

EU Green Deal target - pesticide reduction

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Introduction

Several important initiatives have been developed by the European Commission as part of the European Green Deal, including the “From Farm to Fork” (F2F) strategy (Triantafyllidis et al., 2023; Schebesta and Candel, 2020). The F2F strategy envisages ambitious and specific targets to be achieved by 2030. These targets include a 50% reduction in the overall use of pesticides, a 50% reduction in the use of more hazardous pesticides, a 20% decrease in fertiliser use, and an increase in the area under organic cultivation to reach at least 25% (König and Araújo-Soares, 2023; Tataridas et al., 2022; Silva et al., 2022; McGinley et al., 2023). This policy document requires farmers to transform conventional production techniques and use nature-based, technologically advanced and digital solutions to achieve better climate- and environment-friendly results; strengthen the resilience of sectors to climate change and reduce the use of production resources, e.g. pesticides and fertilisers (European Commission, 2020a). Sustainable management of natural resources as well as higher productivity and stable food supplies at affordable prices are among the long-term goals of the Common Agricultural Policy of the EU.

This study has **three main objectives**: 1) it aims to evaluate the potential impact of pesticide use reduction on the profitability of the crop sector in Latvia; 2) it seeks to assess the effect of pesticide use reduction on the usage of synthetic fertilisers; 3) it aims to evaluate the influence of these changes on the overall volume of crop production.

Methodology

Crop/indicator	Target yield						
	2 t ha ⁻¹	3 t ha ⁻¹	4 t ha ⁻¹	5 t ha ⁻¹	6 t ha ⁻¹	7 t ha ⁻¹	8 t ha ⁻¹
Winter wheat							
Pesticides active substance (kg ha ⁻¹)	-	0.78	0.78	1.35	1.97	1.97	1.97
N fertiliser (kg ha ⁻¹)	-	76	110	129	165	197	204
P fertiliser (kg ha ⁻¹)	-	20	30	40	50	56	60
K fertiliser (kg ha ⁻¹)	-	30	45	60	75	84	90
Expected profit (EUR ha ⁻¹)	-	215	327	463	554	695	861
Spring wheat							
Pesticides active substance (kg ha ⁻¹)	-	0.06	0.99	1.04	1.04	-	-
N fertiliser (kg ha ⁻¹)	-	81	106	121	155	-	-
P fertiliser (kg ha ⁻¹)	-	30	37.5	40	50	-	-
K fertiliser (kg ha ⁻¹)	-	30	37.5	60	75	-	-
Expected profit (EUR ha ⁻¹)	-	224	336	439	587	-	-
Winter rapeseed							
Pesticides active substance (kg ha ⁻¹)	0.72	0.72	1.04	1.04	-	-	-
N fertiliser (kg ha ⁻¹)	109	142	182	213	-	-	-
P fertiliser (kg ha ⁻¹)	52	65	78	91	-	-	-
K fertiliser (kg ha ⁻¹)	52	65	78	91	-	-	-
Expected profit (EUR ha ⁻¹)	442	860	1234	1671	-	-	-

The study was performed by comparing various production alternatives used in cultivation of winter wheat, spring wheat, and winter rapeseed in Latvia. To describe different production alternatives with different pesticide inputs, crop production technology models were used (LLKC, 2021a).

Table 1. Average optimal pesticide and NPK fertiliser use rates, and profit for different target yields of crops

Scenario simulation approach is used to assess pesticide usage reduction policies: 1) pesticide use intensity is reduced to 1.35 kg of active substance per hectare, which corresponds to the target winter wheat yield of 5 tons per hectare; 2) pesticide use intensity is reduced to 0.78 kg of active substance per hectare, which corresponds to the target winter wheat yield of 4 tons per hectare; 3) the most ambitious policy scenario envisions not only reducing pesticide use intensity to 0.78 kg, but also converting 33% of the wheat and winter rapeseed areas to organic farming. The 33% increase is above the 25% objective of the F2F strategy.

Results

For the baseline scenario, all areas under winter wheat, spring wheat and winter rapeseed in Latvia were divided into yield categories (Table 2). For instance, the total area under winter wheat with an average yield of 5 t ha⁻¹ (from 4.5 to 5.5 t ha⁻¹) in 2021 was 119025 ha, the spring wheat area being 6568 ha and the winter rapeseed area being 1681 ha. This allows us to evaluate total pesticide usage by crop and yield and to later use this information for the policy simulations, introducing pesticide usage limitations.

Table 2. Crop areas which are assumed to be cultivated using pesticides with various yield levels in Latvia in 2021, ha.

Crop / indicator	Average yield							Total
	2 t ha ⁻¹ (< 2.5)	3 t ha ⁻¹ (2.5 - 3.5)	4 t ha ⁻¹ (3.5 - 4.5)	5 t ha ⁻¹ (4.5 - 5.5)	6 t ha ⁻¹ (5.5 - 6.5)	7 t ha ⁻¹ (6.5 - 7.5)	8 t ha ⁻¹ (7.5 >)	
Winter wheat area (ha)	-	44 113	77 040	119 025	107 691	43 122	5 845	396 836
Spring wheat area (ha)	-	33 218	19 830	6 568	1 802	-	-	61 418
Winter rapeseed area (ha)	20 131	79 775	26 515	1 681	-	-	-	128 102

Table 3. Consumption of pesticides and NPK fertilisers and farm profits at various target yields and in total in Latvia in 2021.

Crop/indicator	Yield							Total
	2 t ha ⁻¹	3 t ha ⁻¹	4 t ha ⁻¹	5 t ha ⁻¹	6 t ha ⁻¹	7 t ha ⁻¹	8 t ha ⁻¹	
Winter wheat								
Pesticide active substance (t)	-	34.4	60.1	160.1	211.6	84.7	11.5	563
N fertiliser (thou. t)	-	3.4	8.5	15.4	17.8	8.5	1.2	54.7
P fertiliser (thou. t)	-	0.9	2.3	4.8	5.4	2.4	0.4	16.1
K fertiliser (thou. t)	-	1.3	3.5	7.1	8.1	3.6	0.5	24.2
Expected profit (mln. EUR)	-	9.5	25.2	55.2	59.7	29.9	5.0	185
Spring wheat								
Pesticide active substance (t)	-	2.1	19.6	6.8	1.9	-	-	30
N fertiliser (thou. t)	-	2.7	2.1	0.8	0.3	-	-	5.9
P fertiliser (thou. t)	-	1.0	0.7	0.3	0.1	-	-	2.1
K fertiliser (thou. t)	-	1.0	0.7	0.4	0.1	-	-	2.3
Expected profit (mln. EUR)	-	7.5	6.7	2.9	1.1	-	-	18
Winter rapeseed								
Pesticide active substance (t)	14.5	57.3	27.5	1.7	-	-	-	101
N fertiliser (thou. t)	2.2	11.3	4.8	0.4	-	-	-	18.7
P fertiliser (thou. t)	1.0	5.2	2.1	0.2	-	-	-	8.5
K fertiliser (thou. t)	1.0	5.2	2.1	0.2	-	-	-	8.5
Expected profit (mln. EUR)	8.9	68.6	32.7	2.8	-	-	-	113

Therefore, under the baseline scenario, the totals for producing winter wheat, spring wheat and winter rapeseed were as follows: 1) Pesticide active substance – 694 tonnes; 2) N fertiliser – 79.2 thou. tonnes; 3) P fertiliser – 26.7 thou. tonnes; 4) K fertiliser – 34.9 thou. tonnes; 5) Expected profit – EUR 316 mln.

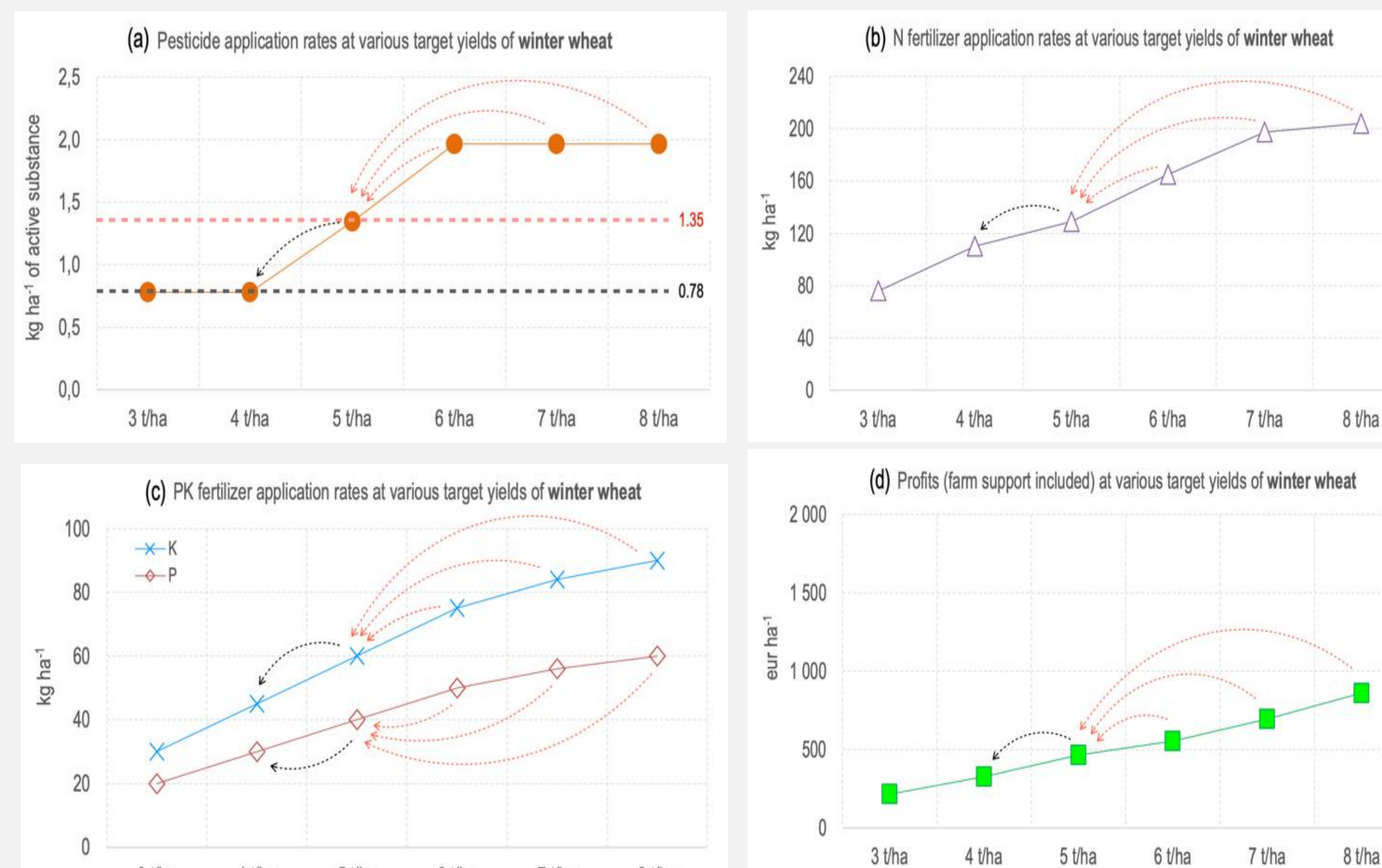


Fig.1. Impacts of pesticide use intensity reduction on the use of NPK fertilisers and expected profits from winter wheat in Latvia.

Results

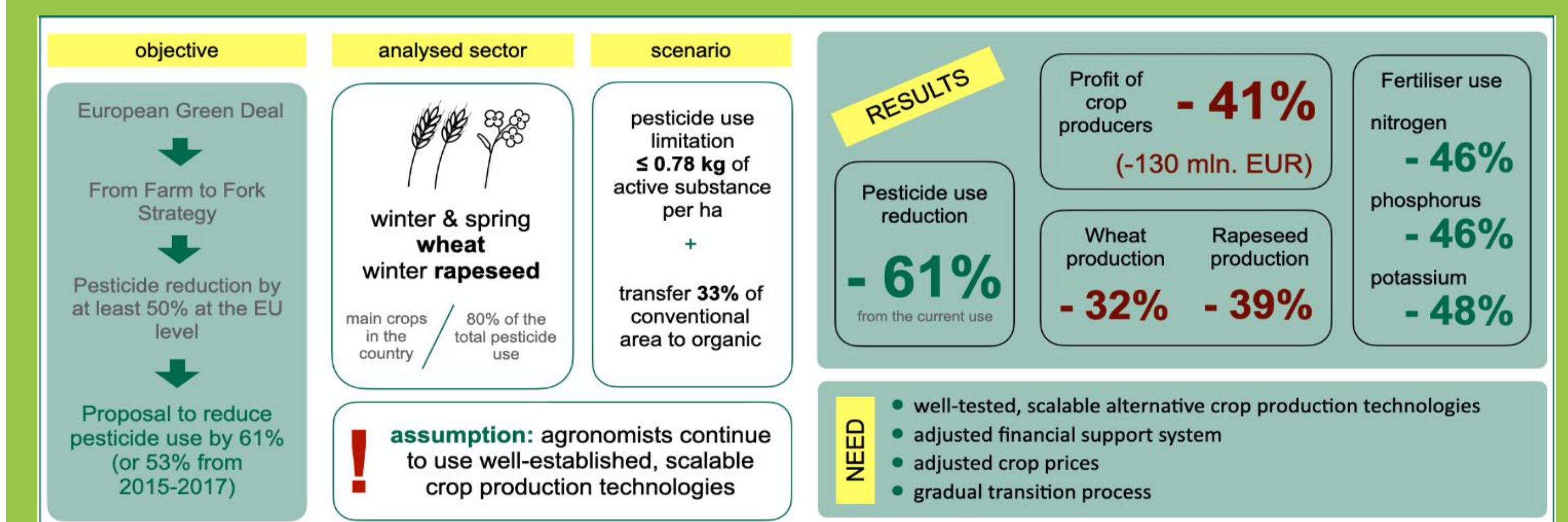
Table 4. Results of pesticide and NPK fertiliser use and farm profits per Scenario.

Indicators	Baseline scenario	Scenario 1*	Scenario 2**	Scenario 3***	Change against base scenario		
					Scenario 1	Scenario 2	Scenario 3
Pesticides (t)	694	597	405	270	-14%	-42%	-61%
N fertiliser (thou.t)	79.2	71.9	64.6	43.2	-9%	-18%	-46%
P fertiliser (thou.t)	26.7	24.8	21.4	14.3	-7%	-20%	-46%
K fertiliser (thou.t)	34.9	32.1	27.1	18.2	-8%	-22%	-48%
Profit (mln. EUR)	316	294	240	186	-7%	-24%	-41%
Wheat production (thou.t)	2253	2042	1727	1526	-9%	-23%	-32%
Rapeseed production (thou.t)	394	394	364	242	0%	-8%	-39%

* Pesticide limitation 1.35 kg ha⁻¹ of active substance
 ** Pesticide limitation 0.78 kg ha⁻¹ of active substance
 *** Pesticide limitation 0.78 kg ha⁻¹ of active substance and 33% of area conversion to organic

The scenario involving a reduction of pesticide use intensity to 1.35 kg ha⁻¹ (Scenario 1) reveals a 14% decrease in pesticide use and a 9% decrease in N fertiliser use. Additionally, the profit for agricultural producers from the three main crops would decrease by 7%, equivalent to EUR 22 mln. Implementing pesticide use limitation to 0.78 kg ha⁻¹ (Scenario 2) will result in a significant reduction in overall pesticide use by 42% compared to the base level. Additionally, the use of N fertiliser will decrease by 18%, and farm profits will decline by 24%, equivalent to EUR 75 mln. In Scenario 3, it is also anticipated that the use of pesticides will be reduced by 61%. At the same time, it would lead to a decrease in farmers’ profits by 41%. This scenario will meet the target of reducing overall pesticide use by 61% compared to the base scenario level (53% reduction from the 2015-2017 level).

Main conclusions



More information

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Research article

When pesticide reduction objectives meet business as usual: Possible impacts on the crop sector in Latvia

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