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Analysis of pesticide residue levels in dairy products in Europe from 2009 to 2022

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The role of milk and dairy products in the diet

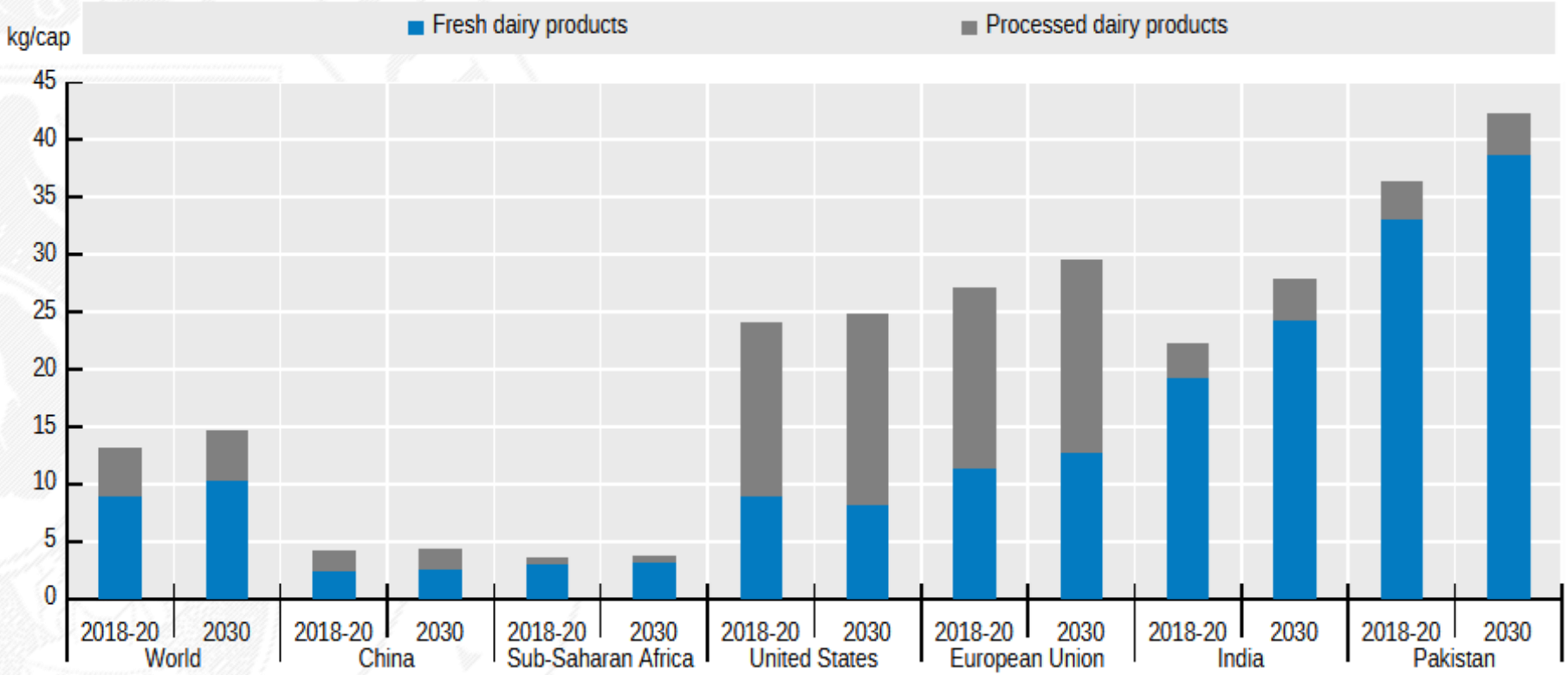
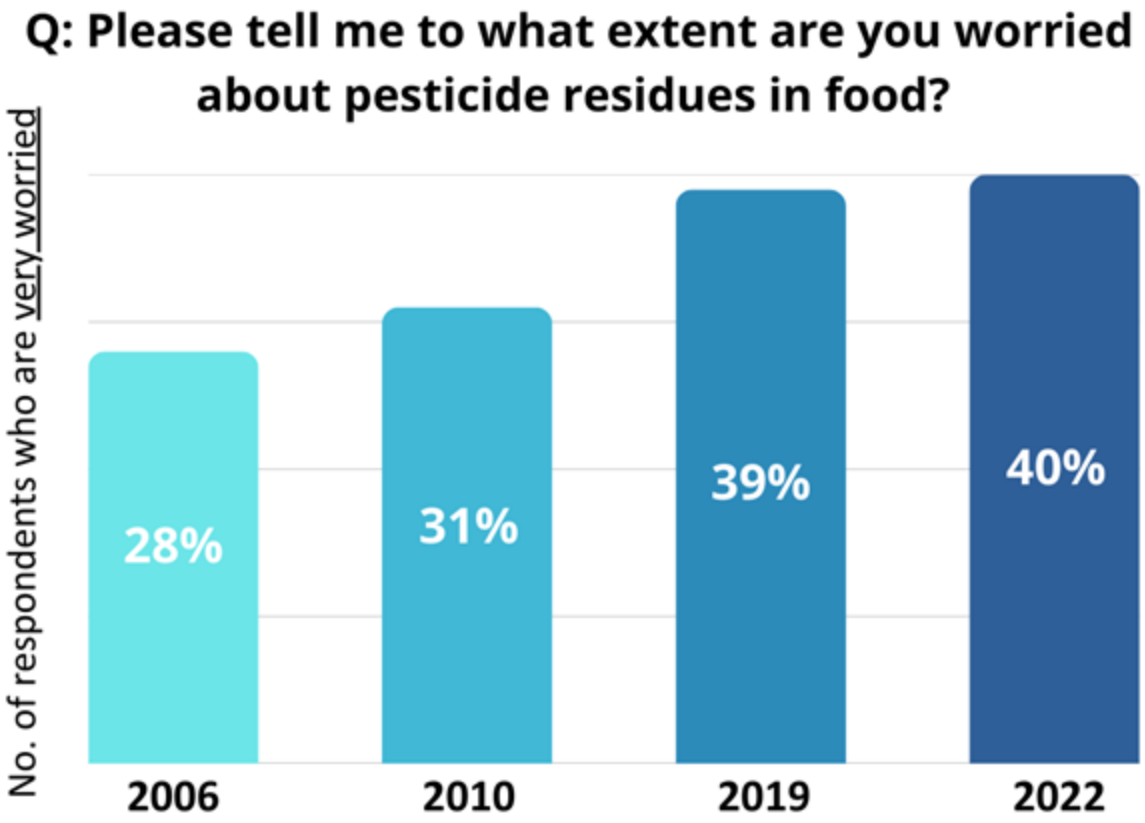


Figure 1. Per capita consumption of fresh and processed dairy products in milk solids

Monitoring pesticide residues in milk is crucial due to the potential health risks for consumers.

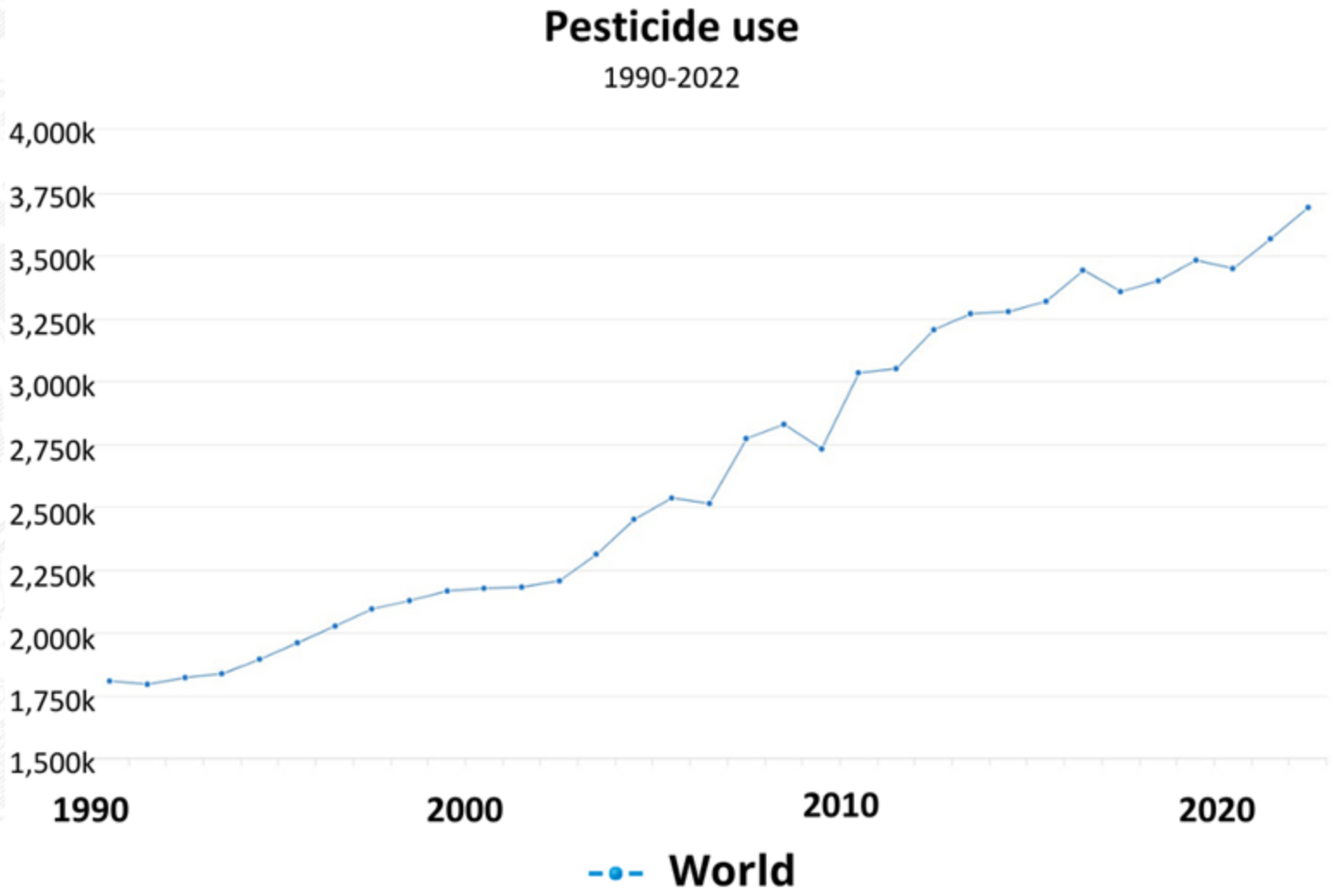
source: OECD/FAO (2021),
''OECD-FAO Agricultural Outlook OECD Agriculture statistics (database)''

Concerns regarding pesticide residues in food



source: own elaboration by Para J.,
based on **Eurobarometer reports from 2006, 2010, 2019 and 2022**

Increase in global pesticide use



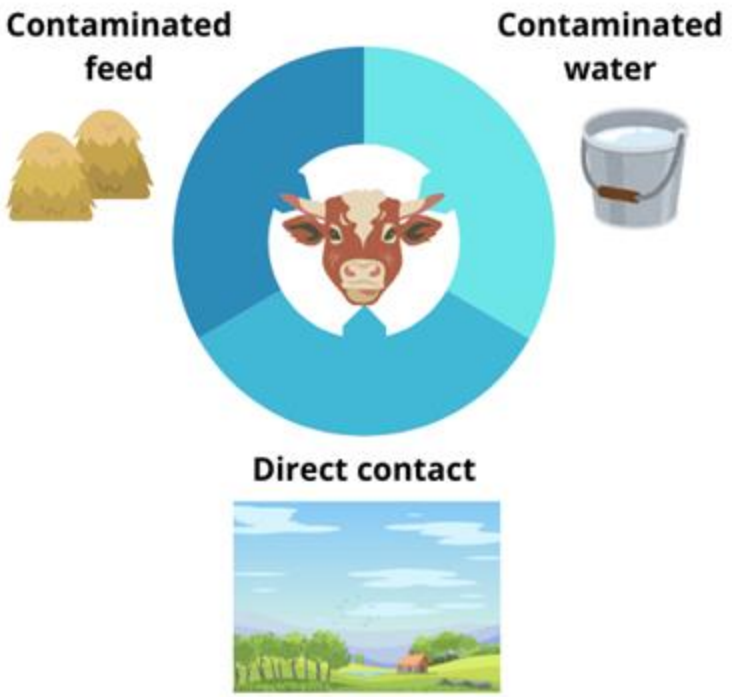
source: FAOSTAT (18 March, 2025)

Pathways of pesticide exposure in dairy cattle

Consumption of contaminated **feed is the main route** of exposure.

Pesticides also have the ability to enter the body through inhalation or dermal absorption and to accumulate in tissues and organs.

Metabolized compounds are excreted through urine and feces, but **in cattle milk is also a major route of pesticide disposal**.



source: own elaboration by Para J., based on **the Pesticide Atlas 2024**

Monitoring pesticide residue levels in food

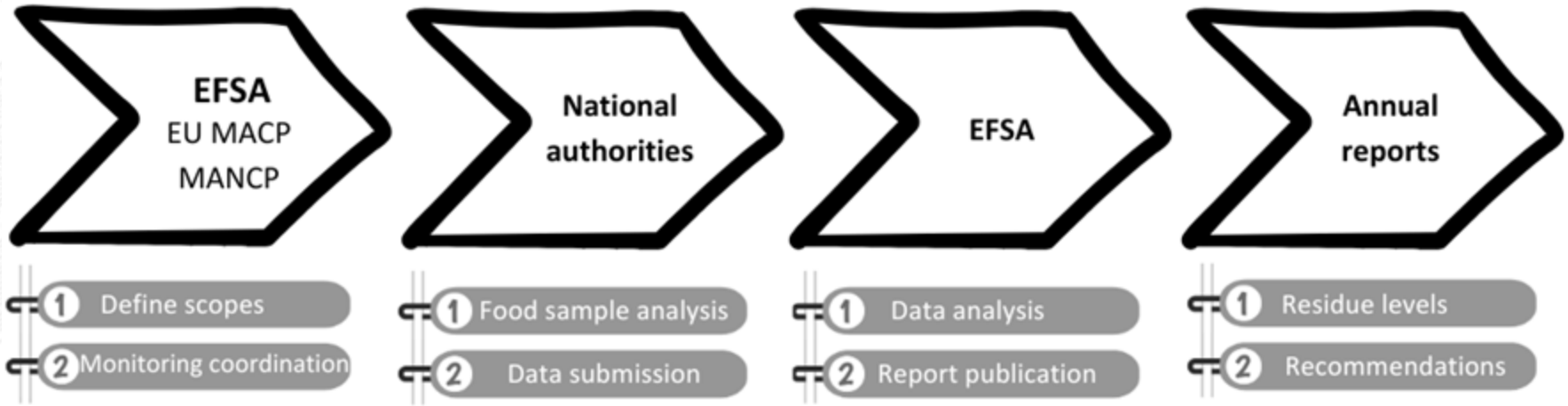
EUROPEAN FOOD SAFETY AUTHORITY

EU MACP
EU-coordinated Multiannual Control Programme

MANCP
Multi Annual National Control Plan

Monitoring under **European Food Safety Authority (EFSA)** supervision since 2002.

Participants: EU Member states, Iceland and Norway.



source: own elaboration by Para J.,
based on **EFSA pesticide residue reports from 2009 to 2022**

EU MACP monitoring is conducted in three-year cycle

Table 1. The major components of the European diet chosen to monitoring in EU MACP

2009, 2012, 2015	2010, 2013, 2016	2019, 2022, 2025
Aubergines	Apple	Apples
Bananas	Head cabbages	Head cabbages
Broccoli[2]	Leek	Lettuces
Cauliflower[4]	Lettuces	Peaches
Orange juice	Peaches	Spinaches
Olive oil[2]	Pears[1]	Strawberries
Peas (without pods)	Rye	Tomatoes
Peppers (sweet)	Oats[5]	Oat grain
Table grapes	Strawberries	Barley grain
Wheat	Tomatoes	Wine (red or white)
Butter	Wine (red or white)[3]	Cow's milk
Chicken eggs	Cow's milk	Swine fat
	Swine meat[5]	
	Swine fat[5]	

[1] analyzed only in 2010
[2] added in 2012; broccoli as an alternative to cauliflower
[3] added in 2013
[4] discontinued in 2015
[5] swine fat replaced swine meat; oats were discontinued

source: own elaboration by Para J.,
based on **EFSA pesticide residue reports from 2009 to 2022**

Objective

The aim of this study was to analyse pesticide residue levels in dairy products in Europe from 2009 to 2022.

Methods

- The study employed data on **pesticide residues** and their metabolites in **milk** and **butter** derived from annual reports of the EU-coordinated Multi Annual Control Programme (**EU MACP)** for the years 2009, 2010, 2012, 2013, 2015, 2016, 2019 and 2022.

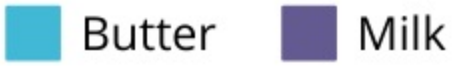
- Descriptive statistics were performed based on the data collected from the EFSA database in the Zenodo repository.

Monitoring pesticide residue levels in food

Table 2. Total number of samples taken in EU-coordinated programmes, number of participating countries and number of samples taken by Germany, Poland and Greece in EU-coordinated programmes in years 2009–2022

	2009	2010	2012	2013	2015	2016	2019	2022
TOTAL (n)	473	654	692	1021	616	582	706	486
PARTICIPATING COUNTRIES (n)	29	29	29	29	30	30	33	33
DE (n) - an example	68	94	N/A	N/A	N/A	118	197	119
PL (n) - an example	50	1	N/A	N/A	N/A	45	55	53
EL (n) - an example	16	0	N/A	N/A	N/A	15	5	0

N/A – data not available due to lack of publicly accessible records in Zenodo



source: own elaboration by Para J.,
based on **EFSA pesticide residue reports from 2009 to 2022**

Results – pesticides detected in butter samples

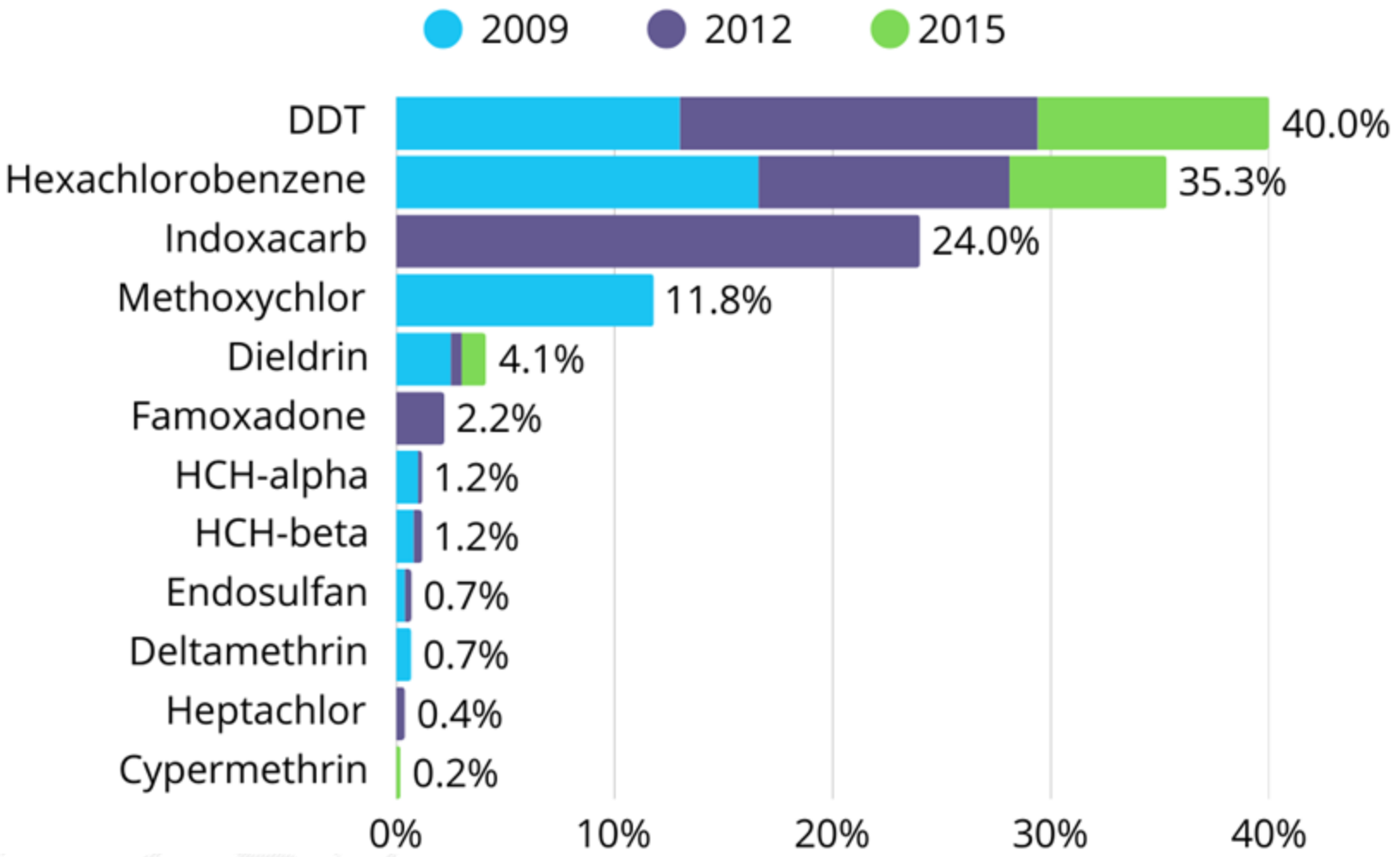


Figure 2. Percentage of butter samples with measurable residues for the specific pesticide in 2009, 2012 and 2015

source: own elaboration by Para J.,
based on **EFSA pesticide residue reports from 2009, 2012 and 2015**

Results – pesticides detected in milk samples

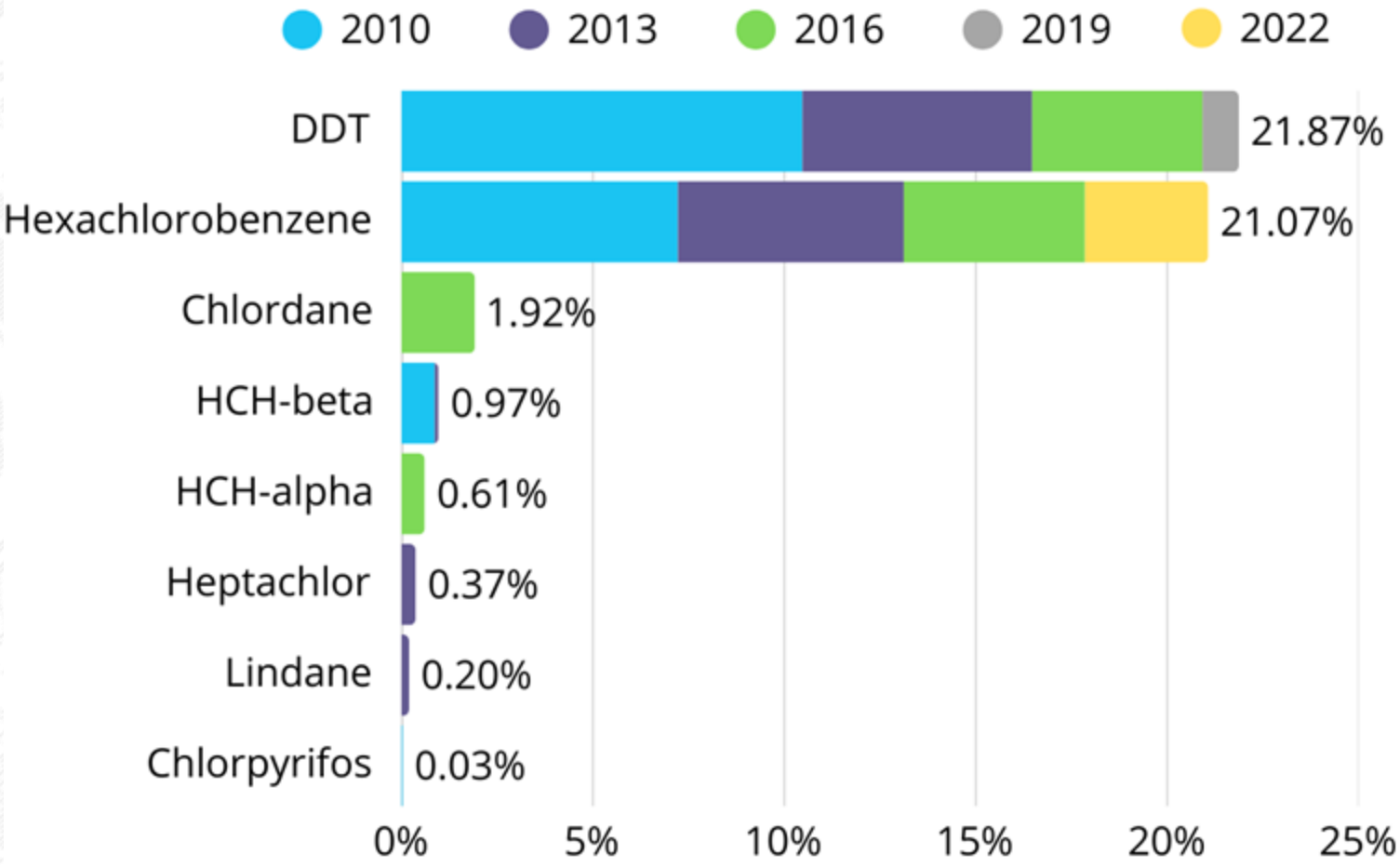


Figure 3. Percentage of milk samples with measurable residues for the specific pesticide in 2010, 2013, 2016, 2019 and 2022

source: own elaboration by Para J., based on
EFSA pesticide residue reports from 2010, 2013, 2016, 2019 and 2022

Results – exceedances of permissible limits

MRL - maximum residue level
LOQ - limit of quantification

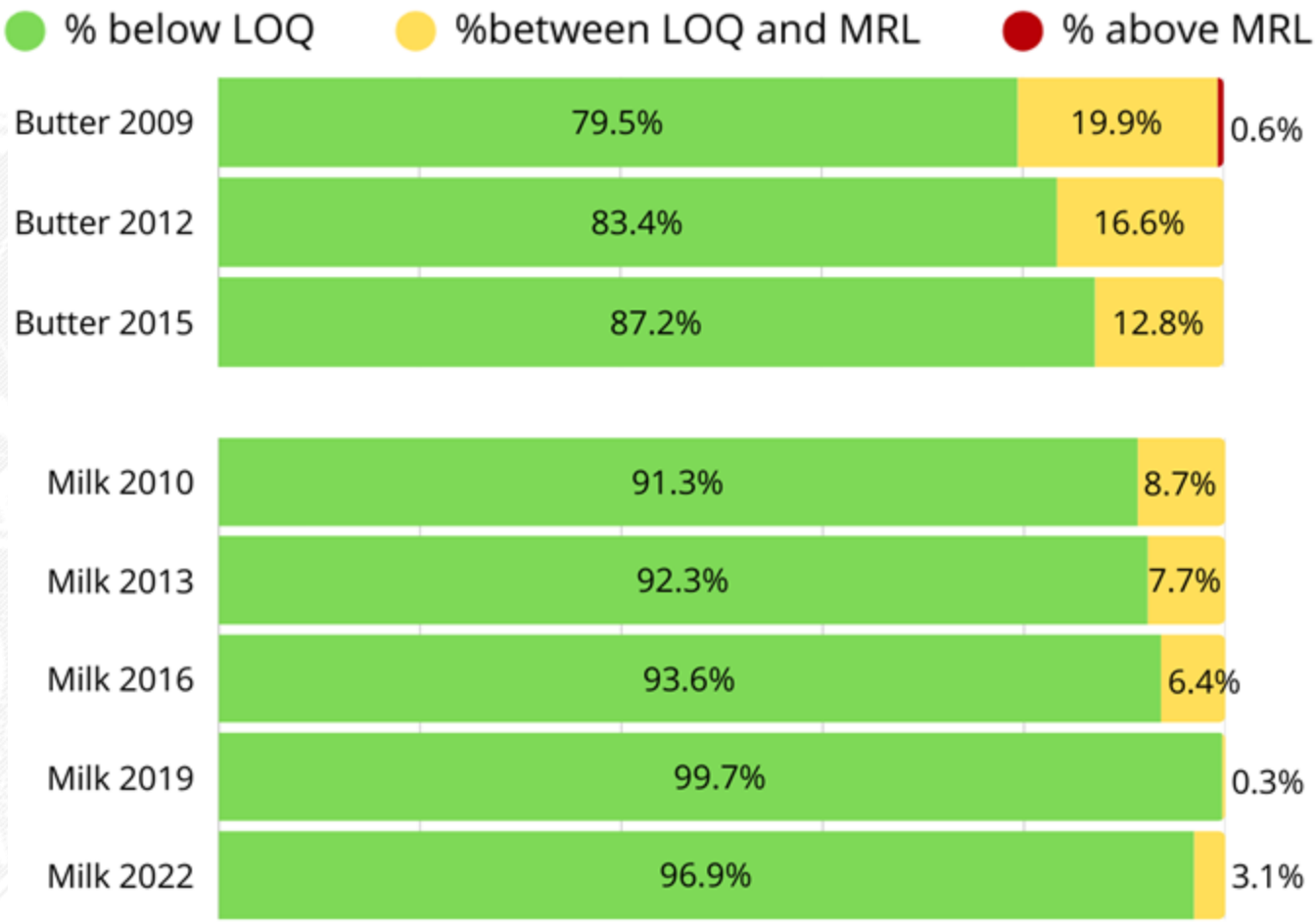


Figure 4. Percentage of samples not measurable, below MRL and above MRL for butter and milk in the EU-coordinated programmes in years 2009–2022

source: own elaboration by Para J.,
based on **EFSA pesticide residue reports from 2009 to 2022**

Results – multiple residues in butter and milk samples

Table 3. Number of detectable residues in individual butter and milk samples (2009-2022)

PESTICIDES (n)	2009	2010	2012	2013	2015	2016	2019	2022
0	N/A	N/A	577	942	537	545	704	471
1	N/A	N/A	53	43	56	23	2	15
2	N/A	N/A	55	35	20	10	-	-
3	N/A	N/A	5	1	3	2	-	-
4	N/A	N/A	2	-	-	1	-	-
TOTAL	473	654	692	1021	616	582	706	486

N/A = not analyzed in the respective year

Butter Milk

source: own elaboration by Para J.,
based on **EFSA pesticide residue reports from 2009 to 2022**

Number of pesticides reported in butter and milk samples (2009-2022)

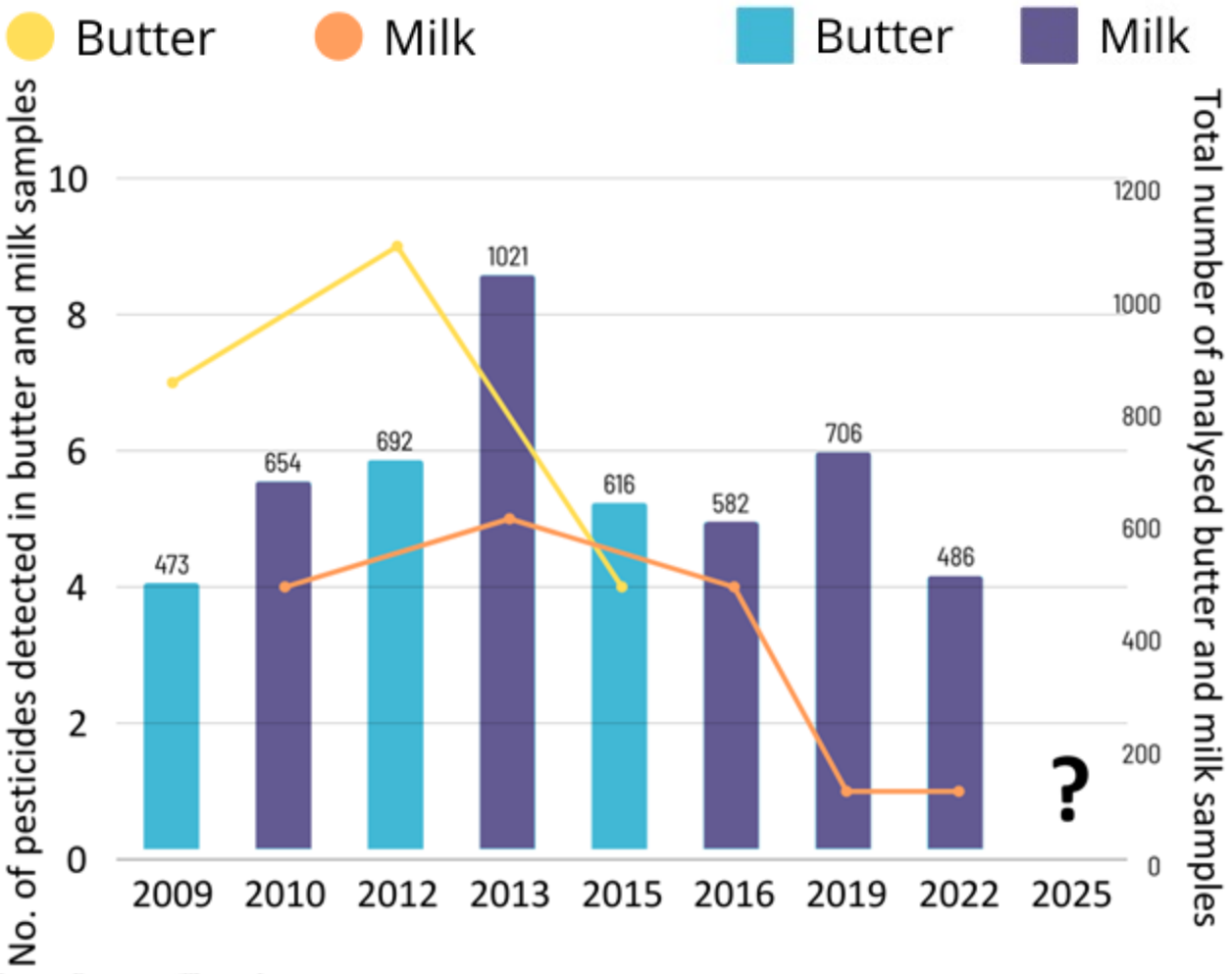


Figure 5. Number of specific pesticides reported for butter and milk in the EU-coordinated programmes and total number of samples analysed in years 2009–2022

source: own elaboration by Para J.,
based on **EFSA pesticide residue reports from 2009 to 2022**

Conclusion

MRL - maximum residue level
LOQ - limit of quantification

- From 2009 to 2022, only trace amounts of pesticides were detected in milk and butter samples.
- The MRL was exceeded only in 2009, in three butter samples.
- A concerning trend is the decreasing number of samples analyzed.

- The 2025 sample collection is still uncertain.
- EFSA's decision on including milk in the next three-year cycle will be announced.

Acknowledgements

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Thank you for your attention

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