

# THE DANISH PESTICIDE TAX 2013-2024. AN EXAMPLE OF A GREEN TAX WITH GREAT EFFECT

Anders Branth Pedersen, Aarhus University

Senior Researcher (Env. Governance, policy analysis, target group behavior etc.);

Head of Section, Environmental Social Science and Geography, Dep of Env Science.

Email: [abp@envs.au.dk](mailto:abp@envs.au.dk)

# ACKNOWLEDGEMENT

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Findings presented today builds on several pesticide research projects funded by the Danish EPAs Pesticide Research Programme since 2007

Result of a **team effort**. Several colleagues at AU involved (and back in 2007 also KU). Team for the evaluation: **Helle Ørsted Nielsen, Anders Branth Pedersen, Maria Konrad, Steen Gyldenkærne**.

**Thank you very much to all farmers participating in surveys and interviews!**

Latest publication:

Nielsen, H.O., Konrad, M., Pedersen, A.B., Gyldenkærne, S., 2023. Ex-post evaluation of the Danish pesticide tax: A novel and effective tax design. *Land Use Policy* 126, 106549.

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# SUCCESSIVE PESTICIDE ACTION PLANS FROM 1980S

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- Danish pesticide tax until 2013: Value added tax on retail price
- Not optimal – environmental economists would prescribe taxing load
- Indicator: Treatment frequency index – not optimal either. Volume-based



# PESTICIDE PLAN, 2013-2016 (CONT. 2017-2021)

Adopted in June 2012, but tax implemented from July 2013

Most important policy instrument: Revised pesticide tax.

- tax differentiated according to impact on environment and health of each product, based on a newly developed indicator (PLI)
- Increase in tax rates
- Revenue returned to farmers through reduced land taxes

Main objective:

Reduction in pesticide load by 40 pct. between 2011 and 2015 (measured by sales)

= Pesticide Load Indicator (PLI) to be reduced to 1.96



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# WHY TAX PESTICIDES – AND WHY DIFFERENTIATE ?

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Pesticide prices should reflect externalities caused by use of pesticides

Potential externalities

- Health
- Groundwater and drinking water
- Toxic effects on non-target species and biodiversity

Behaviour change: Higher prices offer incentive to reduce use of pesticides or switch to less harmful products

Source of revenue



# THE PESTICIDE LOAD INDICATOR

For all commercial products, a pesticide load (PL) is calculated and expressed as the PL per unit commercial product (kg, litre or tablet).

Three elements:

- Human health indicator
- Ecotoxicology indicator
- Environmental fate indicator

(see e.g. Kudsk et al. 2018)



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PLI was used to set policy target

Old indicator (TFI): focus on volume

New indicator (PLI): focus on harmfulness

# NEW PESTICIDE TAX – DESIGN 2013

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## TAX BASES

Basic tax

Health

Environmental effect

Environmental behaviour

## TAX RATES

50 kr./kg active substance (6.5 EUR/7 USD)

107 kr./kg pesticide pr. unit load index (13.9 EUR/15.6 USD)

107 kr./kg active substance pr. unit load index

107 kr./kg active substance pr. unit load index  
(1 kr. = 0.13 EUR/0.15 USD)

Complex calculation for each pesticide

Average tax rate increased by 125 pct.

Revenue:  $\approx$  10 pct from basic tax and 30 pct. from each of load taxes

# OTHER INSTRUMENTS?

- Advisory services for IPM
- Research on alternative pest management strategies
- More control directed towards illegal import
- Stricter sanctions for illegal import
- Ongoing support for pesticide-free farming





# DID IT WORK?

Policy objective (sales indicator):  
1.96 PLI achieved by 2015 ✓

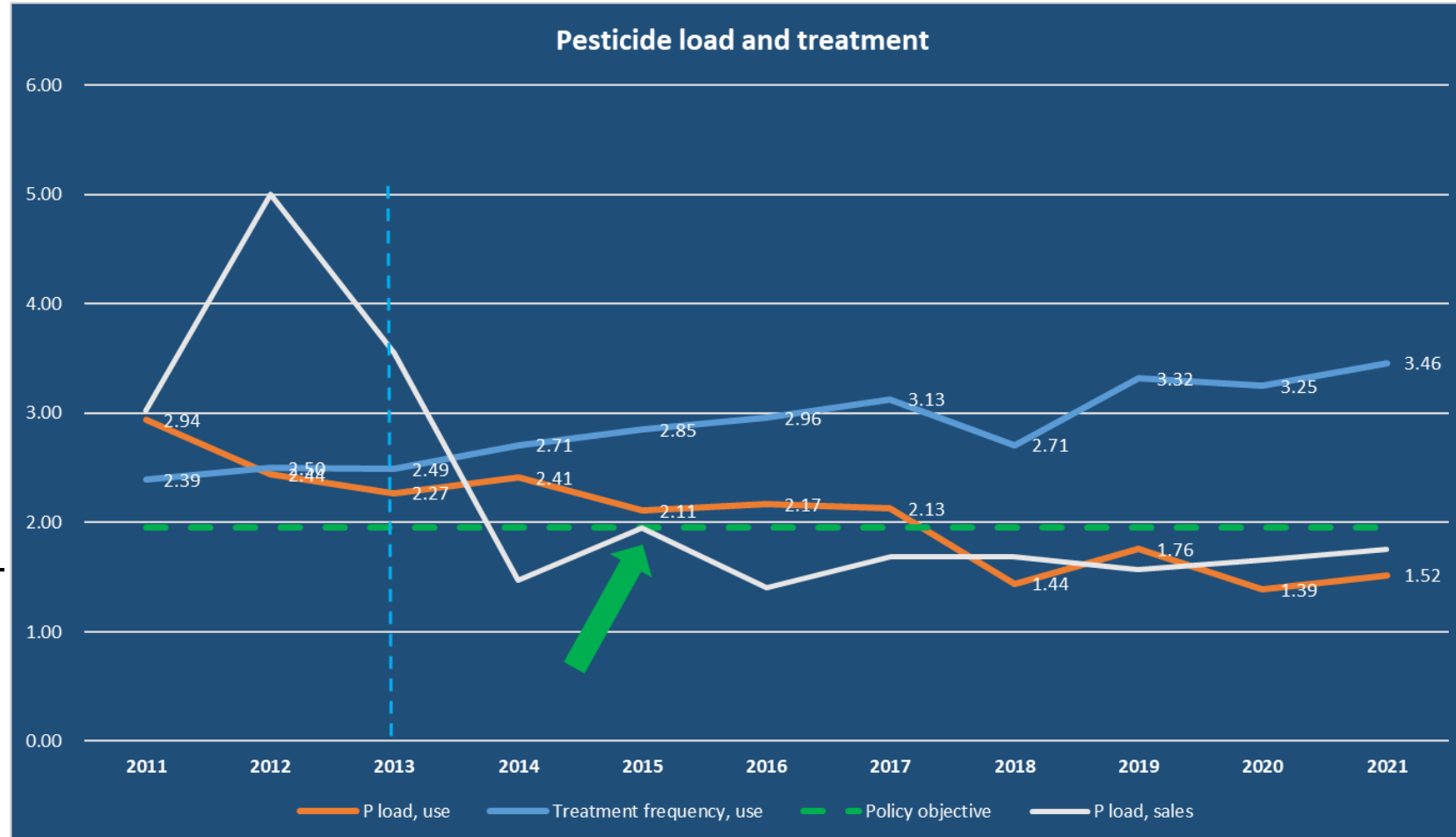
Pesticide use data:

Treatment freq. Increases! But –  
what is important:

Load (P load/ha) decreases

I.e. substitution towards less harm-  
ful substances

Conclusion: tax has worked !



# HOW MUCH REDUCTION IS DUE TO THE TAX 2012-2017?

Panel study (FE) based on farm-level data for 1900 farmers (repr.)

- Pre-tax: 2012-2013; post-tax 2016-2017
- Change in pesticide use due to tax 2012-2017:
  - 18 % reduction in pesticide load
- Reduction depends on crops grown
  - Winter wheat, spring cereal, sugar beet greater relative reductions
- Other findings
  - Crop prices do not affect use of herbicides, but small impact on use of fung. and insecticides
  - Some fluctuations due to pest pressure
- High value crops not flagged out
- No major impact on yield/productivity



## Ex-post evaluation of the Danish pesticide tax: A novel and effective tax design

Helle Ørsted Nielsen<sup>\*</sup>, Maria Theresia Hedegaard Konrad, Anders Branth Pedersen, Steen Gyldenkærne

*Department of Environmental Science, Aarhus University, Denmark*

### ARTICLE INFO

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### ABSTRACT

Externality taxes are considered a key tool in the climate and environmental policy toolkit. However, externality taxes do not always deliver on their promise due to design flaws and low tax rates. The Danish pesticide tax, which was redesigned in 2013, addresses these flaws by differentiating tax rates according to the harmfulness of products and significantly increasing prices on the most harmful pesticides. This article evaluates the redesigned tax, using a panel data set with pesticide use on 1900 medium-size and large farms two years before and four years after the tax change. We find that the tax has been effective, prompting substitution from more harmful products to less harmful ones, resulting in a 16 pct. reduction in pesticide load. Response to the pesticide tax varies among farms, depending on the crop types grown. The study is highly policy relevant for countries aiming to lower pesticide load, providing empirical evidence that a proper tax design can overcome the low price sensitivity found with previous pesticide taxes in Denmark and elsewhere. Moreover, this study offers a rare example of an ex-post evaluation that builds on detailed farm-level data, following registered pesticide use before and after the tax redesign, which allows for a more precise estimation of the impact of the tax.

- Barriers to behaviour change
  - Lack of substitutes for some products
  - Fear of developing resistance
  - Not all farmers optimize on pesticide costs

# WHAT DO FARMERS SAY

Survey data, 600 farmers, 2017

Rating decision parameters on a scale from 1 to 5:

- On average, crop yield, resistance and early treatment more important than prices
- 46 pct.: changed pesticide products because of price changes

Legitimacy of differentiated tax:



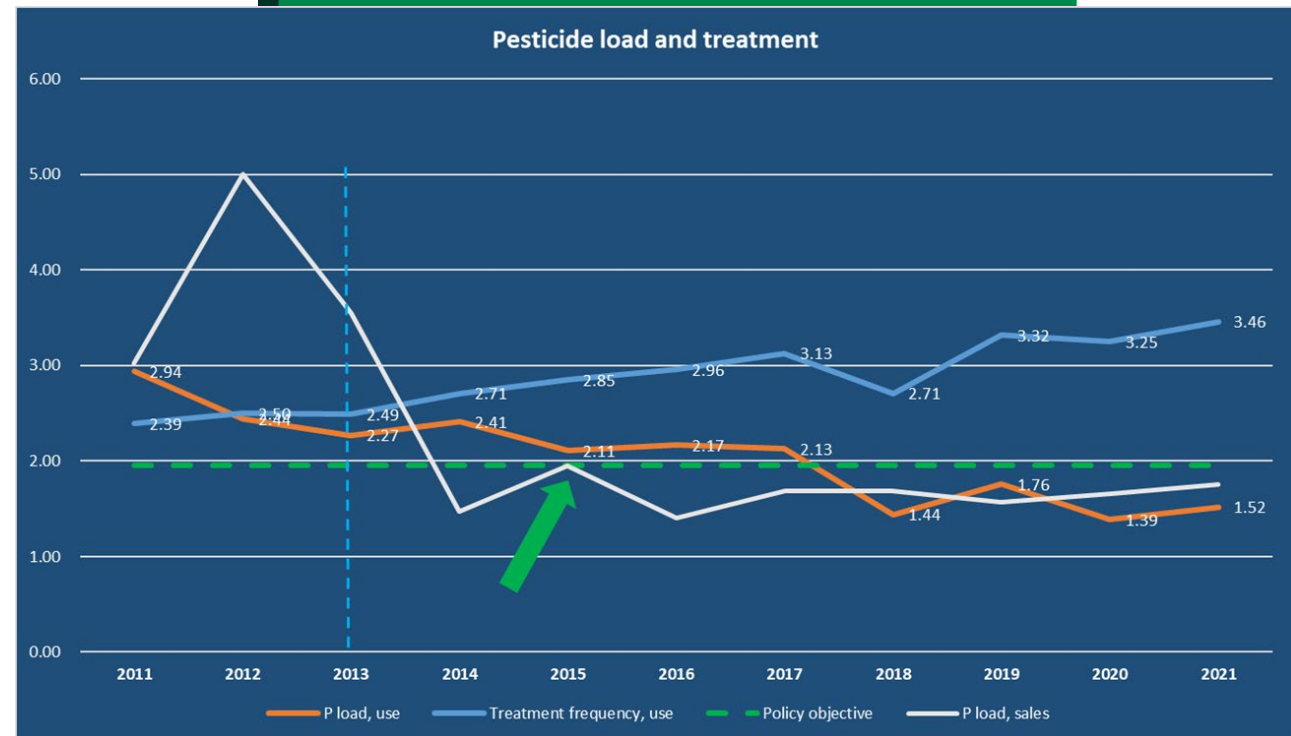
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Q17	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't know	Average score
The principles are sensible	18	13	22	24	16	7	3.1
The tax is not transparent	5	11	21	24	36	4	3.8
The tax rates are generally reasonable	51	24	14	3	2	5	1.7

# DEVELOPMENT SINCE 2017

Stronger reduction from 2018 on - with fluctuations:

- Weather
  - 2018 very dry → pesticide use ↓
- Fluctuations in crop choices
  - Winter cereal acreage down in 2018, 2020 & spring cereal up  
→ pesticide use ↓
- Stockpiling
  - Before tax, large stock piles of more harmful products, used up by 2017 or so



# REVENUES

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Before 2013: 500M DKK (67M EUR) annually

Revenue expected post tax:

650 M with a 40 pct. reduction in sales

150 M reimbursed to farmers through lower land taxes, i.e. a redistribution

Revenue, realized:

- about 550 mill. DKK
- revenue: entered into the general coffers of Ministry
- financing supplementary efforts, including research, advisory (but not earmarked)

# COMPENSATIONS TO MITIGATE COMPETITIVENESS

- Potato growers to loose from the 2013 tax base
- In compensation, another tax (on pickling agents) reduced
- In further compensation, some revenues directed to novel Potato Tax Fund
- Overall compensation
- Expected increase in revenues of €22 million recycled back to farm sector



# IMPACTS ON VULNERABLE SUB-SECTORS

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Some high-value crops experience higher pesticide costs, but not as a share of their gross sales prices, indicating a **pass-over of tax**

Declines in sugar beets, eating potatoes, cherries and black currants due to **non-tax related** factors (e.g. for sugar beets: EU regulation, for cherries and black currants: a large drop in market prices, for eating potatoes: maybe a switch towards starch potatoes)

Source: Environmental Protection Agency, 2018, Evaluation of the differentiated pesticide tax [in Danish] <https://www2.mst.dk/Udgiv/publikationer/2018/05/978-87-93710-28-3.pdf>



# UPDATE – POLITICAL AGREEMENT 2022-26

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- New reduction target: 1.43 PLI (in sales)
- Restrictive approval of new products to protect groundwater
- Research and promotion of alternatives to pesticides
- Further implementation of Integrated Pest Management

To reduce pesticide load further: revision of tax design

- Basic tax from 50 DKK → 20 DKK (= 3 USD) per kg active substance
- Impact-based tax from 107 → 140 DKK (= 20 USD) active substance pr. unit load index

Revenue neutral



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# DATA FOR 2022 PUBLISHED LAST WEEK BY EPA RESULTED IN HEADLINES

Altinget

Artikler Debat Job Navnenyt Podcast Q

Det Kongelige Bibliotek,

13. marts 2024 kl. 05.00

## Salg af pesticider er steget markant: Landmænd har hamstret for at undgå afgift

I 2022 blev der købt markant flere pesticider af danske landmænd end året før, herunder især insektmidler med høj miljøbelastning, der indeholder PFAS. Man har købt ind til lager som reaktion på justering af pesticidafgiften, lyder det fra Landbrug & Fødevarer, mens DN kalder indkøbet for vanetænkning og efterlyser andre metoder.

- Yes, there has been hoarding in 2022. But use data are still stable (1.53 PBI 2021/2022)
- Is hoarding a problem?
- No, not from a tax effectiveness viewpoint. Farmers respond to the price signals. Hoarding is normal. And the hoarded pesticides will be used within a couple of years.

# CONCLUSION

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Danish pesticide succesful – achieved policy goals: pesticide load significantly reduced

- Why:
  - High tax rate
  - Differentiation – farmers able to treat, but with less harmful substances
  - Differentiation increases legitimacy – targetting harm
  - Revenue recycling increases support
  - Other policy instruments supporting changes in practices

Tax design:

- Need data and expertise to devise proper tax base
- Need high tax rate – political will ?
- Know your farmers: what drives their decisions and what obstacles to price adjustment
- Other policy instruments necessary, possibly financed by tax revenue



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