Integrated Climate Risk Assessment in Agriculture & Food - Trade M

Parallel Session

Modelling improvements through integrated approaches

Chair: Franz Sinabell

Common Agricultural Policy and climate variability changes: an impact assessment of the first-pillar reform on an agricultural area of Grana Padano in different climate scenarios

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Outline

- CAP 2014-2020: direct payments
- Study area: representative farms
- DSP model
  - ✓ with binary variables
- Simulated scenarios and states of nature
- Results
- Conclusions

CAP 2014-2020: regulations

- No. 1305/2013: rural development
- No. 1306/2013: financing, management, and monitoring
- No. 1307/2013: rules for direct payments
- No. 1308/2013: common organization of the markets for agricultural products

- No. 1306/2013 (supplementing): reduction of the greening payment in case of non-compliance and administrative penalties on direct payments

Basic and greening payments

1. Basic Payment Scheme

- ✓ replaces the Single Payment Scheme
- ✓ 57% of the national ceiling
- ✓ internal convergence

2. Greening payments

- ✓ agricultural practices beneficial to climate and environment
- ✓ 30% of the national ceiling
- ✓ and..

non-compliance with greening practices → reduces greening payment and generates administrative penalties

Greening: agricultural practices

- Crop diversification
  - at least two crops on farms where the arable land exceeds 10 ha
  - at least three crops where arable land exceeds 30 ha
  - limiting the main crop to 75% of the arable land and the two main crops to 95% of the arable land

- Maintaining existing permanent grassland

- Having Ecological Focus Areas (EFA) on the agricultural area:
  - at least 5% of the arable land of farms larger than 15 ha (7% from 2017)
  - fallow land, landscape features, hectares of agro-forestry, afforested areas, areas with nitrogen-fixing crops,…

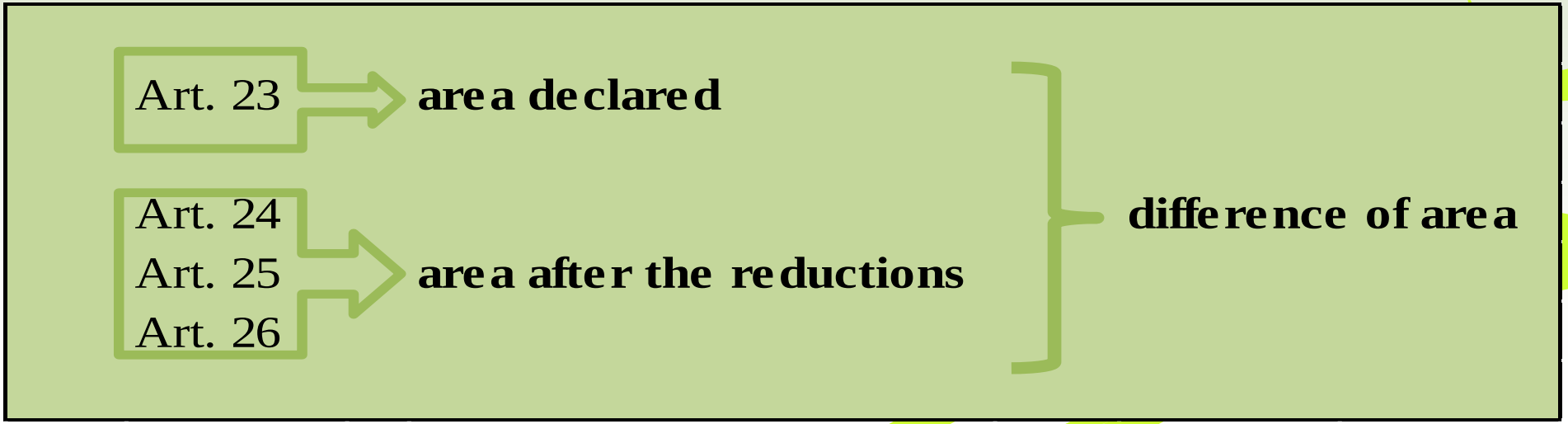
Reduction of greening payment

Articles of the No. 1306/2013 (supplementing Regulation)

- ✓ art. 23: area declared and eligible to payment

Reductions in case of non-compliance:

- ✓ art. 24: with crop diversification
- ✓ art. 25: with the permanent grassland
- ✓ art. 26: with the EFA



% difference of area and greening payments

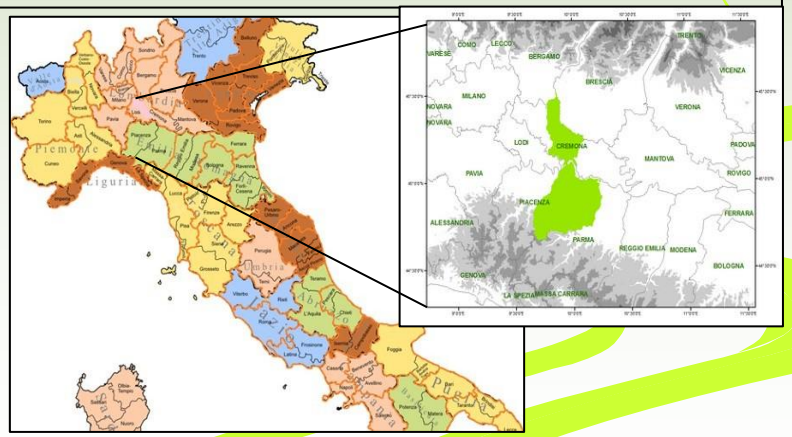
The article 28 defines the reductions of the greening payment and administrative penalties for various difference of area levels (%)

% difference	Greening payments
$0 \leq 3$	- reductions
> 3 and ≤ 20	- 2 * reductions
> 20 and ≤ 50	no aid is granted
> 50	no aid is granted + additional penalty

The study area and its representative farms

Representative farms: weighted average per farm values in each province (NUTS3)		
	Cremona	***Piacenza***
UAA - ha	90.5	46.1
% of corn silage	*62.2*	*27.8*
% of alfa-alfa	*18.7*	*39.9*
Number of livestock	298	129
Annual milk production - ton.	1,509	495
Total labour - labour units	4.2	2.8
% of temporary	*13.7*	*30.6*
Revenues - 000 €	1,080	333
% of milk	*61.4*	*69.6*
Gross Income - 000 €	506	163
Net Income - 000 €	321	141
Payment entitlements - €/ha	853	486

- Study area
  - Cremona and Piacenza provinces in the Po Valley (Northern Italy)
- Farm Accountancy Data Network
  - 23 dairy farms representing 856 farms in the whole area
- Corn silage
  - feed and biogas
  - long and short cycle



DSP model: binary variables

$$\max_{x_{n,j},ca_{t_{n,s}}} zg = \sum_n \sum_j \sum_s P_s * \{GI_{n,j,s} * x_{n,j} - C_{ca} * ca_{t_{n,s}} + Pm_n * Qm_n + VEb_n * NEb_n$$

$$+ VEg_n * [NEg_n - rtot_n - 2 * rtot_n * (1 - y_1)] * y_2$$

$$- VEg_n * rtot_n * (1 - y_3)\}$$

subject to

$$y_1 * rtot_n \leq 0.03 * (Aland_n - rtot_n) \qquad \forall n$$

$$y_2 * rtot_n \leq 0.20 * (Aland_n - rtot_n) \qquad \forall n$$

$$y_3 * rtot_n \leq 0.50 * (Aland_n - rtot_n) \qquad \forall n$$

DSP model: other constraints

$$rdiv1_{n,jgr} \geq Aland_n * 0.5 * (x_{n,jgr} - 0.75 * Aland_n) / (0.25 * Aland_n) \quad \forall n,jgr \ if \ Aland_n > 10$$

$$rdiv2_{n,jgr,jjgr} \geq Aland_n * 0.5 * (x_{n,jgr} + x_{n,jjgr} - 0.95 * Aland_n) / (0.05 * Aland_n) \quad \forall n,jgr,jjgr \ if \ Aland_n > 30$$

$$rpast_n \geq x^0_{n,'past'} - x_{n,'past'} \quad \forall n$$

$$refa_n \geq Aland_n * 0.5 * [0.07 * Aland_n - (\sum_{jefa} CF_{jefa} * PF_{jefa} * x_{n,jefa})] / (0.07 * Aland_n) \quad \forall n \ if \ Aland_n > 15$$

$$rtot_n = \sum_{jrg} rdiv1_{n,jgr} + \sum_{jrg,jjgr} rdiv2_{n,jgr,jjgr} + rpast_n + refa_n \quad \forall n$$

$$\sum_j A_{n,j} * x_{n,j} \leq B_n \quad \forall n$$

$$\sum_j N_j * Y_{t_{n,j,s}} * x_{n,j} + ca_{t_{n,s}} \geq R_{t_{n,s}} \quad \forall n,s$$

$$x_{n,j} \geq 0 \ and \ ca_{t_{n,s}} \geq 0 \quad \forall n,j,s$$





Simulated scenarios

	Baseline	Future	CAP 2014-2020		Sensitive analysis
Climate scenarios	Present	Future	Present	Future	Future
Common Agricultural Policy Direct payments	Single payment	Single payment	Basic payment: internal convergence Greening payment: with compliance modelling Coupled payments: soybean, tomato processing, cows		Basic payment: internal convergence Greening payment: with compliance modelling Coupled payments: soybean, tomato processing, cows
Corn silage for biogas prices	2010	2010	2010		up to 200%

Climate scenarios: states of nature

Scenarios		Present			Future (%)			Future (%)
		Low	Intermediate	High	Low	Intermediate	High	Average
Ryegrass		8.4	8.9	9.4	5.0	3.7	3.3	**3.9**
Corn silage								
Yield (t ha^{-1} d.m.)	*long cycle*	25.0	26.2	27.4	1.4	2.3	3.0	**2.2**
	short cycle 1	20.4	21.6	22.7	-3.0	-2.3	-1.9	**-2.4**
	short cycle 2	12.5	13.4	14.1	-7.8	-6.7	-4.6	**-6.4**
THI (June-August)		75.9	76.8	77.7	2.2	2.3	2.3	2.3

Land and input uses

	Baseline	CAP 2014-2020	
		Present	Future
corn silage feed	31,744	**-4.0**	**-5.0**
corn silage for biogas	5,286	-0.1	**17.1**
grain maize	4,246	-0.7	**14.0**
alfalfa	14,479	3.4	**-4.5**
ryegrass	1,311	0.5	**37.4**
soybean	443	**148.4**	**143.1**
tomato processing	628	**62.3**	**60.0**
nitrogen (tons)	8,450	-0.9	**2.1**
water (000 m3)	275,637	0.6	**9.2**
feeds (tons)	573,590	0.0	**-8.0**






Economic results

		Baseline	CAP 2014-2020	
			Present	Future
revenues total		532,901	1.0	0.1
	animal	*503,563*	*0.0*	***-1.5***
direct payments		52,050	-25.8	-25.8
	decoupled	*52,050*	***-39.6***	***-39.6***
costs		224,153	**2.4**	**2.5**
	input	*12,607*	*9.1*	*14.0*
	water	*4,169*	*1.5*	*3.1*
	extra labour	*33,474*	*0.4*	*0.3*
	feeds	*116,977*	*0.4*	*-6.9*
net income		240,783	**-5.6**	**-7.8**






Sensitivity analysis

Representative farms compliant or not with the greening at different percentage increases in the prices of corn silage for biogas, and subject to different levels of penalization								
	0.33 €/ton	+25%	+50%	+75%	+100%	+125%	+150%	+200%
compliant	**23**	22	20	16	14	13	13	12
non compliant	**0**	**1**	**3**	**7**	**9**	**10**	**10**	**11**
0-3%	*0*	***1***	***3***	***4***	***4***	***1***	***1***	***1***
3-20%	*0*	*0*	***0***	***0***	***2***	***5***	***3***	***3***
20-50%	*0*	*0*	*0*	***3***	***3***	***4***	***1***	***1***
>50%	*0*	*0*	*0*	*0*	***0***	***0***	***5***	***6***






Climate change impact

Climate change impact in scenario with CAP and no. % variations		
	CAP	NO CAP
net income	**-2.3**	**-2.1**
corn silage for biogas	**17.2**	**20.2**
ryegrass	**36.7**	**28.3**
soybean	**-2.2**	**4.7**
tomato processing	**-1.4**	**4.1**
nitrogen	**3.0**	**3.3**

Conclusions: main remarks

- The CAP has *contradictory* impacts
  - decrease of the income
  - less intensification of cropping patterns
  - limited on input uses (nitrogen, water)

- The system of reduction of greening payments and administrative penalties seems to be efficient to determine the compliance
  - farms non-compliant in scenarios with relevant increases in the prices

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