IV Convegno AISSA#under40

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Evaluating cover crop mixtures in orchards: a multi-functional approach

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The use of grassing in orchards is a technique that has been used for several years and provides some fundamental functions for the sustainable management of the orchard.The current trend is to move towards the use of mixed cultures, which should provide a higher variety of functions than a single crop. The present work describes the development of a vegetational index that would allow to evaluate and optimize inter-row plant covers, starting from information on the species found in the field and their abundance.

Materials and Methods

Position of apple and blueberry orchards in Cavour area, Piedmont, Italy.

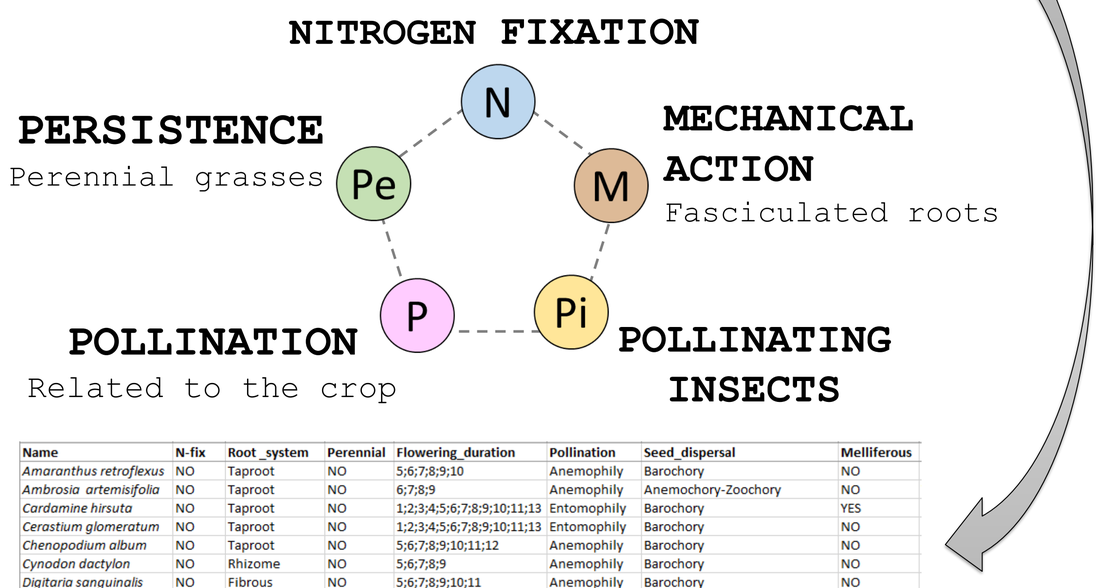
Index = (Sa*Ca)+(Sb*Cb)+(Sc*Cc)+(Sd*Cd)

a, b, c, d… potential functions

Classes (S)	N°species
0	0
1	1
2	2-3
3	4-5
4	6-7
5	>8

Classes (C)	Coverage (%)
0	0
1	<5
2	5-25
3	25-50
4	50-75
5	75-100

FUNCTIONS



Name	N-fix	Root_system	Perennial	Flowering_duration	Pollination	Seed_dispersal	Melliferous
Amaranthus retroflexus	NO	Taproot	NO	5;6;7;8;9;10	Anemophily	Barochory	NO
Ambrosia artemisifolia	NO	Taproot	NO	6;7;8;9	Anemophily	Anemochory-Zoochory	NO
Cardamine hirsuta	NO	Taproot	NO	1;2;3;4;5;6;7;8;9;10;11;13	Entomophily	Barochory	YES
Cerastium glomeratum	NO	Taproot	NO	1;2;3;4;5;6;7;8;9;10;11;13	Entomophily	Barochory	NO
Chenopodium album	NO	Taproot	NO	5;6;7;8;9;10;11;12	Anemophily	Barochory	NO
Cynodon dactylon	NO	Rhizome	NO	5;6;7;8;9	Anemophily	Barochory	NO
Digitaria sanguinalis	NO	Fibrous	NO	5;6;7;8;9;10;11	Anemophily	Barochory	NO
Echinocloa crus-galli	NO	Fibrous	NO	5;6;7;8;9;10	Anemophily	Barochory	NO
Festuca arundinacea	NO	Fibrous	YES	4;5;6;7	Anemophily	Anemochory-Myrmecochory	NO
Festuca rubra	NO	Fibrous	YES	4;5;6;7;8;9;10	Anemophily	Barochory	NO
Galinsoga quadriradiata	NO	Fibrous	NO	7;8;9;10	Entomophily	Anemochory-Myrmecochory	NO
Glechoma hederacea	NO	Stolon	YES	2;3;4;5;6	Entomophily	Anemochory-Myrmecochory	NO
Lamium maculatum	NO	Rhizome	YES	2;3;4;5;6;7;8;9;10;11;12	Entomophily	Anemochory-Myrmecochory	YES
Lolium perenne	NO	Fibrous	YES	2;3;4;5;6;7;8;9;10	Anemophily	Anemochory-Myrmecochory	NO
Malva neglecta	NO	Taproot	NO	4;5;6;7;8	Entomophily	Barochory	YES
Oxalis stricta	NO	Stolon	YES	4;5;6;7;8;9;10;11	Entomophily	Ballistic	NO
Panicum dichotomiflorum	NO	Fibrous	NO	7;8;9;10	Anemophily	Barochory	NO

Results

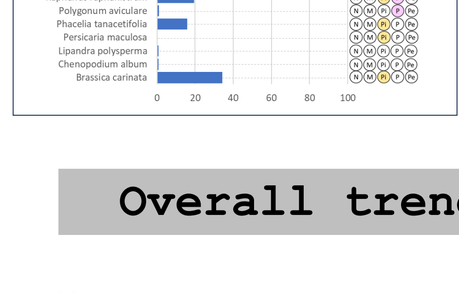
Is 100% soil cover enough?

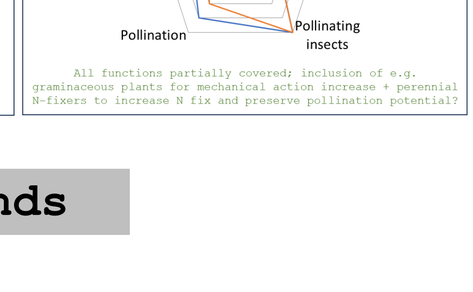
June 2022, Spontaneous

Cover = 100%

species = 2

I = 5



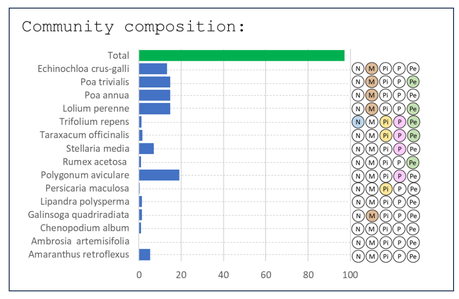


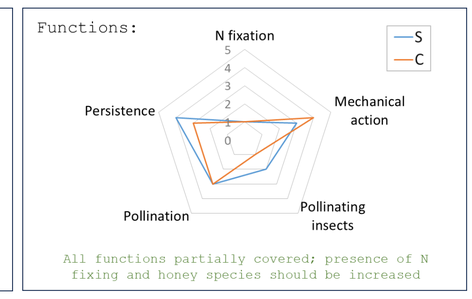
May 2022, Seeded Mix 1

Cover = 97%

species = 15

I = 36



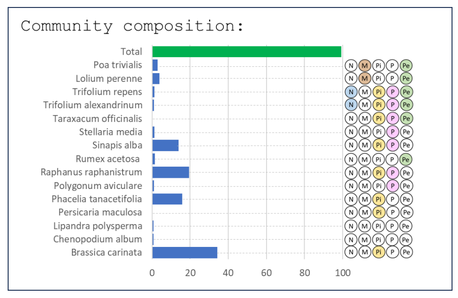


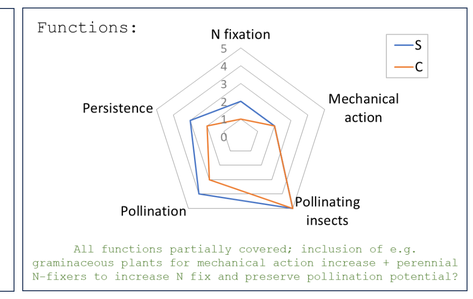
May 2022, Seeded Mix 2

Cover = 99%

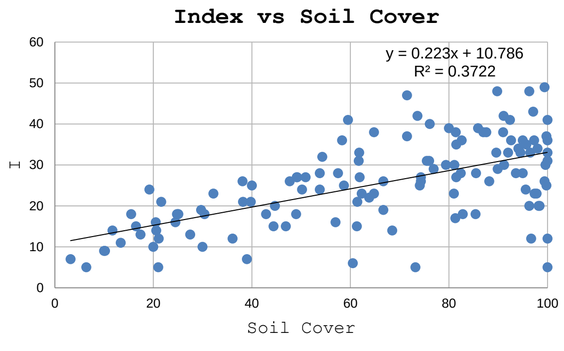
species = 15

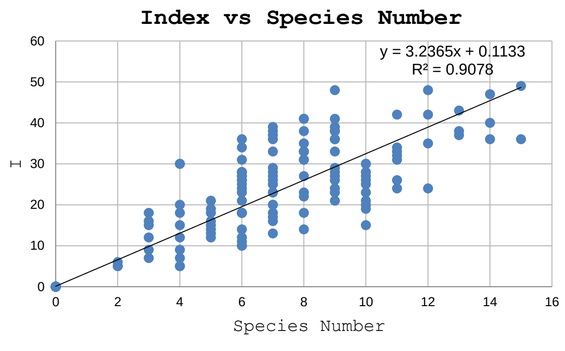
I = 49





Overall trends





Conclusions

- The index offers information **complementary to** total **soil cover**, and positively correlated with the number of species
- The presence of **multifunctional species** strongly impacts the final value of the index

Open Issues

- Recognition of Graminaceae, especially after mowing
- Need to include more functional traits (e.g. mycorrhization ability, biomass production, root length…)

Funded by:

References

Charles Ricoua et al.A vegetation-based indicator to assess the pollination value of field margin flora. Ecological indicators. 2014

Mario Hanisch et al. Plant functional traits shape multiple ecosystem services, their trade-offs and synergies in grasslands. Journal of applied ecology. 2022