

Conservation agriculture: *principles, characteristics and benefits for farmers and the environment*



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Definitions & General principles

The three components of optimum CA are:

1. **Maintaining year-round organic matter cover over the soil**
2. **Minimizing soil disturbance** by tillage and thus seeding directly into untilled soil: adoption of the No-Till technique;
3. **Diversifying crop rotations**, sequences and associations, adapted to local environmental conditions, and including appropriate nitrogenfixing legumes;

Kassam et al, 2009

- Conservation agriculture means “conservation of soil fertility ” (where soil fertility still exists.. otherwise, re-build it!)
- Basing on these three components, CA fits well with the approach of the “regenerative agriculture”



1. Organic matter cover over the soil

Vetch growing on straw of barley

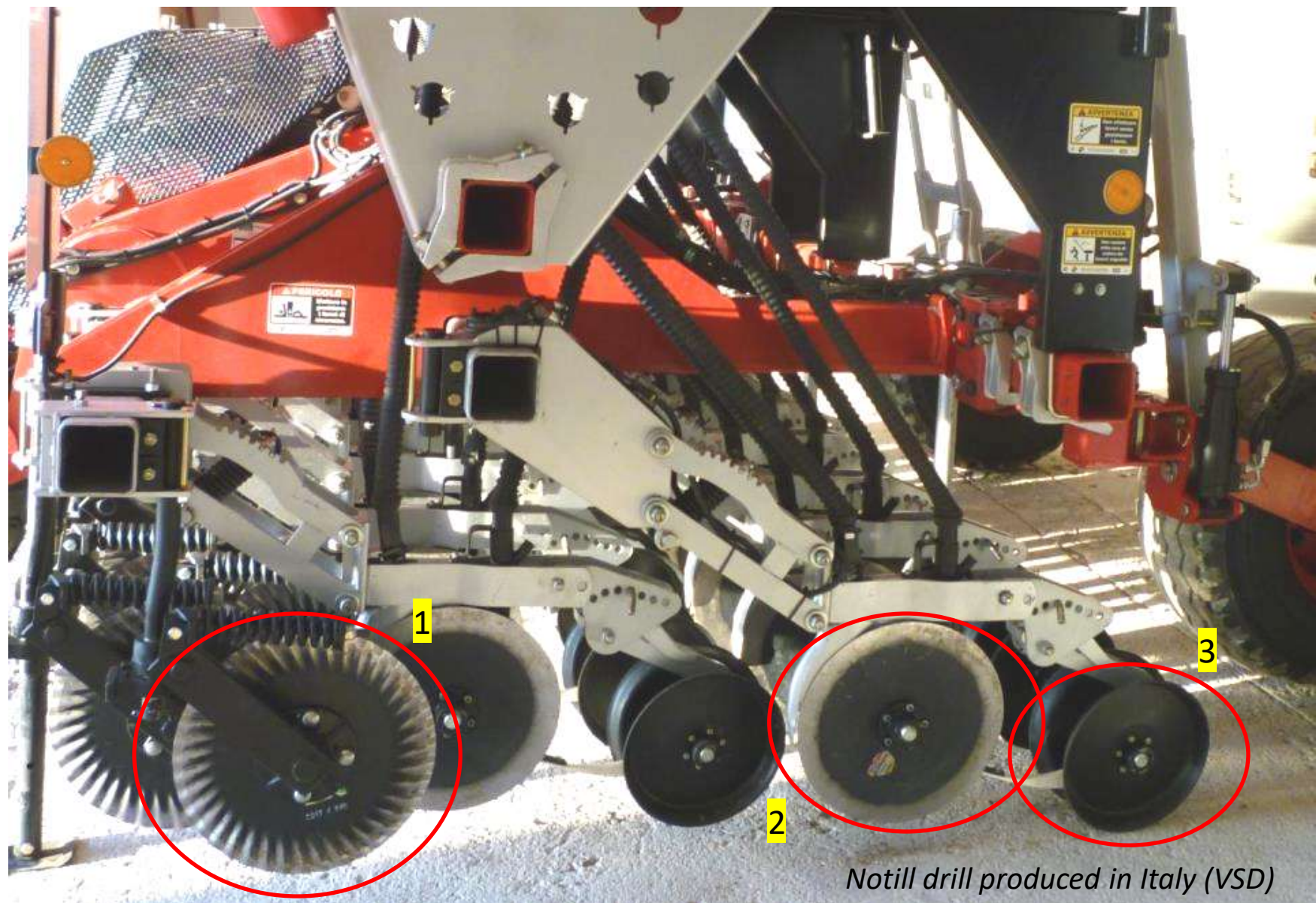
- mulch provided by retained residues from the previous crop
- cultivation of dedicated «cover crops» and «intercrops»



Notill sowing of Maize on a green cover of Faba bean

2. Adoption of No-Till

- A specific drill allows to sow any kind of seeds directly into untilled soils
- No previous tillage operation is needed to sow
- A systems of disks opens and closes thin furrows where seeds are placed
- Helps to minimize soil disturbance
- The drill practically becomes the main machine in the process, substituting many other ones



Notill drill produced in Italy (VSD)

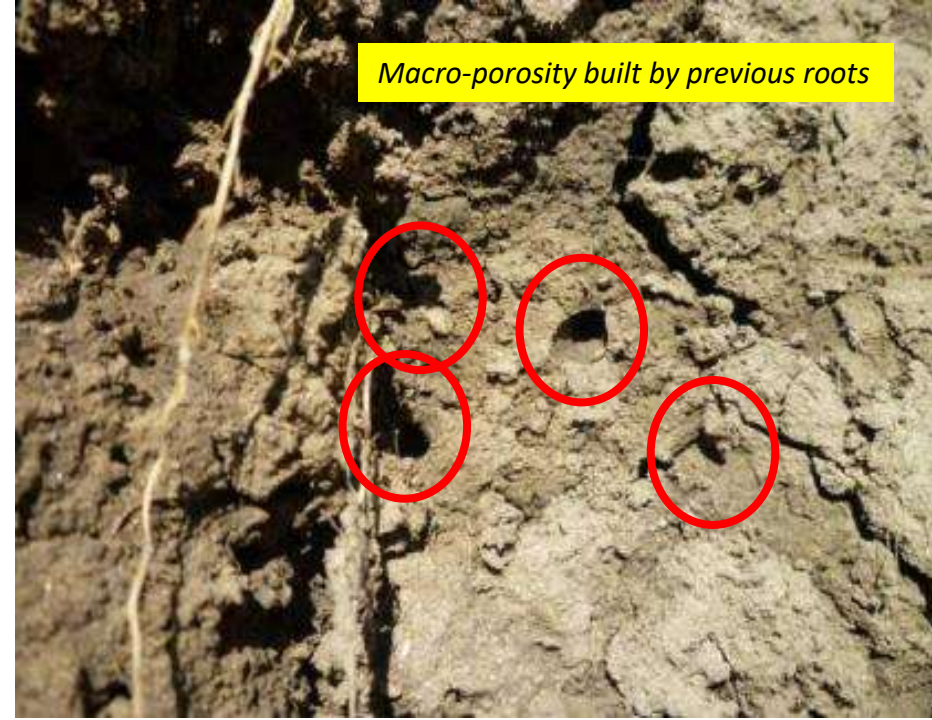
3. Crop rotation

..typical benefits of crop rotation:

- Rotation of functions by different root types
- Rotation of different typologies of crop residues
- Rotation of weeds and pests

Roots: in a NoTill system, roots and earthworms are the main source of porosity -> drainage/ water retention

Rotation and cover crops are the primary way to reduce the use of herbicides to **control weeds**



1



2



3



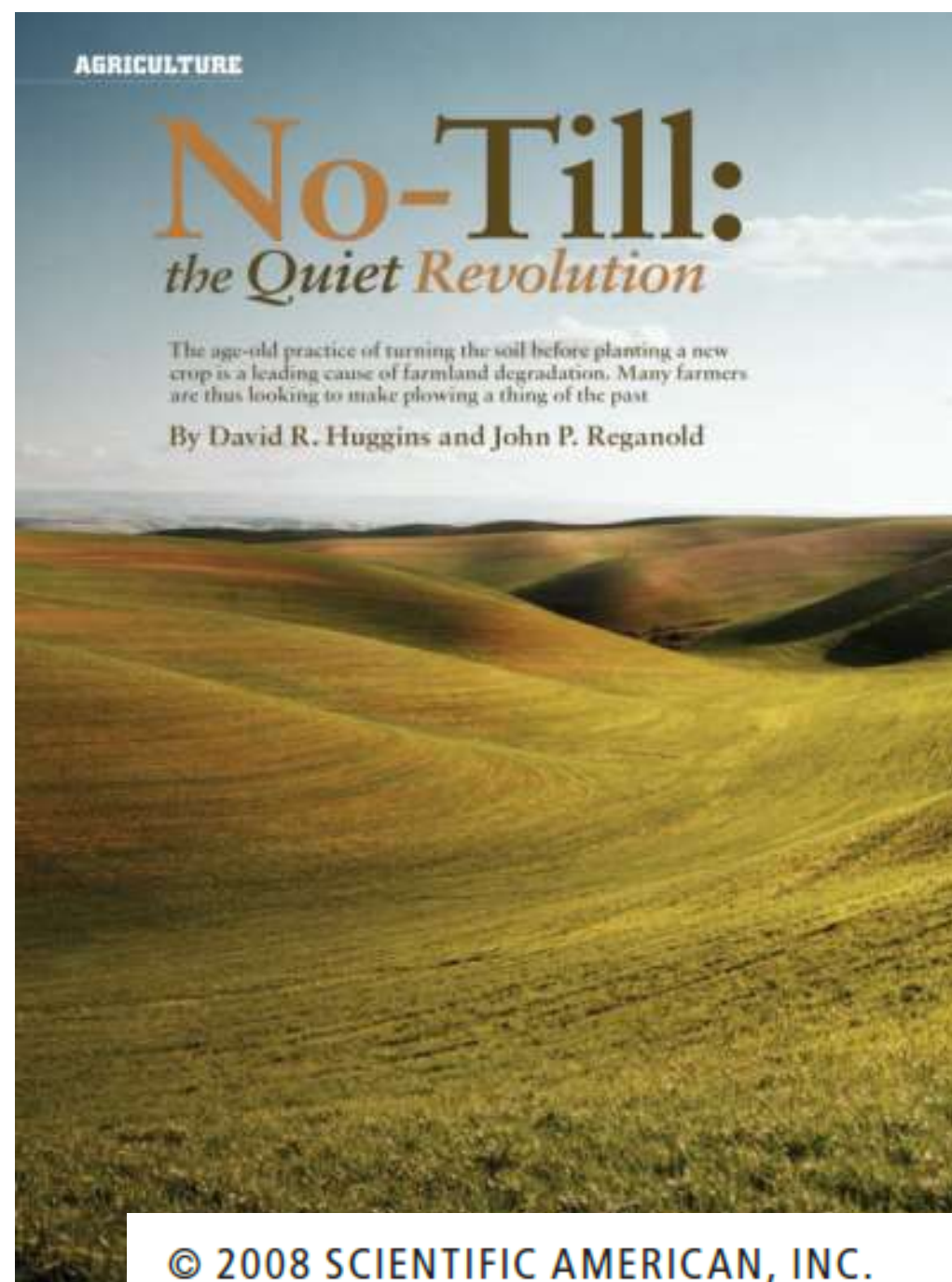
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Why dealing with CA (I)?

- ✓ In 2015/16, CA was practiced globally on about 180 M ha of cropland, corresponding to about 12.5% of the total global cropland (+70% compared to 2008/2009)
- ✓ The average annual rate of global expansion of CA cropland area since 2008/2009 has been some 10.5 M ha.
- ✓ CA adoption is reported in 78 countries, an increase in adoption in 42 more countries since 2008/09.
- ✓ The largest extents of adoption are in South and North America, followed by Australia and New Zealand, Asia, Russia and Ukraine. Still low adoption in Europe and Africa.

Kassam et al., 2018



Why dealing with CA (II)?

- Fits well with all the three principles of sustainability: environmental, social, economic
- Suitable for smallholder agriculture (e.g Africa/Asia) (see FAO activities)
- Suitable for industrial big-scale agriculture

Expecially in association with the adoption of precision farming technologies, it is recognized as a way for «Sustaible intensification of agriculture»: *can boost yields, increase farmers' profits and reduce greenhouse gas emissions.*



<http://www.fao.org/ag/ca/>

Save and Grow FAO: <http://www.fao.org/3/i2215e/i2215e00.htm>

Why dealing with CA (III)?

Environmental benefits:

- ✓ Reduction of Soil erosion up to 90%
- ✓ Reduction of energy inputs (fuel)
- ✓ Reduction of energy consumption (machineries)
- ✓ Increase in soil carbon content (carbon sink)
- ✓ Conservation and enhancement of soil fertility and diversity
- ✓ Reduction of water losses (evaporation) and enhancement of soil water storage



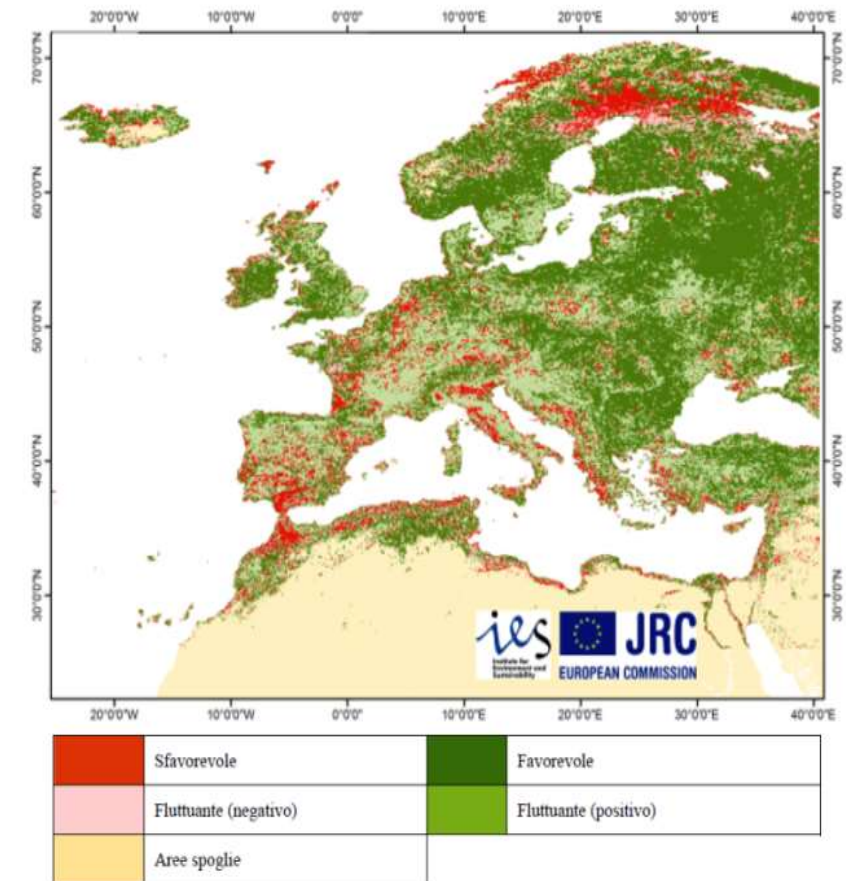
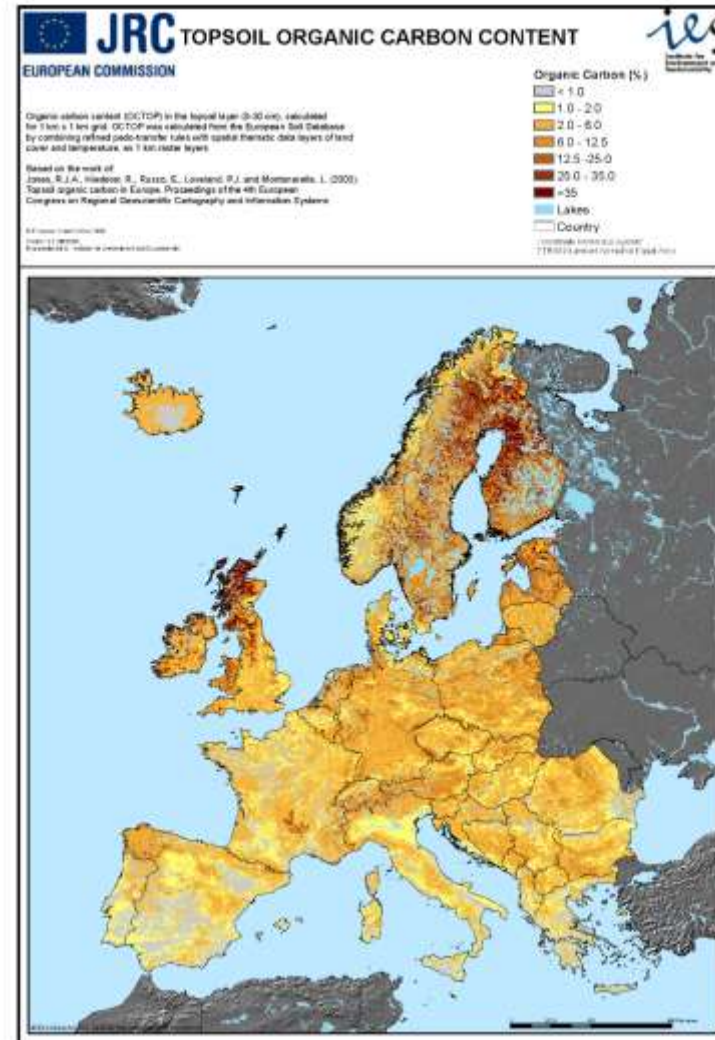
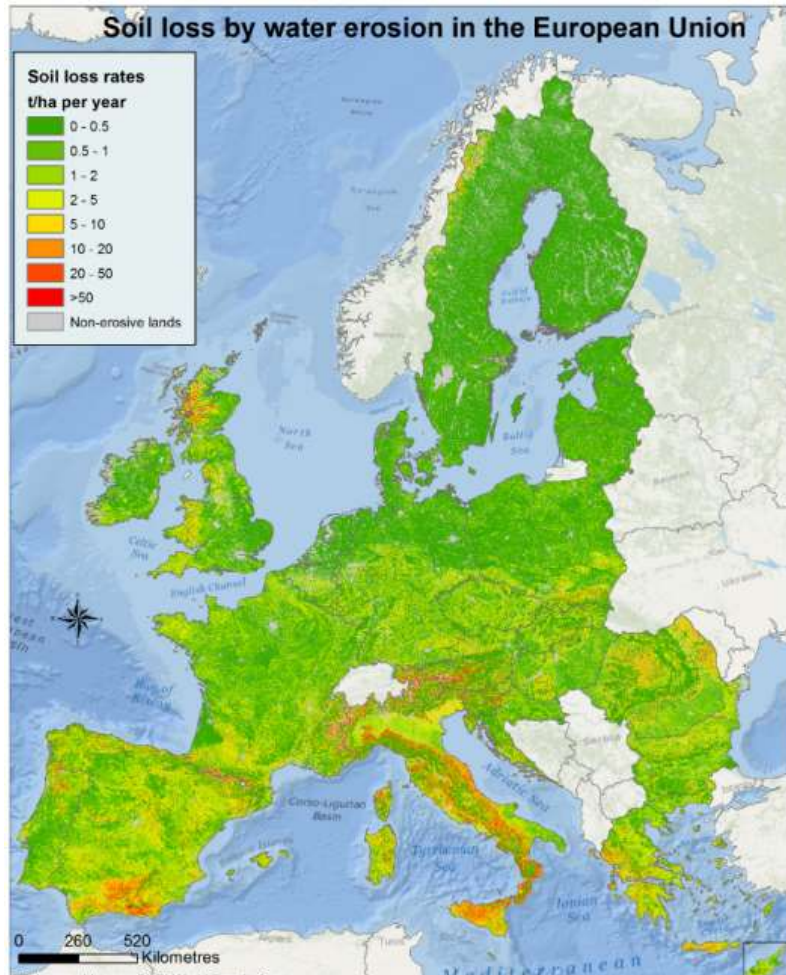
Relevance of CA in the frame of EU policies

CA is acknowledged for its environmental benefits, especially the ones related to soil conservation from erosion, to soil carbon sink and to conservation of water from nutrient pollution by:

- CAP reform
- EU Green deal
- EU Climate action: mitigation - adaptation
- Healthy soil initiative
- EU Water framework Directive
- EU Nitrate directive



Soil issues in EU



RDP MEASURE 10 – AEC PAYMENTS for soil conservation in Italy (2014-2020)

480 M. euro
330.000 ha of target area

DEDICATED SUPPORT TO NOTILL
FARMING AND CONSERVATION
AGRICULTURE



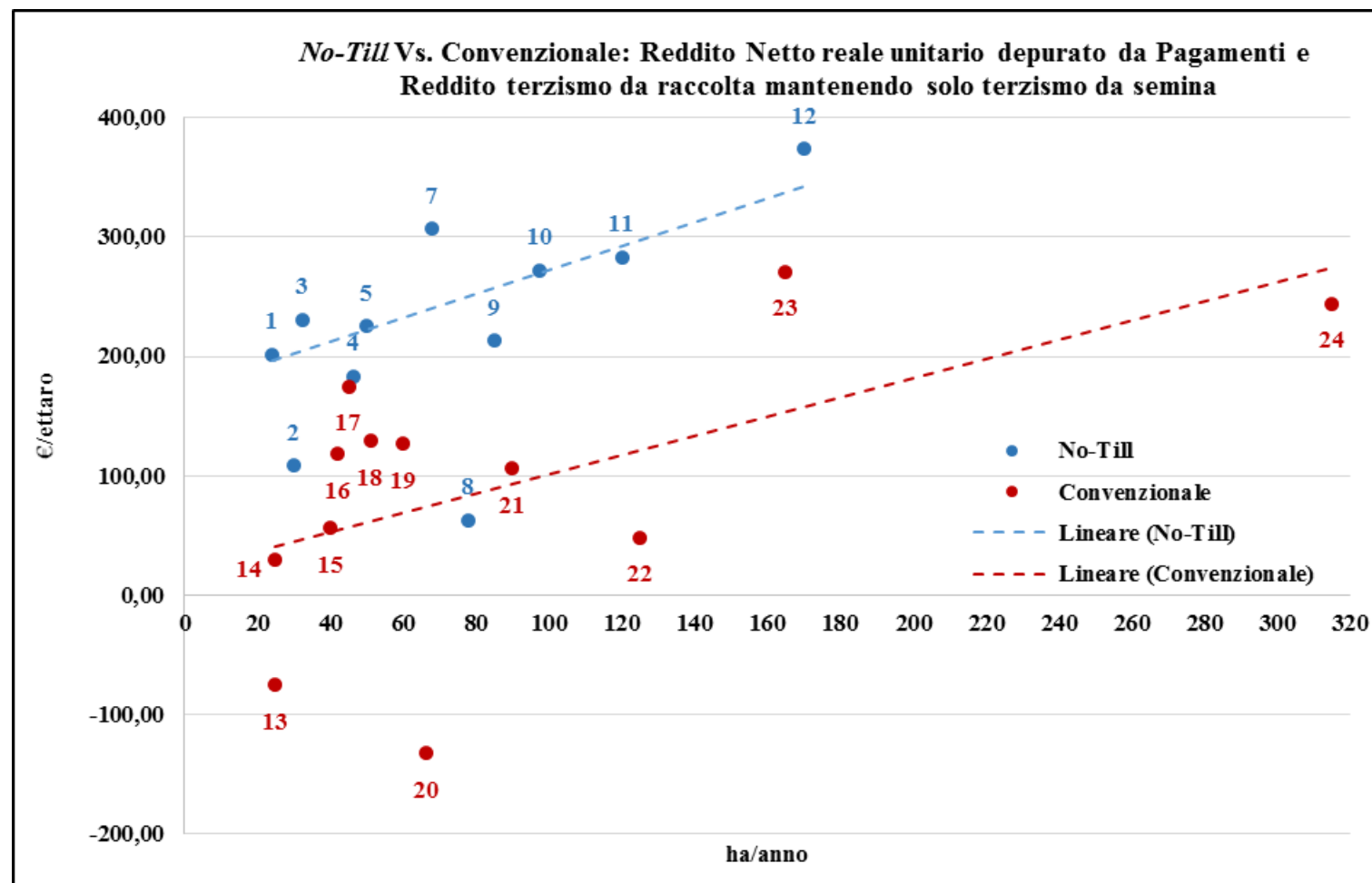
15 Regions

1. *Piemonte*
2. *Lombardia*
3. *Veneto*
4. *Friuli*
5. *Emilia Romagna*
6. *Toscana*
7. *Lazio*
8. *Abruzzo*
9. *Molise*
10. *Campania*
11. *Basilicata*
12. *Puglia*
13. *Calabria*
14. *Sicilia*
15. *Sardegna*

Why dealing with CA (IV)?

Benefits for farmers

- ✓ Reduction of direct costs, labour and machineries
- ✓ Stabilization of yields
- ✓ Room for multiple harvests/year
- ✓ Simplification of operations
- ✓ Reduction of risks
- ✓ Increase in overall farm income



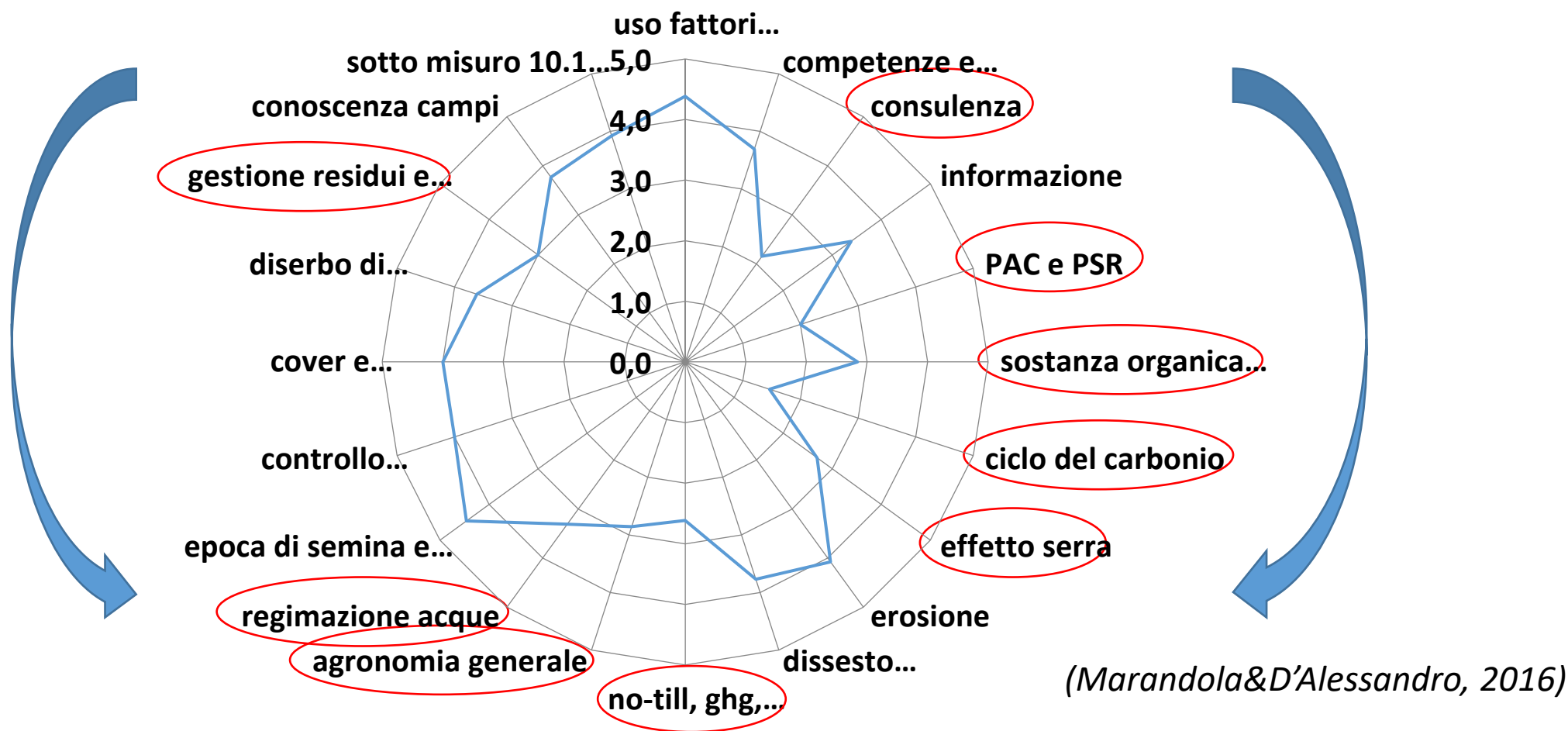
Comparison of farm net income in 12 CA holdings vs. 12 conventional (Marandola&Caprarella, 2016)

The plough: have we wasted time for centuries?



For decades **we used our soils as ATMs**: we withdraw fertility without returning it to soil. The plough has been used as a sort of credit card in this process. Huge machines are needed to extract the last credits of soil fertility... but sometimes it is already too late...

Successful shift to conservation agriculture: also a matter of practical skills and theoretical knowledge



SOME ITALIAN EXPERIENCES OF (EXTREME) CONSERVATION AGRICULTURE

**DRY CONDITIONS: SECOND HARVEST/YEAR.
NOTILL MAIZE ON HAY WITH DRIP FERTIGATION**





Azienda Marcantonio, Lucera (FG)



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**DRY CONDITIONS:
SECOND
HARVEST/YEAR.
NOTILL RAINFED
SUNFLOWER ON
CEREAL STRAW**





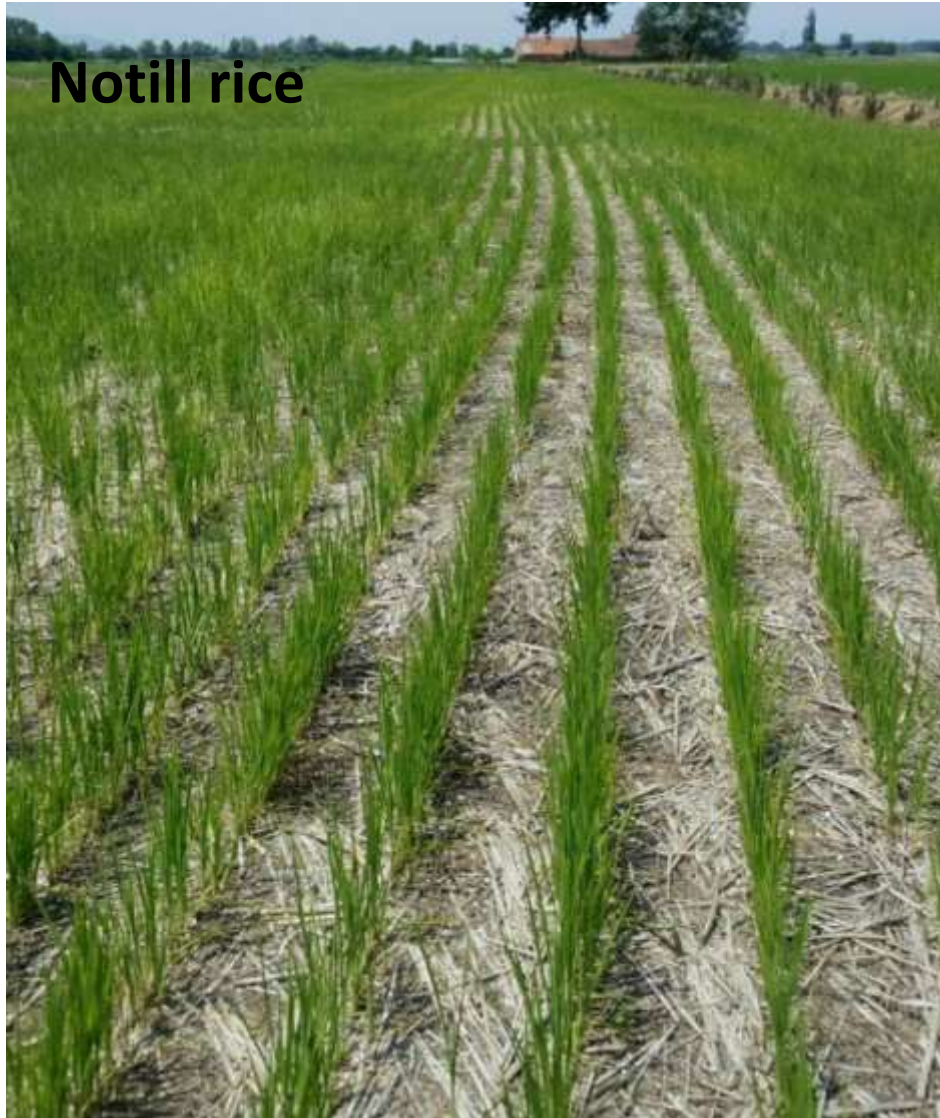
Azienda Antonio Spiga, Ascoli Satriano (FG)



Azienda Antonio Spiga, Ascoli Satriano (FG)



Notill rice



Azienda Paolo Maria Mosca, Crescentino (VC)



HIGH HILLS: 900 m u.s.l.

**2 HARVESTS/YEAR (TRITICALE + SORGHUM) TO FEED COWS AND
USE MANURE AS A CRUCIAL INPUT**





Azienda Marcantonio, Castelfranco in Miscano (BN)

NOTILL CORN ON LUCERN TO INCREASE ORGANIC MATTER









Azienda D'Alessandro, Rocca d'Evandro (CE)

CHALLENGES: NOTILL VEGETABLES. SECOND HARVEST TRANSPLANTED MELON ON CEREAL STRAW OF THE SAME YEAR





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RESEARCH

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The spread of no-till in conservation agriculture systems in Italy: indications for rural development policy-making



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Abstract

No-tillage is a farming system aiming at minimizing soil disturbance associated with the cultivation of arable crops. This technique, together with the practices of continuous soil cover and of crop rotation, also represents one of the elements of

<https://agrifoodecon.springeropen.com/articles/10.1186/s40100-019-0126-8>

THANK YOU FOR YOUR ATTENTION

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