.*, 2021)

The way in which the use of fossil fuel inputs determines returns to labour differs for farms within this continuum. The marginal effect of each input intensity changes in accordance with the combined intensity (the sum of individual input intensities).

Figure 1: Estimated returns to labour effects for the UK



least from the point of view of labour returns are very small. This means that there are no meaningful incentives for farmers to adopt low-input farming based on pure economic rationality alone. Therefore, policies which aim to support the adoption of ecological agriculture may need to employ several instruments. First, strong regulatory instruments to push the intensive farms just below the tipping point of the hockey stick, or payments to compensate labour to incentivise such a move, or both, may be necessary. In addition, input taxes designed to reduce farm use of inputs derived from fossil fuels may move farms from the higher-input intensities down towards the tipping point. In order for this to happen, farmers may need different skill sets than those used in conventional farming.

Table 1: Estimated thresholds per input and country

	Fuel	Crop Protection Chemicals	Fertilisers
France	0.03	0.05	0.07
Hungary	0.12	0.06	0.08
Poland	0.06	0.03	0.08
UK	0.04	0.03	0.07

Table 2: Share of farms at the low-input segment in the FADN samples per input and country (%)

	Fuel	Crop protection chemicals	Fertilisers
France	7.0	12.7	19.1
Hungary	18.7	10.2	13.0
Poland	4.5	1.4	7.5
UK	7.3	6.5	20.4

Box 2: Analysis of working conditions on 99 dairy farms in four European case-study areas

Primary data on working conditions were collected in 2019 during interviews with 99 dairy farmers in two European countries and more specifically four European case study areas: Salzburg area (Austria), Steyr-Kirchdorf (Austria), Brittany (France), and Puy-de-Dôme (France). The sample included organic (48) and non-organic (51) farms. A comparative analysis was conducted on the sample of farms to identify interactions between the implementation of ecological (organic) practices and farmers' and hired labour's working conditions (see Hostiou *et al.*, 2021, and Niedermayr *et al.*, 2022).

Effects of the uptake of ecological practices on working conditions

Working conditions are also likely to be affected by the adoption of ecological practices. Working conditions are multidimensional (duration, organisation, stress, quality of life, etc.), and the adoption of ecological practices could improve some aspects of farmers' working conditions while degrading others. For example, the transition to more ecological forms of farming, such as reduced dependency on external inputs, may lead to improved farmers' self-esteem, as such farming contributes to more sustainable production and decreased pressure on natural resources. However, greater intrinsic satisfaction may go hand in hand with an increase in labour load and in arduousness of tasks. This may substantially change the current views of farmers, and of potential farmers, on farming as a more fulfilling occupation (Gliessman, 2007). Applying ecological practices necessitates high levels of understanding, observation and monitoring of the farm operations. It therefore requires increased levels of skills and cognitive capacities compared to more conventional agriculture, and may stimulate higher peer recognition of farmers' work (Barnes *et al.*, this issue). Adoption of ecological practices may also lead to an increase in the complexity of production systems, for example due to new crops or work organisation. This may require more skills, which could be gained, for example, from peers through collective networks (Legras *et al.*, 2021).

> "Es gibt keine sinnvollen Anreize für Landwirte, sich für den ökologischen Landbau zu entscheiden, die allein auf rein wirtschaftlicher Rationalität und auf ihrer Wahrnehmung der Arbeitsbedingungen beruhen."

In order to investigate the effects of ecological practices and on-farm working conditions, an interview survey was carried out in three European case-study areas (one in Austria and two in France). The aim was to explore the diversity of working conditions in dairy farming systems (Box 2). Two types of farms were considered: conventional and organic.

> "Il n'y a pas de raisons valables pour que les agriculteurs adoptent une agriculture écologique sur la base de la seule rationalité économique pure et de leur perception des conditions de travail."

Our results show no strong relationship between ecological approaches and indicators of on-farm working conditions in the sample farms. However, in conventional farms, the average work duration for

the family workforce was higher and farmers reported lower satisfaction with their working conditions than in organic farms. In organic farms, farmers felt that work organisation was more complex following the implementation of organic practices (for example more tasks to perform at a specific moment in time, etc.) and that it was more complex to operate the farm (farmers had to change the way they observe their farm and their monitoring habits). Organic farmers also considered their work as less flexible due to having less free time (fewer holidays and days off, and lower ability to take hours off during working hours). Despite this, organic farmers felt higher levels of satisfaction in being a farmer than conventional farmers.

> “There are no meaningful incentives to farmers to adopt ecological farming based on pure economic rationality alone and on their perception of working conditions.”

Differences in on-farm working conditions in dairy farms were also shown between case study areas, unrelated to the uptake of organic practices. In dairy farms in Puy-de-Dôme in France, work duration was higher than in the other case studies, and farmers perceived lower levels of stress. In both French case study areas, dairy farmers reported having more work at night than in both Austrian case study areas. On-farm working conditions on dairy farms therefore not only depend on the types of practices, but may also depend on the production context. Working conditions also depend on workforce composition. Women, as farm managers, felt higher levels of satisfaction with their work than men, but at the same time felt that they had a higher workload. In dairy farms with less than two family workers, workers reported lower levels of satisfaction or more stress, and less free time.

Weak internal economic incentives?

Ecological farming modifies on-farm working conditions as part of the myriad of influences on the working conditions on farms. Even when focusing on specific farm types – here the case of dairy farms – there are substantial differences between different contexts (e.g. countries/regions, adopted practices or other framework conditions). The results show that it is important to consider workforce composition (gender, number of workers, use of hired workers) to understand transitions of on-farm working conditions and changes induced by the adoption of ecological practices.

Despite recent attention given to low-input farming and other ecological approaches, our research shows that only a small share of farms are in the low-input segment of FADN samples, while the great majority of European farms have not yet embraced this. Our findings highlight that the internal economic incentives faced by farmers to move to ecological farming and decrease the intensive use of inputs based on fossil fuels are weak. Strong regulatory policies, coupled with taxes inducing input price increases, and payments to compensate labour for decreased returns, may move farms towards the adoption of ecological practices. However, much more research is necessary to inform policymakers about an adequate mix of policy instruments according to type of farm and location, and in particular about the skill set required to operate

Dairy farm in Steyr-Kirchdorf, Austria © Stefan Kirchweger

Typical ecological crop farm in England, UK © Bip Mistry

low-input farming if policy incentives are in place.

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Summary

What Does Ecological Farming Mean for Farm Labour?

Ecological farming, such as organic and low-input farming, is gaining popularity in the public discourse. One question is how this type of farming may impact farm labour from a socio-economic point of view. The article first discusses how low-input farming practices (i.e. with lower reliance on inputs derived from fossil fuels) may affect the economic returns to labour, measured as the farm's revenue per hour of labour input, on data from the Farm Accountancy Data Network (FADN) in 2004--2015 for four European countries. Returns to labour appear to be highest at the two extremes – very low-input farms and highly intensive farms. Farms in the low-input end of the spectrum are in the minority, while the overwhelming majority of farms are intensive and have internal economic incentives to intensify further. The article also analyses how working conditions differ between organic and conventional dairy farms in two European countries based on interviews with farmers in 2019. Results show that all dimensions of working conditions are affected by being an organic farm or not, but this is not the only factor. There are many influences on working conditions, such as the production context and workforce composition.

Que signifie l'agriculture écologique pour le travail agricole ?

L'agriculture écologique, telle que l'agriculture biologique et celle à faible intensité en intrants, gagne en popularité dans le discours public. Une question est de savoir comment ce type d'agriculture pourrait affecter la main-d'œuvre agricole d'un point de vue socio-économique. L'article examine d'abord comment les pratiques agricoles à faible intensité en intrants (c'est-à-dire avec un moindre recours aux intrants dérivés de combustibles fossiles) peuvent affecter les rendements économiques du travail, mesurés comme le chiffre d'affaires de l'exploitation par heure d'intrant de travail à partir des données du Réseau d'Information Comptable Agricole (RICA) sur la période 2004–2015, pour quatre pays européens. Les rendements du travail semblent être les plus élevés aux deux extrêmes – les exploitations à très faible intensité en intrants et les exploitations à forte intensité. Les exploitations agricoles à faible intensité en intrants sont minoritaires, tandis que l'écrasante majorité des exploitations sont intensives et ont des incitations économiques internes à s'intensifier davantage. L'article analyse également comment les conditions de travail diffèrent entre les exploitations laitières biologiques et conventionnelles dans deux pays européens sur la base d'entretiens avec des agriculteurs en 2019. Les résultats montrent que le fait d'être une exploitation biologique ou non affecte toutes les dimensions des conditions de travail, mais ce n'est pas le seul facteur. Il existe de nombreuses influences sur les conditions de travail, telles que le contexte de production et la composition de la main-d'œuvre.

Was bedeutet die ökologische Bewirtschaftung für die landwirtschaftliche Arbeit?

Die ökologische Landwirtschaft, wie z. B. der Bio-Anbau und die extensive Landwirtschaft, gewinnt in der öffentlichen Diskussion zunehmend an Bedeutung. Es stellt sich die Frage, wie sich diese Art der Landwirtschaft aus sozioökonomischer Sicht auf die landwirtschaftlichen Arbeitskräfte auswirken kann. In diesem Artikel wird zunächst anhand von Daten des Informationsnetzes landwirtschaftlicher Buchführungen (INLB/FADN) aus den Jahren 2004 bis 2015 für vier europäische Länder erörtert, wie sich extensive landwirtschaftliche Praktiken (d. h. mit einer geringeren Abhängigkeit von aus fossilen Brennstoffen gewonnenen Betriebsmitteln) auf die wirtschaftliche Rentabilität der Arbeit auswirken können, die als Einkommen des Betriebs pro Arbeitsstunde gemessen wird. Die Arbeitserträge scheinen bei den beiden Extremen am höchsten zu sein – bei Betrieben mit sehr geringem Arbeitseinsatz und bei sehr intensiven Betrieben. Der Teil der extensiven Betriebe ist in der Minderheit, während die überwiegende Mehrheit der Betriebe intensiv arbeitet und interne wirtschaftliche Anreize für eine weitere Intensivierung hat. Der Artikel analysiert auch, wie sich die Arbeitsbedingungen zwischen ökologischen und konventionellen Milchviehbetrieben in zwei europäischen Ländern unterscheiden, basierend auf Interviews mit Landwirten im Jahr 2019. Die Ergebnisse zeigen, dass alle Dimensionen der Arbeitsbedingungen davon beeinflusst werden, ob es sich um einen Biobetrieb handelt oder nicht, aber dies ist nicht der einzige Faktor. Es gibt viele Einflüsse auf die Arbeitsbedingungen, wie den Produktionskontext und die Zusammensetzung der Belegschaft.