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Assessing the potential for voluntary adoption of SATs: insights from a choice experiment with German farmers

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Based on the master thesis by Insa Thiermann (2018)

Problem statement

- SATs costly to implement at the farm level
- Not clear how many farmers would voluntarily adopt SATs
- Incentives needed to encourage adoption

Objectives

- To assess the factors affecting adoption of in-field SATs by livestock farmers
- To draw conclusions for the design of support policies

Online survey of livestock farmers

18 December 2017 to 31 March 2018 (Unipark online platform)

- E-Mail newsletters (Gewässerschutz, 3 N, Landwirtschafts-kammern, Maschinenring SH, Molkerei Wiesenhoff…)
- Facebook (Top Agrar, lwd. Wochenblatt, Bauernverband SH…)
- Posts on homepages (ISN, Uni Kiel, Landvolk DH…)
- Flyers at events

→ 144 farmers participated

→ Discrete choice experiment

The discrete choice experiment
Choose your most preferred alternative!

	Alternative 1	Alternative 2	Alternative 3	Status quo (no SAT)
NH_3 emission reduction	40%	20%	60%	0%
Cost reimbursement	60%	100%	80%	-
Increase in N load factor against DüV	+5% points	+10% points	+0% points	50% cattle 60% pigs +0% points
Relaxation of DüV constraints	No immediate incorporation required	None	None	None
I choose …	**O**	**O**	**O**	**O**

DüV = Düngeverordnung = German Fertilizer Ordinance (statutory regulation)

The discrete choice experiment
Attributes and their levels

Emission reduction	• 20 %, 40 %, 60 % • Status quo: 0 %
Cost reimbursement	• 60 %, 80 %, 100 %, 120 % • Status quo: 0 %
Increase in N load factor against DüV	• Increase by 0, 5, 10, 15 percentage points • Status quo: 0 percentage points
Relaxation of DüV requirements	• No relaxation • No immediate incorporation required

DüV = Düngeverordnung = German Fertilizer Ordinance (statutory regulation)

Statistical analysis of the data with mixed logit model

We estimate the probability that a SAT alternative is chosen and ask how this probability is affected by the attributes of the support policies and farm and farmer characteristics

Results: variables affecting adoption of SATs

Variable	Koeffizient	Standardabweichung
ASCAlter	0,15176733***	-
ASCVollerwerb (D)	-5,9635522***	-
ASCökologisch (D)	25,469508	-
ASCUmstellung (D)	25,55106	
ASCLUkomplett (D)	-1,0831609*	-
ASCLUanteilig (D)	-0,75433567	-
ASCAckerbau	0,00290878*	-
ASCGrünland	-0,00999041*	-
ASCSauenplaetze	-0,00402225*	-
ASCSchweineplätze	-0,00038135*	-
ASCMilchviehplätze	0,01298337**	-
ASCBullenmastplätze	0,01358704**	-
ASCBGADummy (D)	-2,7526465***	-
ASCWeidehaltungsdummy (D)	-3,5355247***	
ASCSaldo (D)	-0,67235357	-
ASCTechnik (D)	-0,022985	-
ASCGewerblich (D)	0,76001151	-
ASCExport (D)	-0,15241634	-
ASCLehre(D)	28,542387	-
ASCHS (D)	2,4560332**	-
ASCaußerLW (D)	25,663407	-
ASCHofweiter (D)	-2,2357112**	-
ASCHofnichtweiter (D)	-4,882386***	-
EmissionenLV2 (EV)	0,7140077***	-0,59785267***
EmissionenLV3 (EV)	1,3300707***	1,187679***
FörderungLV2 (EV)	0,38898622**	-0,64777097***
FörderungLV3 (EV)	1,1868203***	1,0293934***
FörderungLV4 (EV)	1,2854968***	1,315433***
Stickstofftotal	-0,10143385***	0,24977976***
DüV (D)	0,38881048***	1,1411602***
Pseudo-R^2	0,30735	-

Farm characteristics

Farmer characteristics

Support policy attributes

How support policy design affects adoption of in-field SATs

- Average probability of choosing a SAT alternative = 79%
- +++ Cost reimbursement: 80%: **+3.4%** points
  100%: **+ 10.8%** points
  120%: **+11.8%** points
- +++ Relaxation of DüV constraints: **+ 4.4%** points for expemption from slurry incorporation requirement
- - - - Increase in N load factor: **- 0.43%** points for each additional percentage point (e.g. 5→6%; 10→11%)
- +++ Emission reduction: 40%: **+ 6%** points
  60%: **+12%** points

How farm and farmer characteristics affect adoption of in-field SATs

- +++ Positive impact on adoption:
  - Large herd size (dairy cows and bulls)
  - High share of arable land
  - Part-time farmers (**+42%** points vis-a-vis full-time)
  - Older farmers (**+1.3%** points per year of age)
  - University degree (**+20%** points)
- - - - Negative impact on adoption:
  - Animals kept on pasture (**-23%** points)
  - Biogas plant (**-19%** points)

Conclusions for the design of SAT support policies

- Farmers´ intrinsic motivation plays an importnant role: Emission reduction by 60% has same effect on adoption as a 120% cost reimbursement! (+12% / +11.8% prob)

  → **Professional communication of benefits for the environment!**

- Farmers willing to adopt at less than 100% cost reimbursement
- Nevertheless, farmers expect full reimbursement for equity reasons (Joormann and Schmidt, 2017)
- Concessions in related policy areas not so important (only +4.4% prob for exemption from slurry incorporation requirement)
- Higher N load factors deterrent in strongholds of livestock production

Conclusions:
A possible support strategy in CAP pillar 2

- 100% cost reimbursement ≈ €30/ha (€1/m³ * 30 m³/ha)
  Less than what is currently paid for slurry injection in Lower Saxony
- Only moderate increase in N load factor.
- No concessions in related policy areas
- Accompany launch of support scheme with info campaign highlighting the benefits for the environment!