Electronic supplementary material A

Table S1. Descriptive statistics of land cover (in %) within landscape sectors of 750 m radius around focal fields. Shown are arithmetic means (Mean), standard errors (SE), minima (Min) and maxima (Max). Intensively cultivated grassland is included into crop area.

Landscape category	Mean	SE	Min	Max
Crop area	53.0	3.3	25.3	92.0
Extensively cultivated hay meadows	4.3	0.4	1.6	7.5
Extensively cultivated pastures	0.4	0.1	0.0	1.5
Perennial wildflower strips	0.4	0.1	0.0	2.0
Forest	20.3	3.4	0.0	57.6
Fruit plantations	1.9	0.3	0.0	5.1
Gravel	0.9	0.5	0.0	12.3
Hedgerows	0.5	0.1	0.0	2.6
Other, undefined areas	3.8	0.6	0.1	11.9
Sealed area	4.7	0.1	3.6	6.7
Settlements	8.5	1.9	0.0	42.8
Single trees	0.1	0.1	0.0	2.2
Vineyards	0.1	0.1	0.0	1.4
Water	1.2	0.4	0.0	7.3

Table S2: Composition of seed mixture used for flower strips

Plant species	Seed quantity [kg/ha]
Anethum graveolens L.	0.13
Anthemis arvensis L.	0.43
Anthriscus cerefolium (L.) HOFFM.	0.23
Centaurea cyanus L.	1.33
Coriandrum sativum L.	0.73
Fagopyrum esculentum MOENCH	15.00
Papaver rhoeas L.	0.13

Table S3: Timeline illustrating the chronological order of the sampling (dark shaded boxes). Samples with identical letters were aggregated for the statistical analysis.

Month	**May**					**June**				**July**			
Week / **Activity**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
CLB larvae: counts on tillers													
CLB plant damage assessment													
CLB adults: sweep netting													
Natural enemies: pitfall trapping					A	A			A				
Natural enemies: sweep netting							B			B			

Table S4: Summary of landscape effects (landscape complexity calculated as percentage non-crop area of 750 m radius landscape sectors around focal fields) and their interactions with treatment (tailored flower strip present or not) on different natural enemy groups of cereal leaf beetles in adjacent winter wheat fields and within the strips themselves. Degrees of freedom (df), Chi-square values (χ^2) and *P*-values from likelihood-ratio tests of the model selection procedure (see Methods section) are shown. *P*-values of explanatory variables that were included in the final model are in bold lettering.

	Within winter wheat			Within strip		
	df	χ^2	*P*	df	χ^2	*P*
Ground beetles (adults)						
Landscape	1	1.27	0.260	1	2.37	0.123
Treatment x landscape	1	0.10	0.747	1	0.92	0.338
Predatory bugs (adults and nymphs)						
Landscape	1	3.81	0.051	1	1.59	0.207
Treatment x landscape	1	0.30	0.582	1	3.47	0.062
Lacewings (adults)						
Landscape	1	2.06	0.151	1	1.84	0.175
Treatment x landscape	1	1.62	0.204	1	0.23	0.632
Lacewings (larvae)						
Landscape	1	2.95	0.086	1	2.85	0.091
Treatment x landscape	1	2.07	0.150	1	1.03	0.309
Ladybirds (adults)						
Landscape	1	0.18	0.667	1	0.17	0.679
Treatment x landscape	1	0.15	0.701	1	0.86	0.352
Ladybirds (larvae)						
Landscape	1	0.14	0.706	1	0.01	0.937
Treatment x landscape	1	4.99	**0.025**	1	0.60	0.438

Electronic supplementary material B

Materials and methods

SIMPLE COST-BENEFIT ANALYSES OF TAILORED FLOWER STRIPS UNDER DIFFERENT SCENARIOS

For an economic evaluation of tailored flower strips we analysed simple cost-benefit scenarios (electronic supplementary material Table S5). We compared 6 scenarios under conventional (2 scenarios) and organic (4 scenarios) winter wheat production, with combinations of flower strip treatments (no flower strip vs. sown 3 m-wide flower strip) and insecticide input (yes vs. no; only for conventional scenarios) for a 1 ha field with the dimensions of 200 m * 50 m. For winter wheat and flower strips we used Swiss average costs and benefits under conventional or organic management, respectively [1] (electronic supplementary material Table S6). For conventional production we assumed that either insecticide treatment or a tailored flower strip is used to reduce CLB density below the economic threshold (assuming equal effectiveness). For organic management we used scenarios under which flower strips increase winter wheat yield (or mitigate yield loss, respectively) by 2.5%; 5% or 10%, based on published and own unpublished empirical data on the negative relationship between CLB numbers (numbers of larvae per tiller) and winter wheat yield (2.5%: [4]; 10%: M. Tschumi, unpublished data; 5%: intermediate scenario).

Table S5: Cost-benefit analysis scenarios. Combinations of different flower strip treatments (No: field without flower strip; Yes: 3 m-wide tailored flower strip sown into the field) and insecticide input (Yes vs. No) were evaluated under standard conventional and organic management for a 1 ha (200 m * 50 m) winter wheat field. Organic management includes scenarios under which flower strips increase winter wheat yield (or mitigate yield loss, respectively) by 2.5%; 5% or 10% (see Material and methods of electronic supplementary material).

Scenario No.	Management regime	Flower strip	Insecticide input	Yield increase [%]
1	Conventional	No	Yes	0
2	Conventional	Yes	No	0
3	Organic	No	No	0
4	Organic	Yes	No	2.5
5	Organic	Yes	No	5
6	Organic	Yes	No	10

Table S6: Average costs and benefits for flower strip establishment and management, and winter wheat production (per ha) under conventional or organic management, respectively (in CHF) in Switzerland. If not indicated in footnotes, data derive from [1].

	Flower strip (Conventional)			**Flower strip (Organic)**			**Winter wheat (Conventional)**			**Winter wheat (Organic)**		
	Quantity (Q)	Price pQ [CHF]	Price [CHF]	Quantity (Q)	Price pQ [CHF]	Price [CHF]	Quantity (Q)	Price pQ [CHF]	Price [CHF]	Quantity (Q)	Price pQ [CHF]	Price [CHF]
Costs												
Seeds	11.0 kg	45.45	500	11.0 kg	45.45	500	180.0 kg	1.29	232.20	200.0 kg	1.93	386.00
Fertilizers			0.00			0.00			407.00			40.00
Herbicides			0.00			0.00	1.0 bin	86.40	86.40			0.00
Fungicides			0.00			0.00	2.0 bin	77.50	155.00			0.00
Insecticides*			0.00			0.00			85.00			0.00
Growth regulators			0.00			0.00	1.0 bin	48.10	48.10			0.00
Hail insurance			0.00			0.00	2.3 %	3630.50	83.50	2.3 %	4452.00	102.40
Yield cleaning			0.00			0.00	71.1 dt	2.85	202.64	43.7 dt	4.35	190.10
Yield drying			0.00			0.00	71.1 dt	1.10	78.21	43.7 dt	1.10	48.07
Various fees			0.00			0.00			64.31			5.15
Threshing			0.00			0.00			436.00			436.00
Machine costs†			358.00			371.00			472.50			699.00
Labour†	19.0 h	28.00	532.00	20.0 h	28.00	560.00	40.5 h	28.00	1134.00	53.0 h	28.00	1484.00
Total costs			1390.00			1431.00			2350.85			1906.71
Benefits												
Product			0.00			0.00	68.5 dt	53.00	3630.50	42.0 dt	106.00	4452.00
Total benefit			0.00			0.00			3630.50			4452.00

*[3]

†Basic costs from [1] including extra costs for insecticide applications (conventional wheat production) following [3]

Results

SIMPLE COST-BENEFIT ANALYSES OF TAILORED FLOWER STRIPS UNDER DIFFERENT SCENARIOS

Costs for flower strips are low, as generally no management is needed after sowing (low machine and labour costs). Thus, a 3 m * 200 m tailored flower strip is less expensive than an average insecticide treatment of 1 ha winter wheat (electronic supplementary material Table S7). A 3 m * 200 m tailored flower strip is therefore economically viable to replace insecticides under conventional management assuming comparable pest control effectiveness of pesticides and tailored flower strips (electronic supplementary material Table S7; scenarios no. 1-2). Under organic management, tailored flower strips are profitable if yield increase is ≥ 3.7% (electronic supplementary material Table S7; scenarios No. 3-6).

Table S7: Cost-benefit analysis for different tailored flower strip scenarios (see Table S5). Total payoff of different scenarios is calculated from costs and benefits of a 1 ha winter wheat field (200 m * 50 m).

	Conventional		Organic			
Scenario	1	2	3	4	5	6
WINTER WHEAT						
Length [m]	*200.00*	*200.00*	*200.00*	*200.00*	*200.00*	*200.00*
Width [m]	*50.00*	*47.00*	*50.00*	*47.00*	*47.00*	*47.00*
Size [ha]	*1.00*	*0.94*	*1.00*	*0.94*	*0.94*	*0.94*
Costs						
Seeds	232.20	218.27	386.00	362.84	362.84	362.84
Fertilizers	407.00	382.58	40.00	37.60	37.60	37.60
Herbicides	86.40	81.22	0.00	0.00	0.00	0.00
Fungicides	155.00	145.70	0.00	0.00	0.00	0.00
Insecticides	85.00	0.00	0.00	0.00	0.00	0.00
Growth regulators	48.10	45.21	0.00	0.00	0.00	0.00
Hail insurance	83.50	78.49	102.40	96.25	96.25	96.25
Yield cleaning	202.64	190.48	190.10	183.16	187.62	196.56
Yield drying	78.21	73.52	48.07	46.32	47.45	49.70
Various fees	64.31	60.45	5.15	4.84	4.84	4.84
Threshing	436.00	409.84	436.00	409.84	409.84	409.84
Machine costs	472.50	419.24	699.00	657.06	657.06	657.06
Labour	1134.00	1052.80	1484.00	1394.96	1394.96	1394.96
Total costs wheat	3484.85	3157.79	3390.71	3192.86	3198.46	3209.65
Benefits						
Product	3630.50	3412.67	4452.00	4184.88	4184.88	4184.88
Yield increase*	0.00	0.00	0.00	104.62	209.24	418.49
Total benefits wheat	3630.50	3412.67	4452.00	4289.50	4394.12	4603.37
FLOWER STRIP						
Length [m]	*0.00*	*200.00*	*0.00*	*200.00*	*200.00*	*200.00*
Width [m]	*0.00*	*3.00*	*0.00*	*3.00*	*3.00*	*3.00*
Size [ha]	*0.00*	*0.06*	*0.00*	*0.06*	*0.06*	*0.06*
Costs						
Seeds	0.00	30.00	0.00	30.00	30.00	30.00
Machine costs	0.00	21.48	0.00	22.26	22.26	22.26
Labour	0.00	31.92	0.00	33.60	33.60	33.60
Total costs flower strip	0.00	83.40	0.00	85.86	85.86	85.86
Benefits						
Total benefits flower strip	0.00	0.00	0.00	0.00	0.00	0.00
Net benefits (total benefits minus total costs)	**145.65**	**171.48**	**1061.29**	**1010.78**	**1109.80**	**1307.85**

*Yield increase due to flower strip mediated increase in natural CLB control (according to the scenarios described in electronic supplementary material Table S5)

References

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4. Buntin, G. D., Flanders, K. L., Slaughter, R. W. & DeLamar, Z. D. 2004 Damage loss assessment and control of the cereal leaf beetle (Coleoptera: Chrysomelidae) in winter wheat. *J. Econ. Entomol.* **97**, 374–382. (doi:10.1603/0022-0493-97.2.374)