

Floor management

- Direct impact on growth, yield and grape composition
- Direct impact on the vineyard ecosystem (soil health, biodiversity, erosion)
- Direct impact on production costs

Which crops to associate with grapevines ?

Improvements on monocrops?



Mechanical weeding



Chemical weeding

Which crops to associate with grapevines ?

Grow grass in the inter-rows?



Grass



Natural cover

Which crops to associate with grapevines ?

Many management strategies are possible for covercrops



Narrow row, thin line of grass
every 2nd inter-row



Wide row, wide line of grass
or total covercropping

Tillage

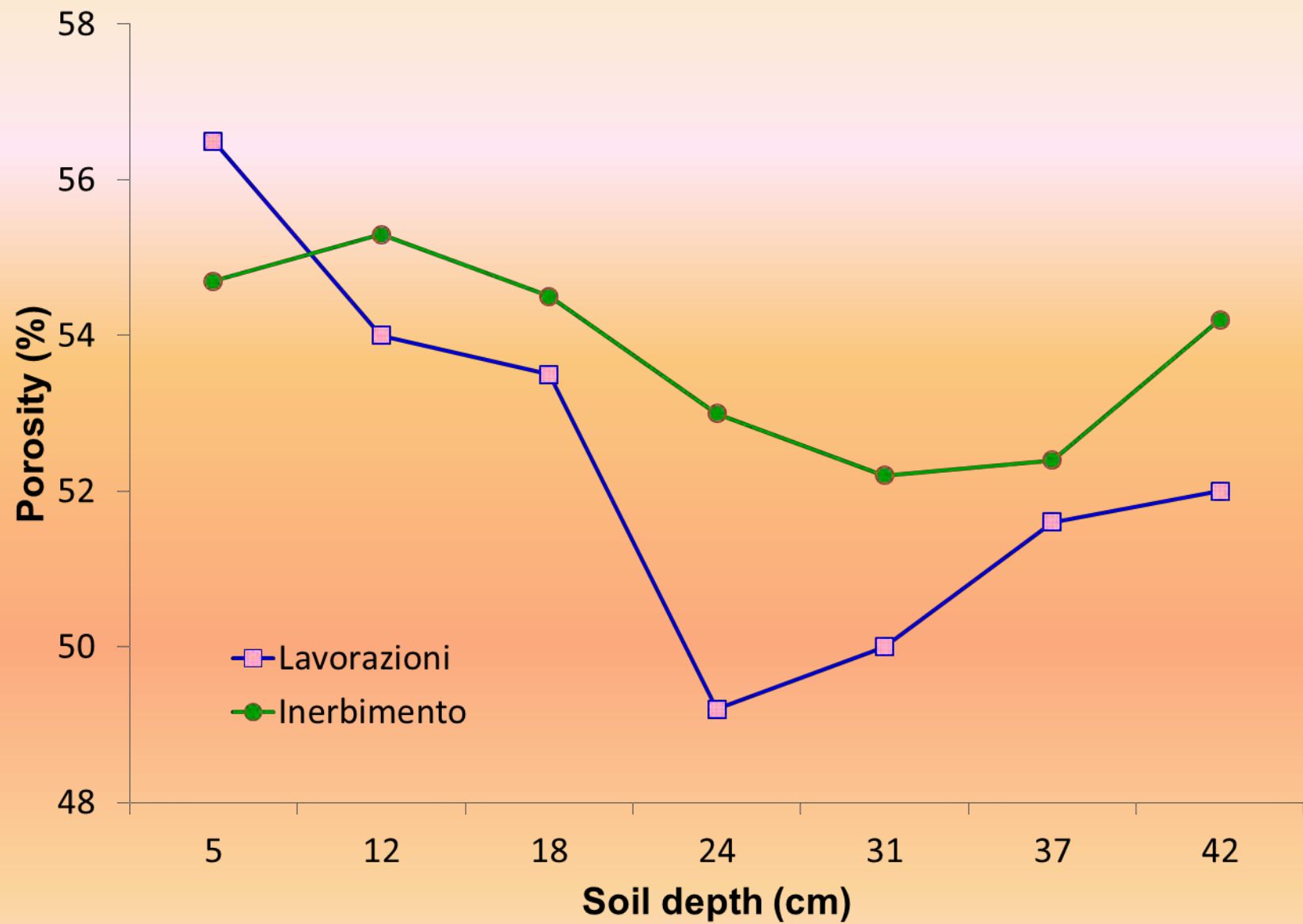
- Remove weeds
- Break cracks in the soil
- Break compaction layers
- Bury fertilisers
- Favor soil water intake
- Weed growth dictate number of interventions
- Easy – Rewarding for the worker

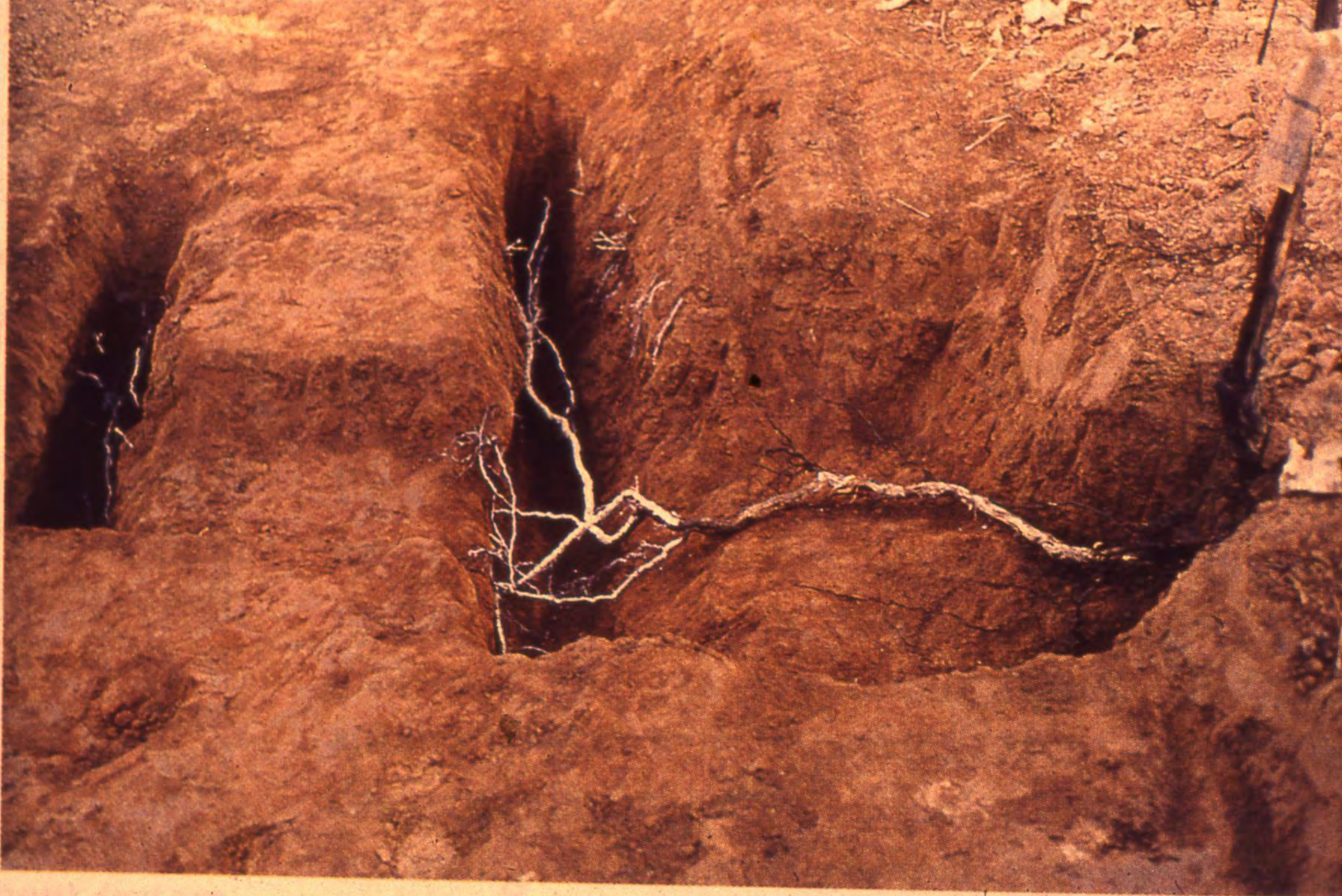
Plus

- Soil structure and compaction
- Erosion (texture, slope, length)
- Deep compaction layer
- Soil fertility (i.e. organic matter)
- Vine health (wounds, trunk diseases)
- Carbon footprint and costs

Minus











Herbicides

- Low cost
- Late winter applications can replace 3-4 tillages
- Water conservation in soil
- Lower erosion as compared to tillage
- Reduced mechanical damage
- Post-emergence applications leave OM onto the soil

Plus

- Soil compaction
- Lower microbiological health
- Resistant weeds tend to prevail
- Possible soil and aquifers contamination
- Lower OM with pre-emergence strategy.

Minus

Pre-emergence herbicides
application very useful in young
vineyards



Post-emergence applications (mostly glyphosate based!)





5 Terre



Valtellina



Porto



Valdobbiadene













8 hours later

Mulching

Natural



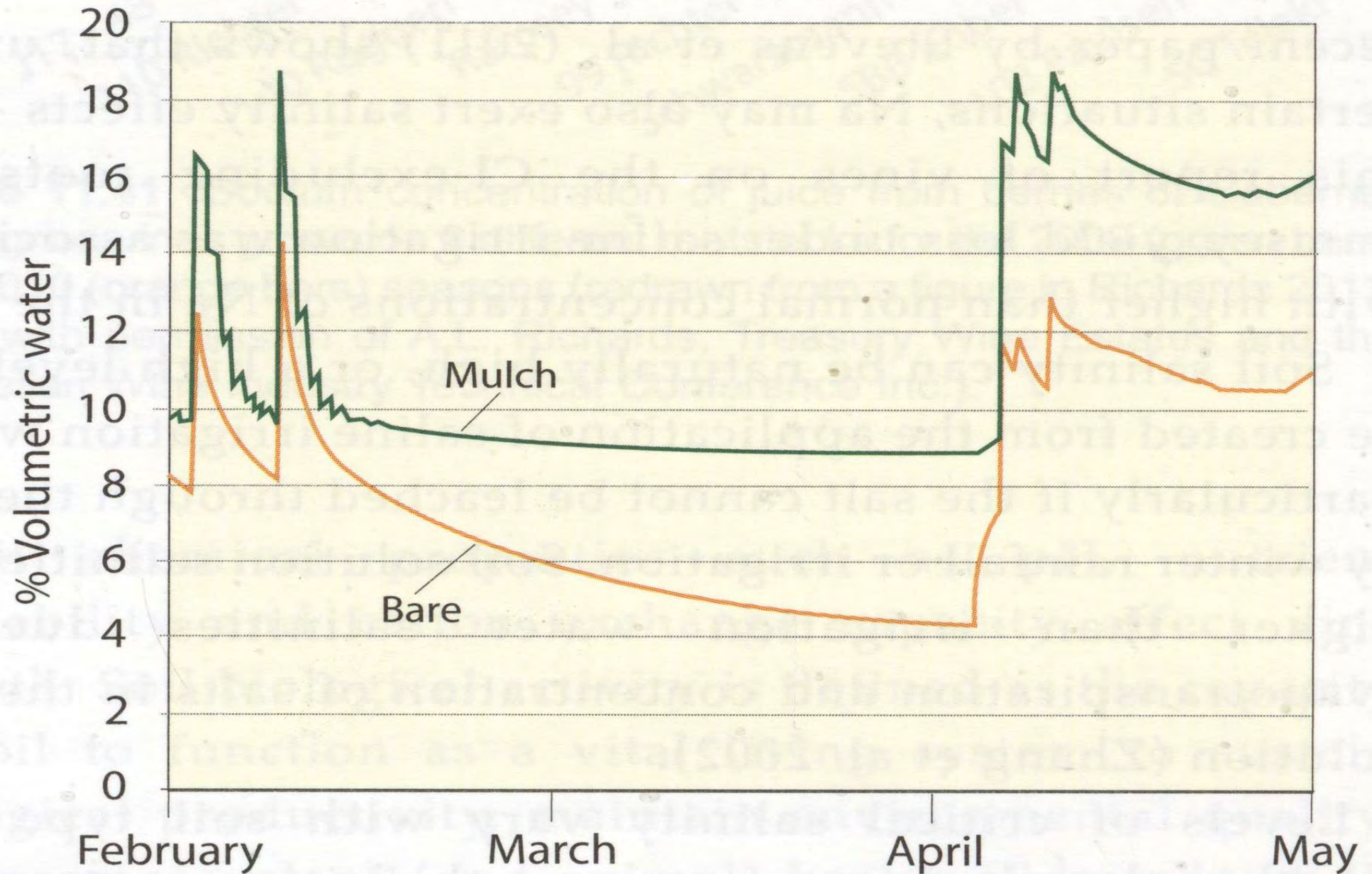
Plastic



Plastic



Vineyard soil moisture 2001 (60-90cm)



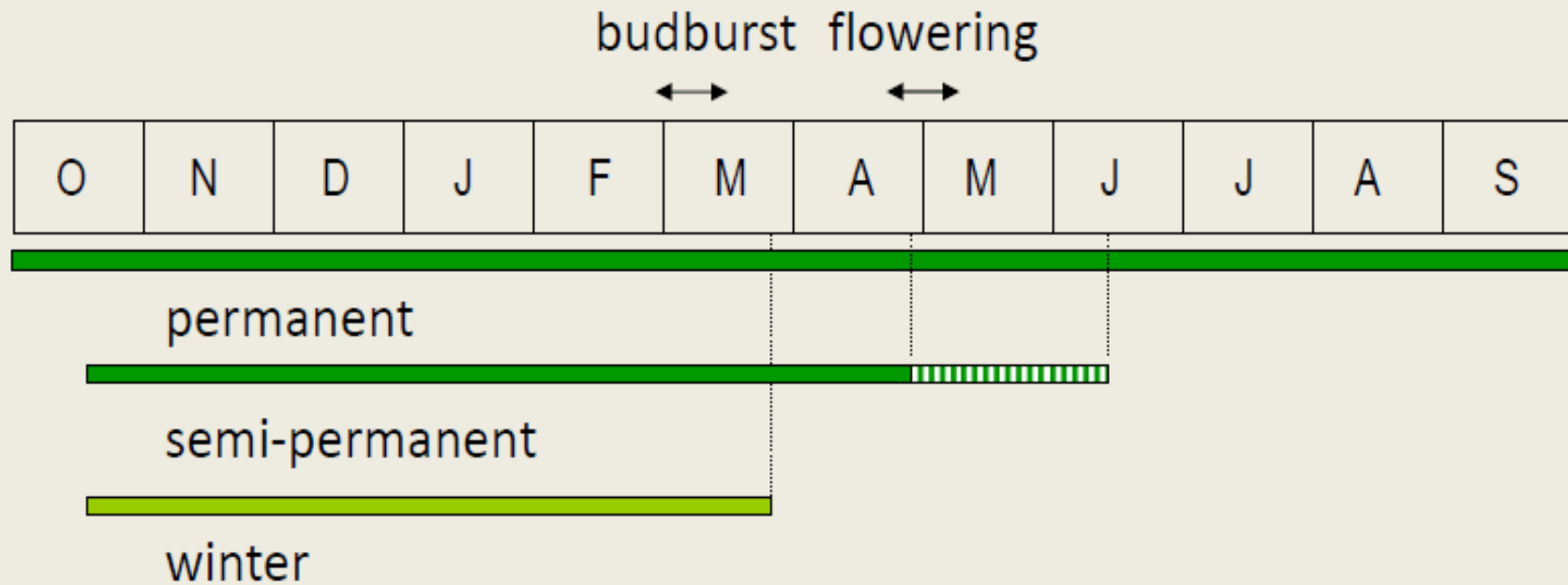




Strategies for covercropping

example for temperate climate with winter from D to M

Covercropping typology



➤ Natural

➤ Sown

➤ Mixed *every 2nd inter-row*

Vineyard Cover Cropping?

Grapevine:

A productive perennial crop

Cover crop:

A service crop

Cover Crop Typology

Species Composition:

- perennial / annual
- rooting depth
- water & nitrogen needs
- growth period

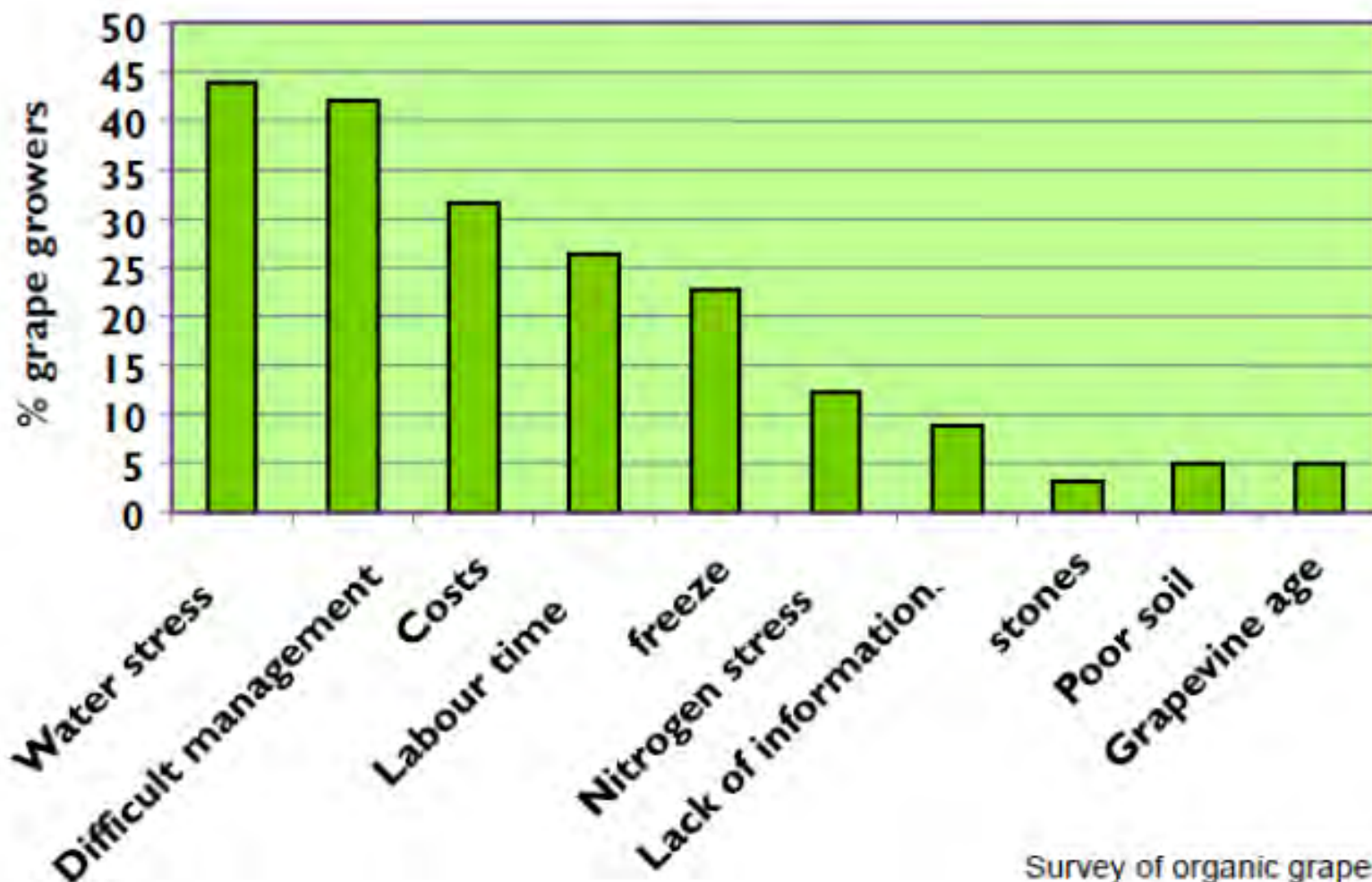
Structure: cover crop surface

- total cover
- every inter-row
- every 2nd inter-row

Timescale Features: growth period

- permanent
- semi-permanent
- winter

Grape growers fears



Survey of organic grape growers *Terra Vitis* of Languedoc (Gaudel, 2002)

Cover crop benefits:

- Prevention of erosion and landslides.
- Better soil structure
- Higher OM and biological activity
- Better water infiltration rates
- Better fine root development
- Better grape composition
- Better alley transit
- Time and cost reduction
- Sustainable technique

For the winegrower a cover cropped vineyard= Many New Questions to Answer?

New Agronomic Design?

- natural dispersion of seed or sown by man?
- permanent, semi-permanent or seasonal?
- between the rows or covering the whole surface?

With a cover crop, what about:

- competition?
- biodiversity?
- erosion?
- runoff and nitrate leaching?

If the covercrop is leguminous: *what about N balance?*



Lieu	Procédés	Rende- ment kg/m ²	Sucres Brix %	Acidité totale g/l ¹⁾	Pourri- ture %	Bois de taille g/m ² ²⁾	N feuilles % MS
Changins II	Travail du sol	2.01	16.8	7.8	11.7	396	2.00
	Gazon permanent	1.58	17.2	7.7	6.5	346	1.75
Pully	Travail du sol	2.04	16.9	7.6	14.1	386	1.97
	Gazon permanent	1.86	17.0	7.3	9.6	353	1.82

= Meno muffa grigia

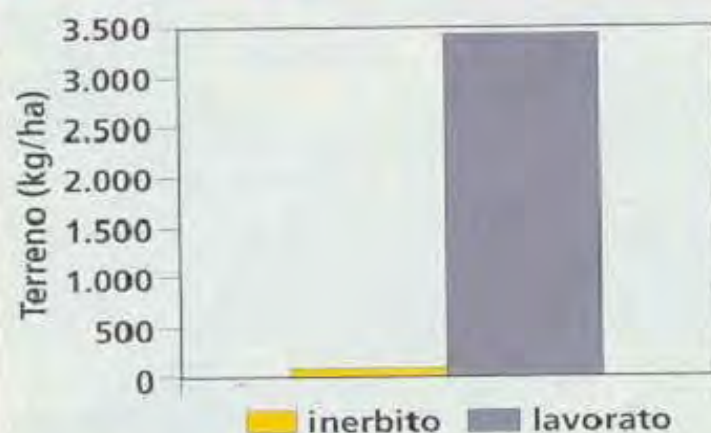


Tabella 2 - Confronto tra essenze erbacee e lavorazione del suolo per macro e microcomponenti delle uve

	Prod. ceppo (kg)	Zuccheri (°Brix)	Antociani totali (mg/kg)	Polifenoli tot. (mg/kg)
Cabernet Sauvignon-Valcalepio (medie 1993-94)				
<i>Lolium multiflorum</i>	6,8 b	19,4 b	2.240 c	3.870 b
<i>Bromus catarticus</i>	6,4 b	19,1 b	2.130 c	3.560 b
<i>Festuca arundinacea</i>	5,0 a	18,8 ab	1.920 b	2.980 a
<i>Trifolium repens</i>	6,2 ab	18,4 a	1.810 b	2.900 a
Suolo lavorato	8,6 c	18,2 a	1.590 a	2.720 a
Barbera-San Colombano (medie 1996-97)				
<i>Lolium rigidum</i>	4,6 b	22,2 bc	2.167 bc	2.918 b
<i>Trifolium resupinatum</i>	4,8 b	21,8 b	2.091 b	2.827 b
<i>Bromus catarticus</i>	4,0 a	21,9 b	2.030 b	2.744 ab
<i>Lolium multiflorum</i>	4,1 a	22,6 c	2.236 c	3.068 b
Suolo lavorato	5,6 c	20,5 a	1.839 a	2.531 a

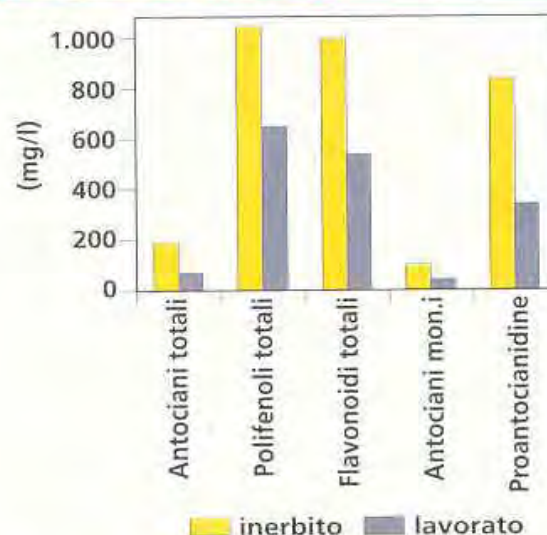
A lettere diverse corrispondono differenze significative per $p < 0,05$.

Grafico 3 - Trasporto a valle di terreno e tecnica di gestione del suolo (*)



(*) Media annuale relativa al periodo 1994-97.

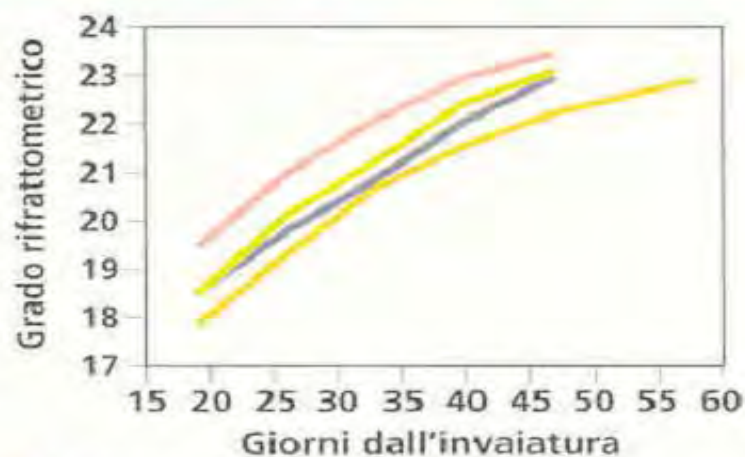
Grafico 2 - Variabili qualitative del vino Barbera e tipo di gestione del suolo (*)



(*) Valori medi 1994-95.



Grafico 2 - Accumulo di zuccheri in uve Sangiovese (Montalcino, Siena)



- Lavorazione
- Inerbimento con *Trifolium subterraneum*
- Inerbimento naturale
- Inerbimento con *Festuca arundinacea*

Cove crop water budget

- 500 l water/kg DM
- 30 t FW/year

=

6 t DW/year

=

3000 m³/year

=

300 mm of rain!!!!

Spontaneous cover with ray grass (*Lolium multiflorum*)



Sinapis alba. Cruciferae species drill the clay soil with a deep root system

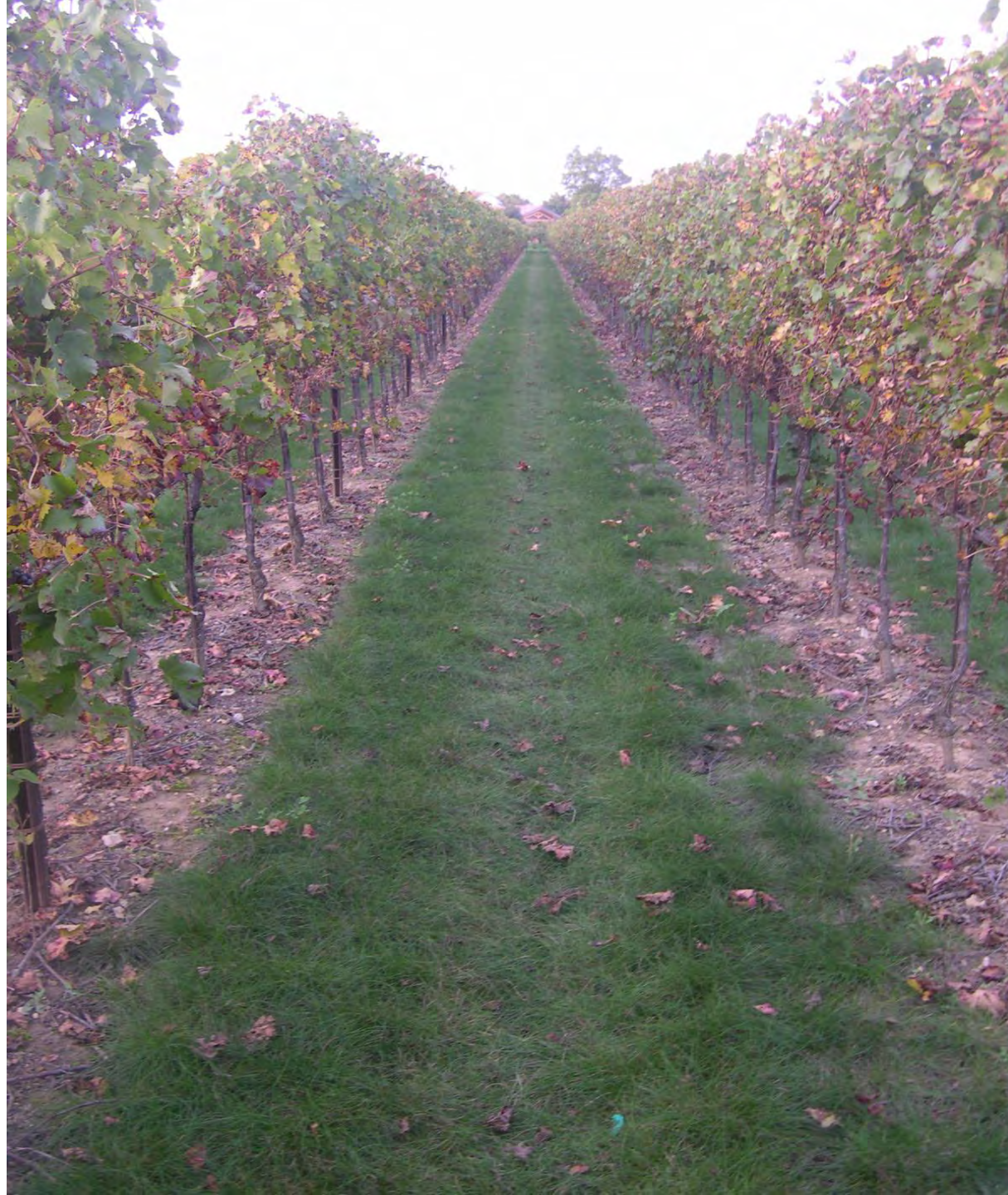


Cover with rye (*Secale cereale*) to improve O.M. and soil portance (Tractor buoyancy)



Festuca longifolia

*A dwarf, low
competing species*



Amatorial vineyard seeded with fine fescue



Dwarf fescue



Dwarf fescue may have low resistance to machinery trampling



Tall fescue (*festuca arundinacea*), for vineyard vigor control, in Po Valley



Broad bean cover to improve soil O.M.



**Broad bean (*Vicia faba*) associate with
oats (*Avena sativa*)**



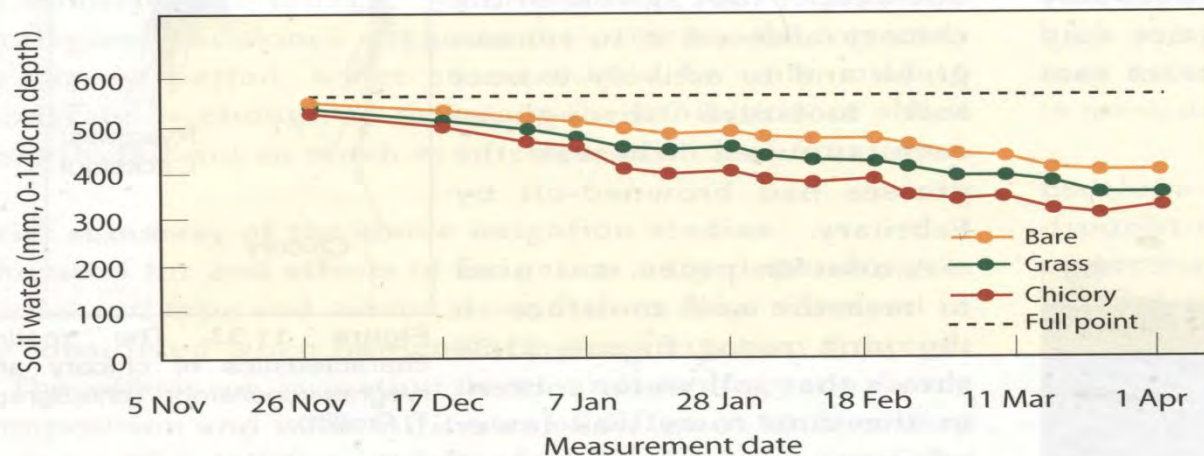


Figure 11.34 Soil water content (0-140 cm depth) in vine rows for each treatment during the 1997/98 growing season (redrawn from Figure 1 in Proffitt 2000, used with permission from Winetitles).

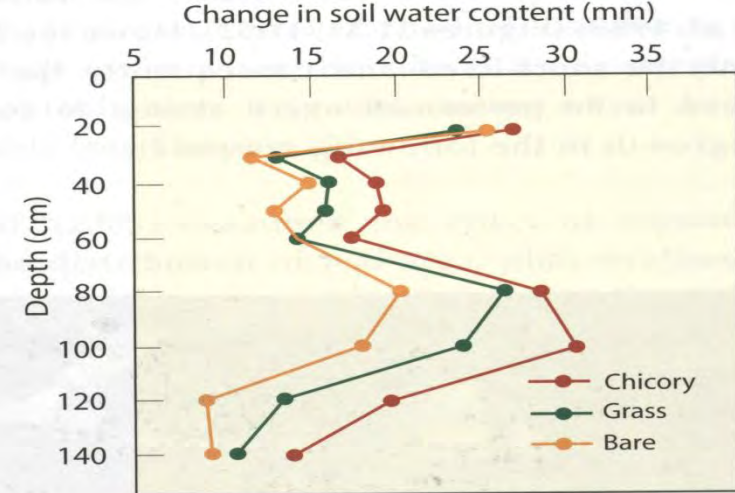
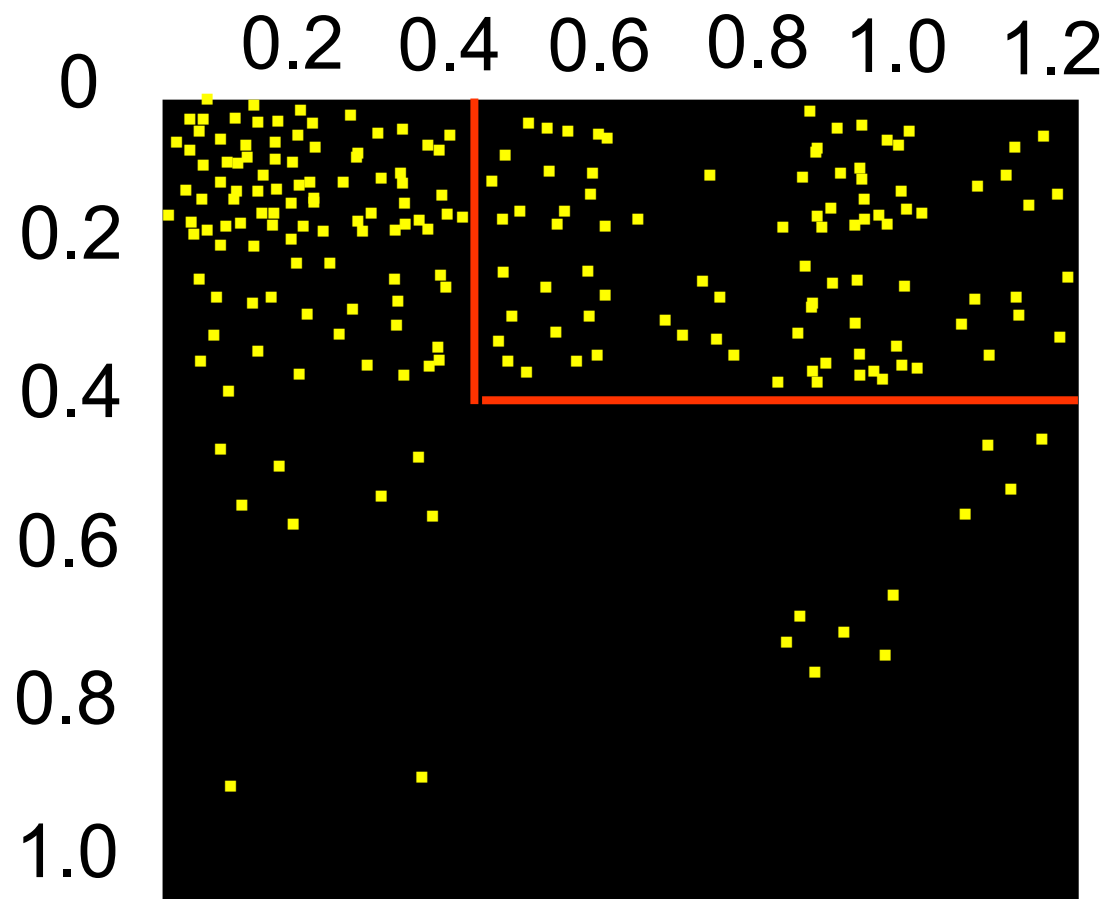


Figure 11.35 Vine water extraction for the bare soil, grass and chicory mid-row treatments (redrawn from Figure 2 in Proffitt 2000, used with permission from Winetitles).

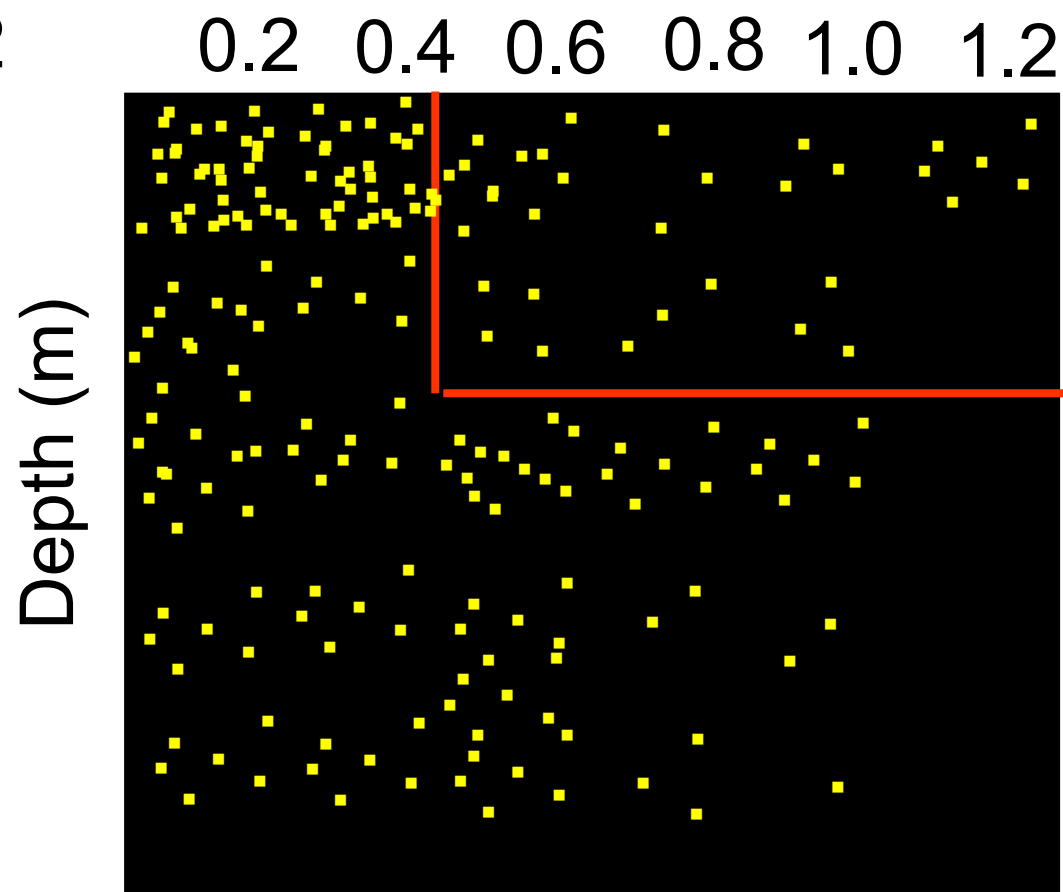


Figure 11.36 The mid-row — (a) bare soil, (b) planted with ryegrass and cocksfoot grasses and (c) chicory (photographs T. Proffitt).

Herbicides



Dactylis glomerata

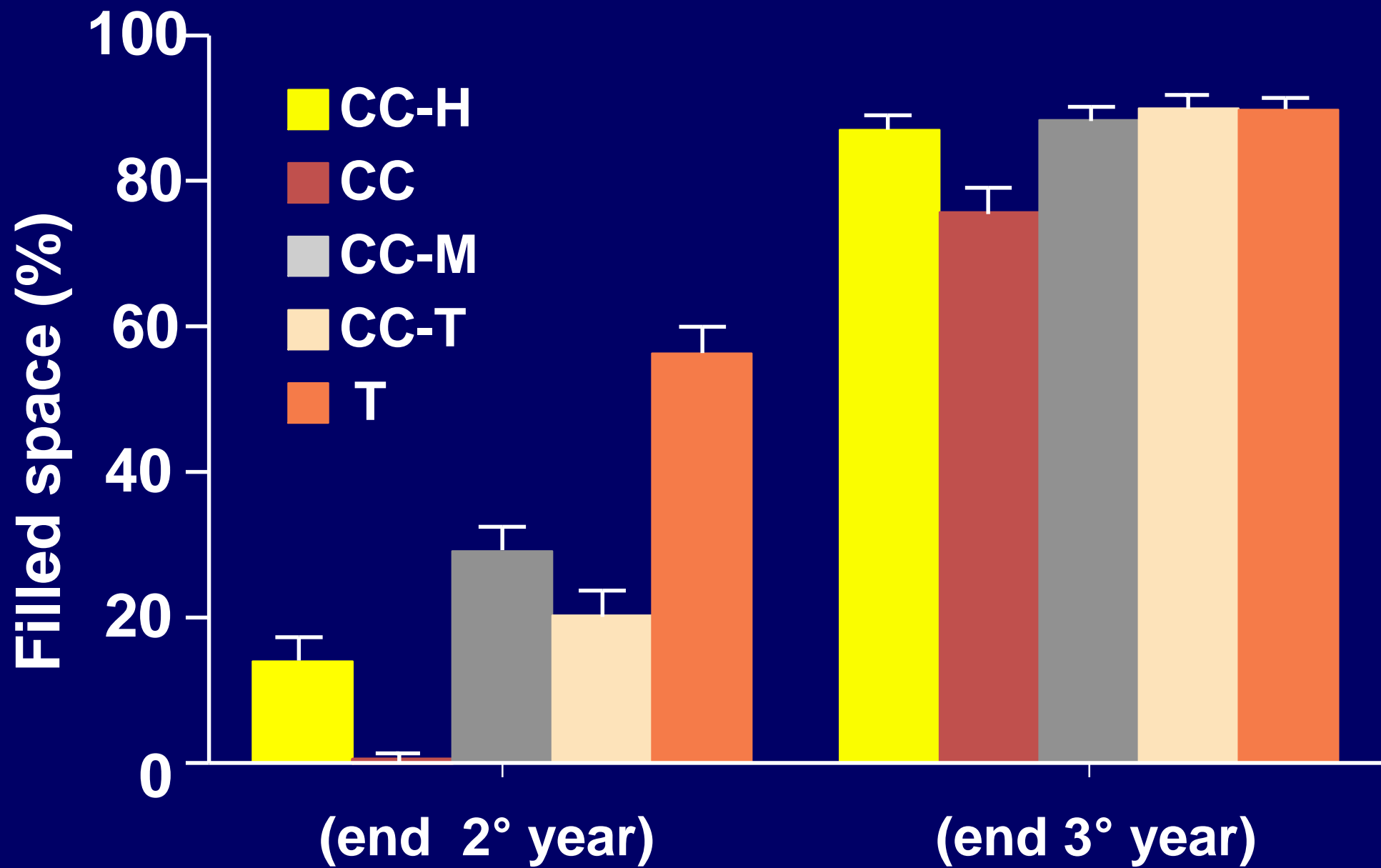


Distance from row axis (m)

From Lopes et al., 2004. Geisenheim, Germania

Species	18h Σ 8h (1 m ⁻² LA)	LAI (m ² m ⁻²)	Trasp. (mm gg ⁻¹)
Medicago lupulina	1.94	1.28	2.48
Festuca rubra	0.60	1.18	0.71
Chenopodium album	2.93	0.76	2.21
Cirsium arvense	1.74	1.22	2.12
Malva neglecta	4.79	0.93	4.45
Taraxacum officinale	2.08	1.38	2.48
Grapevine	0.46	2.31	0.89







CC



T

Tab. 3. Yield components. Means 1996-2000.

	Yield/m (kg)	Yield/ha (q)	Fert. (cl./shoot)	Clusters/ m	CW (g)	BW (g)
T	4.61 a	230	1.65 a	27.0 a	171 a	2.05
LI	4.08 b	205	1.58 ab	24.3 b	167 a	2.08
PI	4.08 b	205	1.58 ab	24.8 b	164 a	2.09
DI	3.53 c	175	1.51 b	23.5 bc	146 b	2.02
II	3.34 c	165	1.54 b	22.9 c	144 b	1.99
Sig.	**	**	*	**	**	ns

Tab. 4. Grape composition and vine balance indices. Mean 1996-2000.

	TSS (°Brix)	TA (g/l)	pH	Sugars/m (g)	Y/PW (kg/kg)	LA/Y (m ² /kg)
T	20.5 b	6.8 a	3.39	937 a	10.1	1.09 b
CC-T	22.1 a	6.2 c	3.43	891 a	10.1	1.15 ab
CC-M	21.0 b	6.5 b	3.42	843 ab	9.7	1.31 ab
CC-H	22.2 a	6.1 c	3.44	776 b	9.6	1.51 a
CC	22.3 a	6.0 c	3.44	735 b	10.4	1.44 ab
Sig.	**	**	ns	**	ns	**











