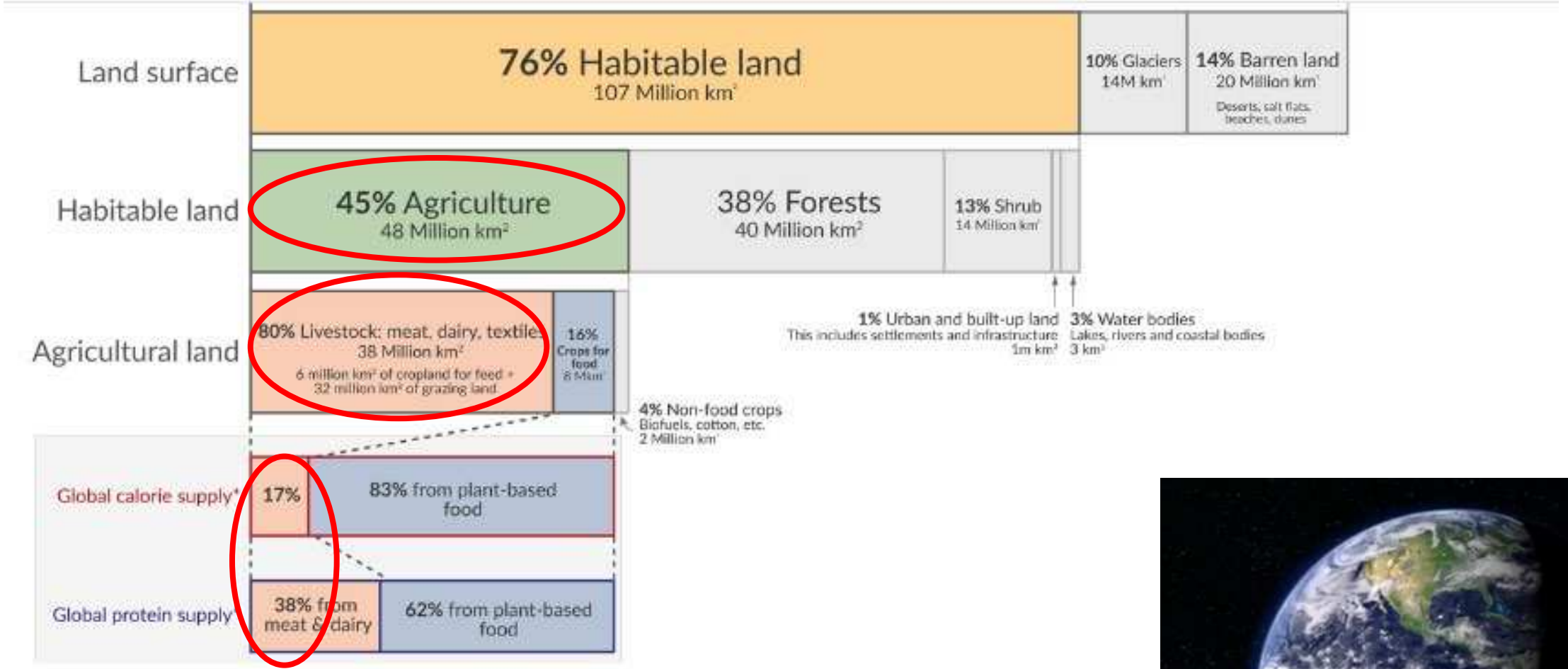
Animali e alberi da frutto

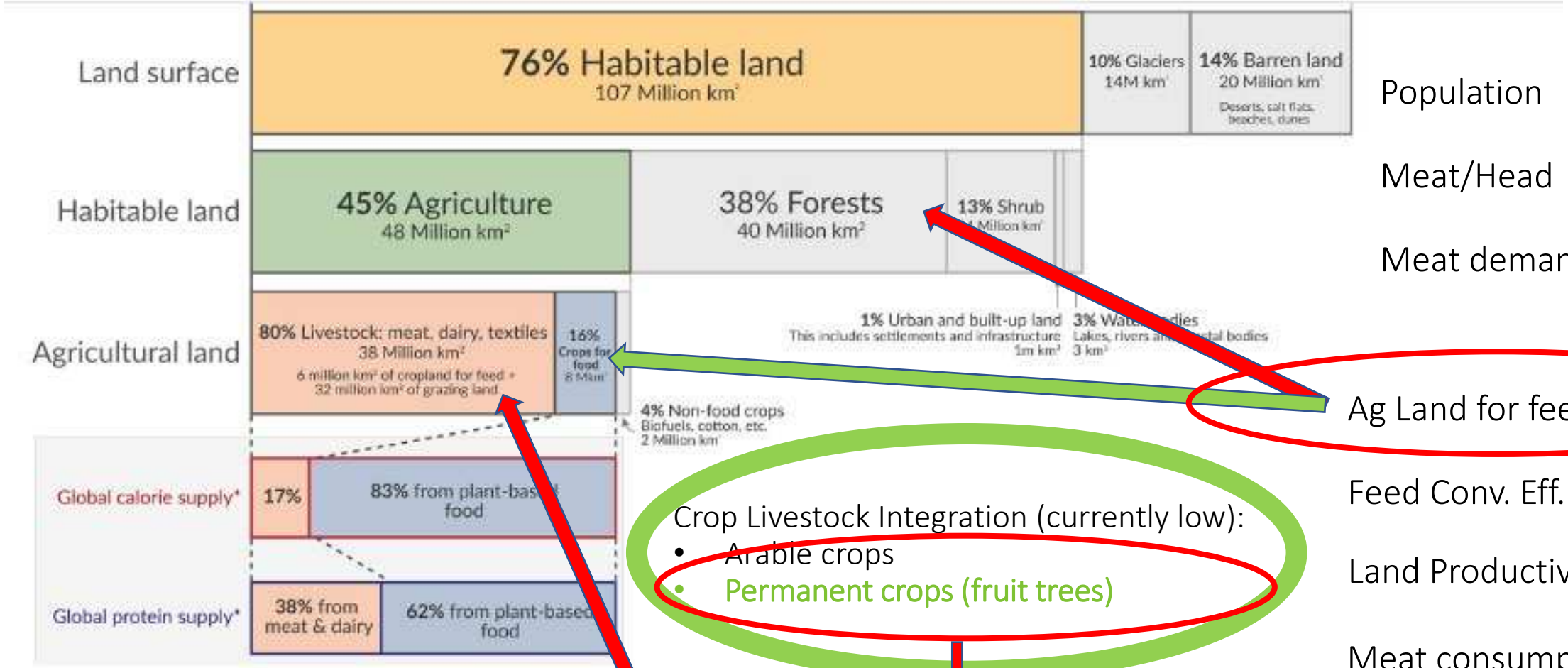
Adolfo Rosati, CREA, Italy (adolfo.rosati@crea.gov.it)



*Includes fish and seafood from aquaculture production, which uses land for feed. If wild fish catch is also included, animal products would provide 18

Data sources: UN Food and Agriculture Organization (FAO) and Poore and Nemecek (2018).

OurWorldinData.org – Research and data to make progress against the world's largest problems.



Population ↑

Meat/Head ↑

Meat demand ↑↑

Ag Land for feed ↑

Feed Conv. Eff. ↑

Land Productivity ↑

Meat consumption ↓

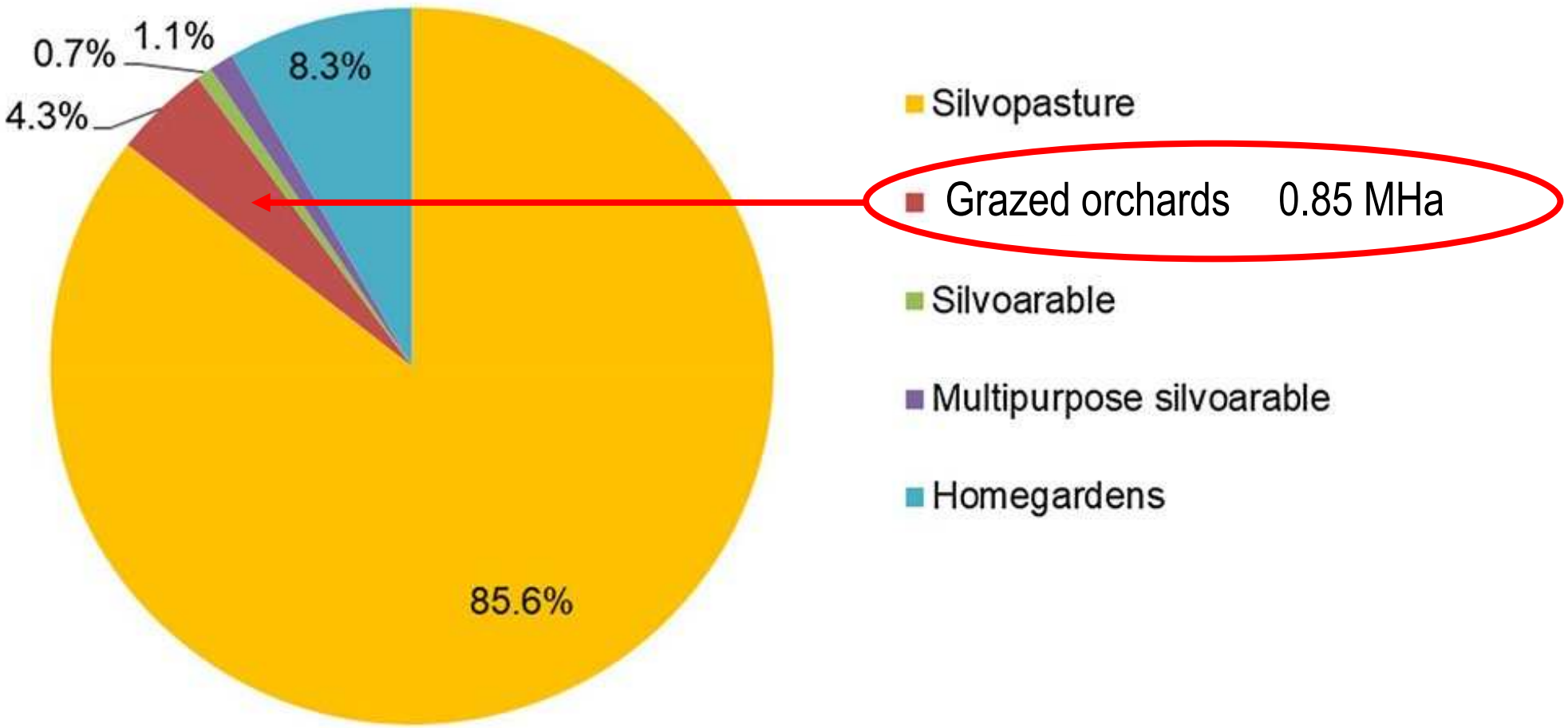
Crop Livestock Integration (currently low):

- Arable crops
- Permanent crops (fruit trees)

Fruit-Tree-based-AFS (FTB-AFS)


Agroforestry in the EU

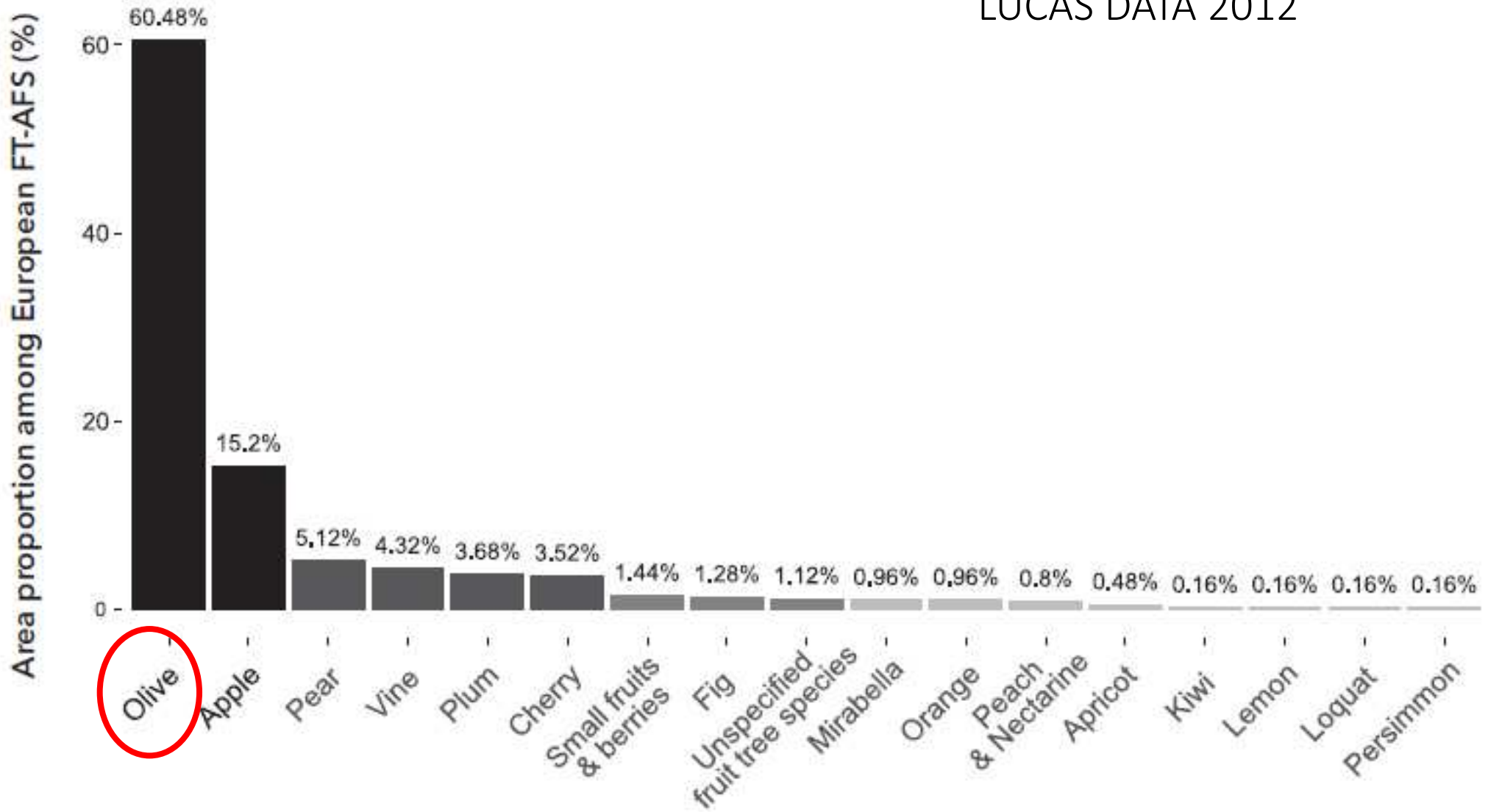
Total EU Agroforestry area: 19.77 MHa[1] (5% EU land area). Or 15.4MHa excluding shrubs and home gardens[2]



[1]Mosquera-Losada et al., 2018, Agroforestry in EU 27, LUCAS 2012
[2]Den Herder et al., 2015

Lauri et al., 2019 **Agroforestry for fruit trees in Europe and Mediterranean North Africa**

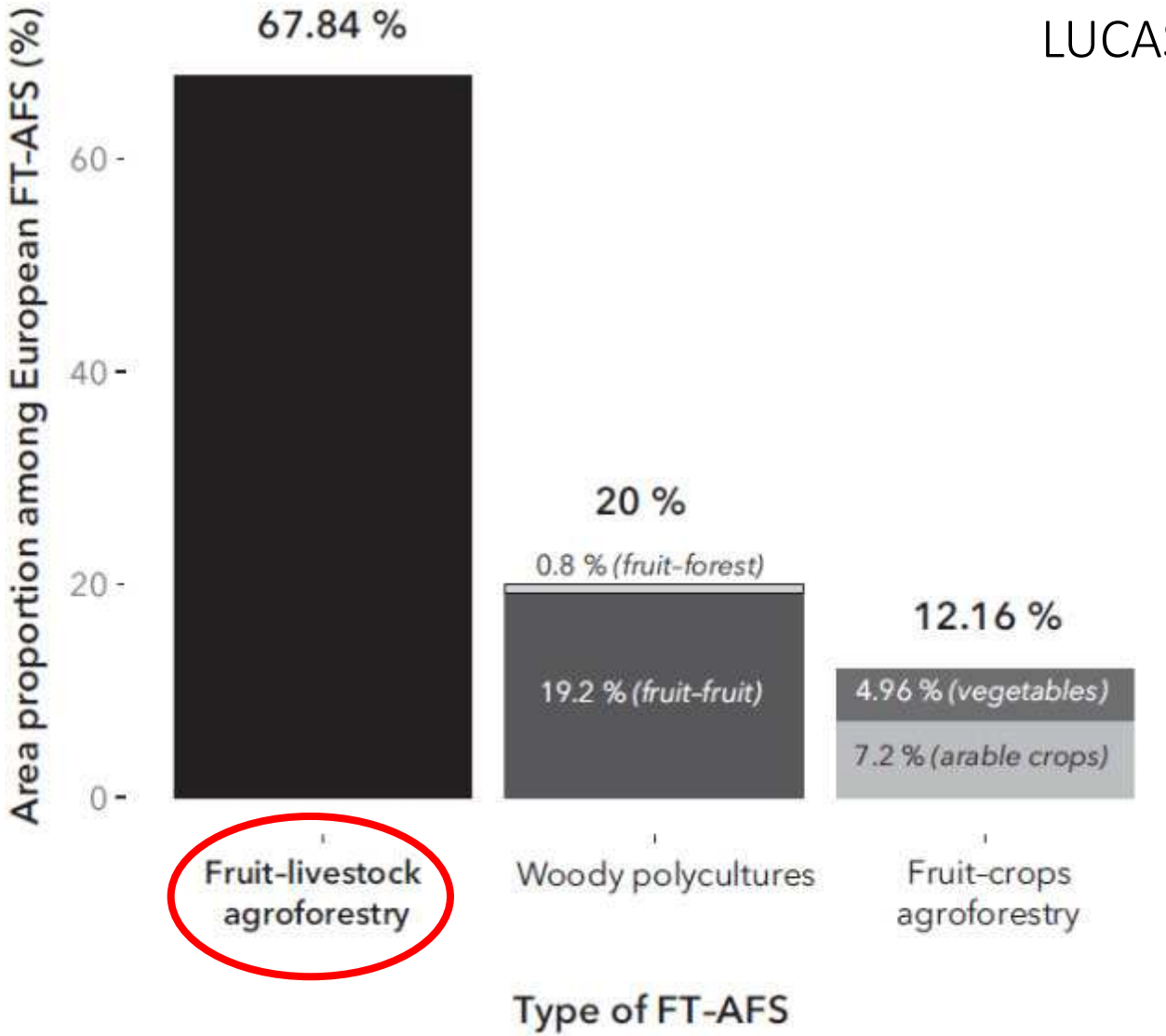
LUCAS DATA 2012

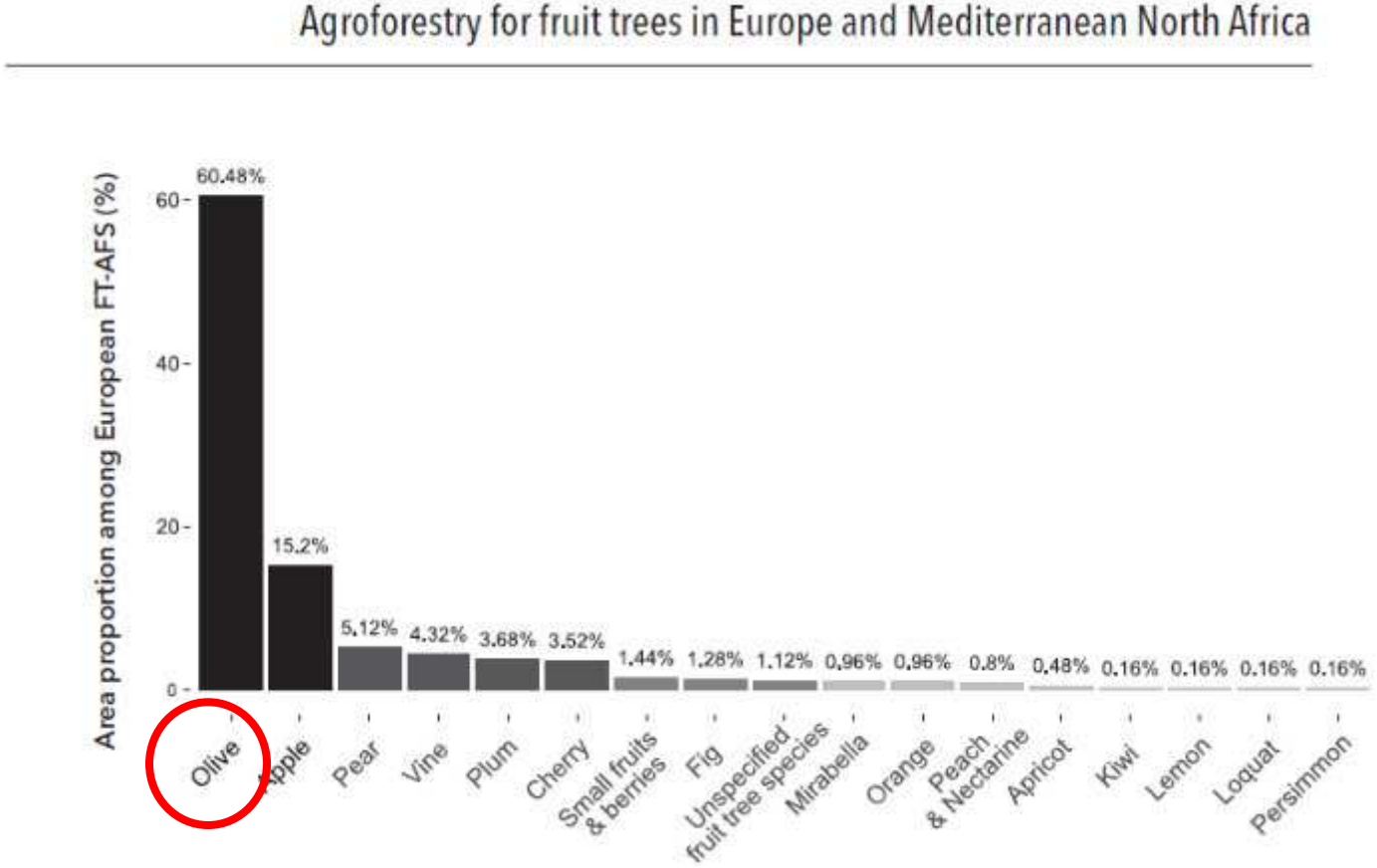


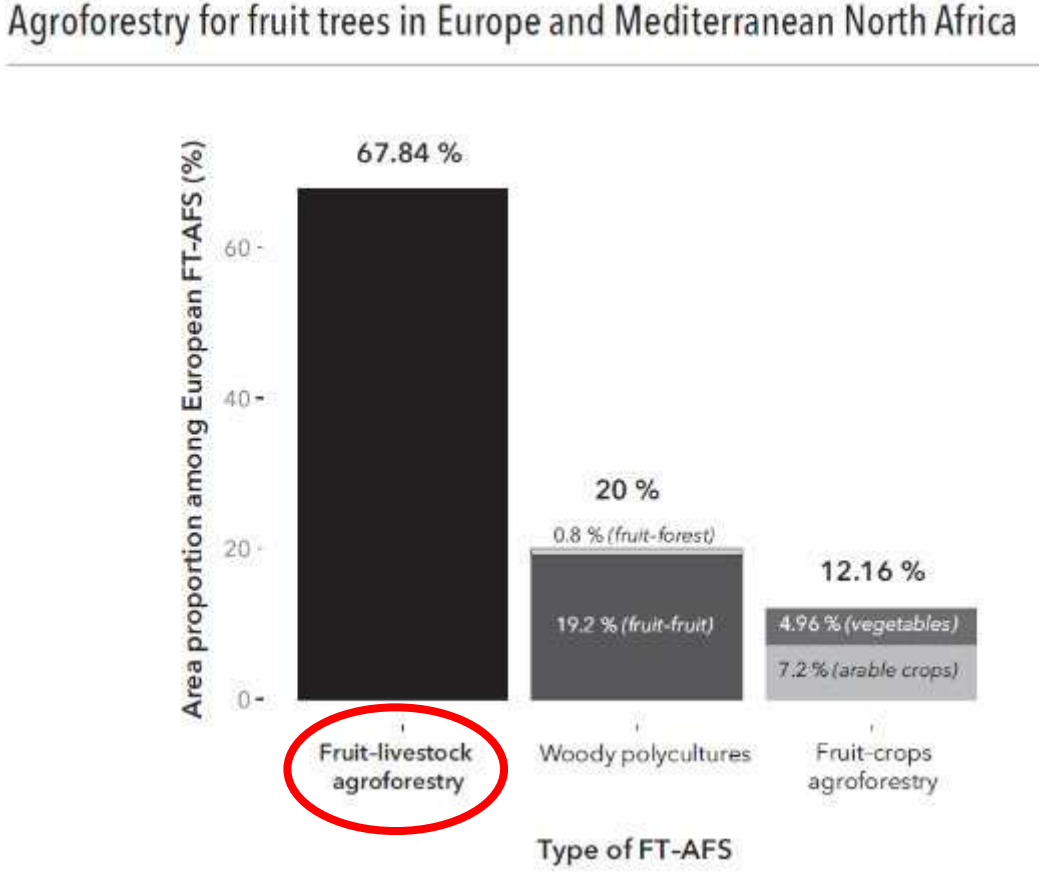
Lauri et al., 2019

Agroforestry for fruit trees in Europe and Mediterranean North Africa

LUCAS DATA 2012







Most EU FTB-AF is **Grazed Olive Orchards**

Yet, most EU **Olive acreage (90%) is not grazed (nor AF)**
Similarly for other fruit species

I frutteti erano consociati

Nel secolo scorso si è passata alla specializzazione colturale (monocoltura)

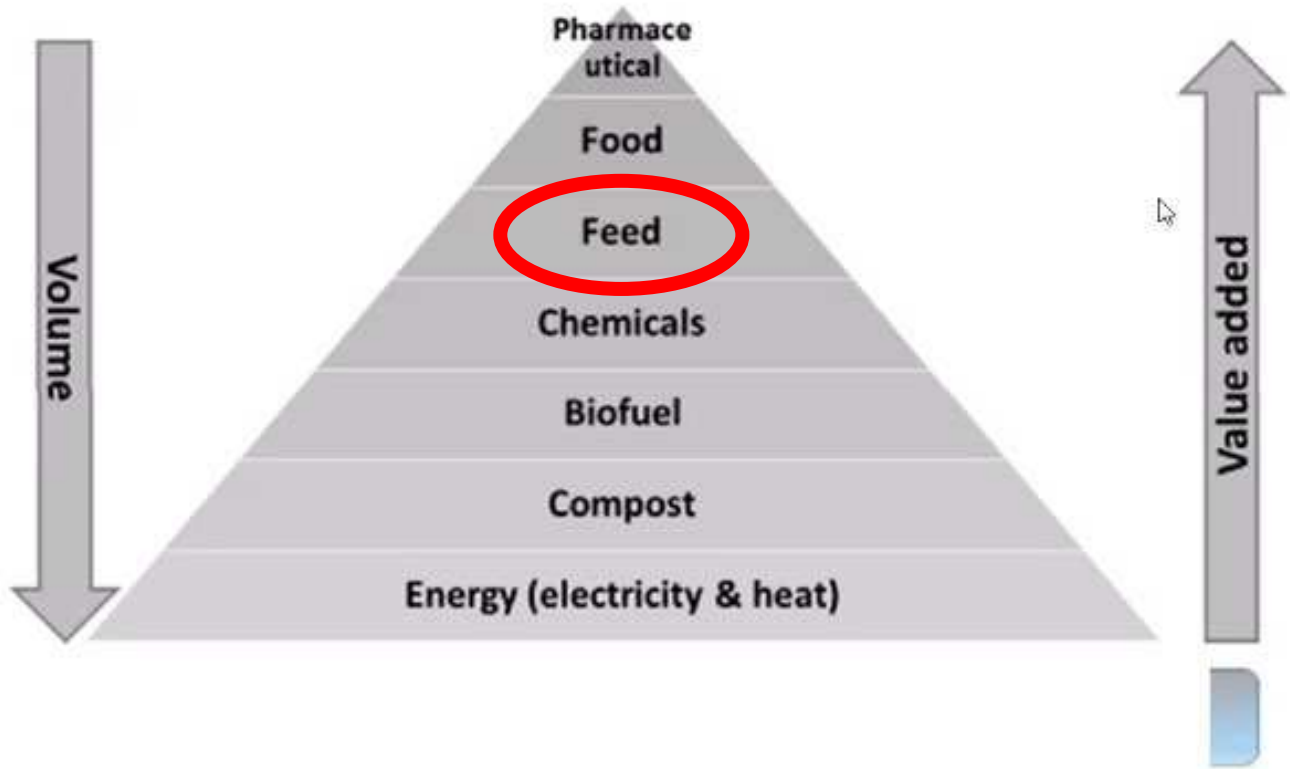
Erosione, perdita biodiversità, di C (fertilità) ed emissioni di carbonio…

Per rimediare… inerbimento sempre più frequente (Ecoschema 2, ma anche 5)

Perché allora non valorizzarlo economicamente?
Con colture da reddito?

Perché non usare gli animali per falciarlo?

Che possiamo coltivare nell’oliveto (Frutteto)?


Pharmace
utical
Food
Feed
Chemicals
Biofuel
Compost
Energy (electricity & heat)
Volume
Value added

La cosa più immediata e facile da produrre nell'oliveto, è il foraggio!

Cresce spontaneamente! Ed è tutto foraggio

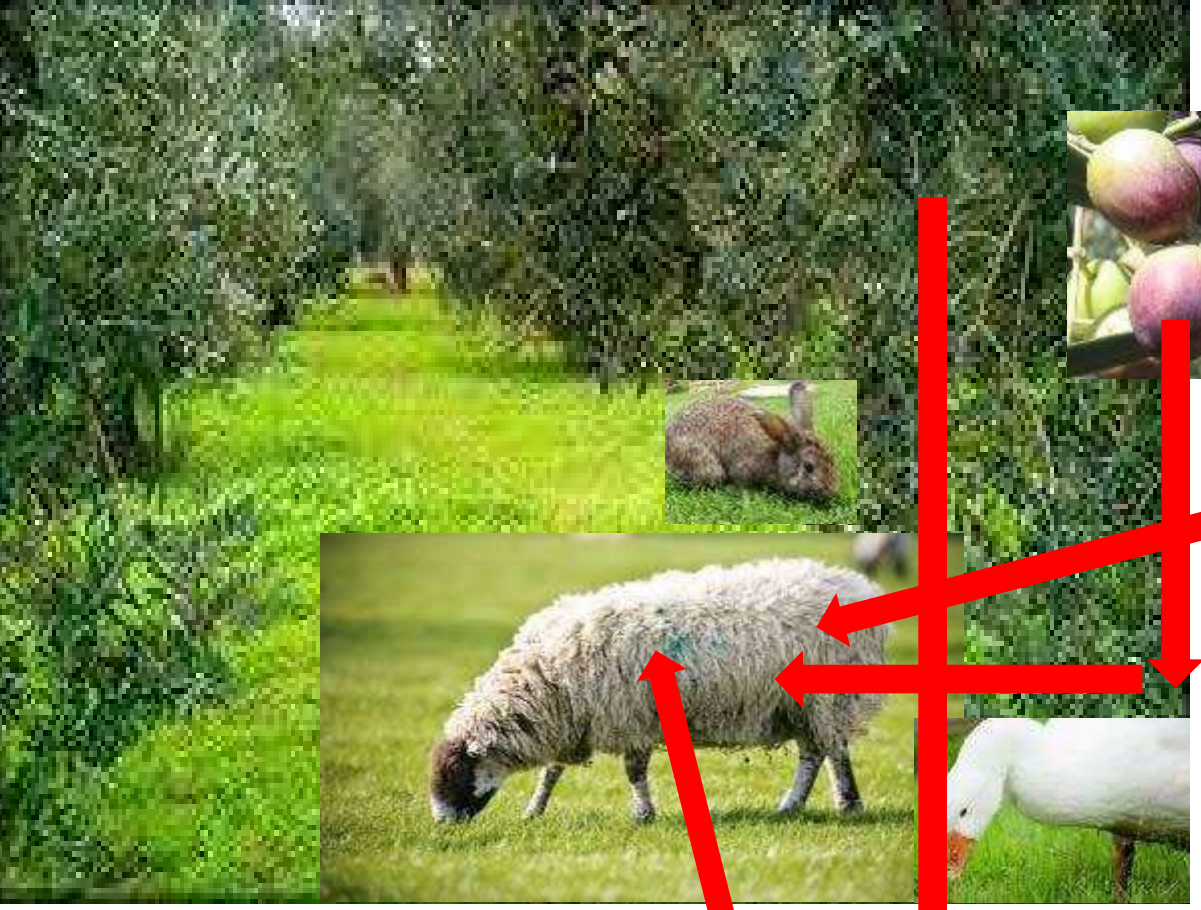
Ma anche facilmente seminabile: grande scelta.

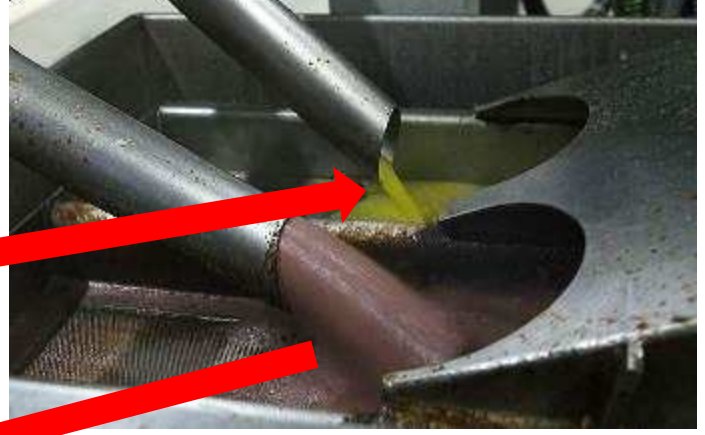
Si usa tutta la pianta + le erbe infestanti!

Si può falciare/eliminare con flessibilità, evitando la competizione idrica con l'olivo.

Questa flessibilità di specie e gestione consente di ottimizzare il sistema, riducendo al massimo la competizione e massimizzando i vantaggi:
Concimazione (exp N), soppressione infestanti, controllo erosione…

Che potenziale foraggero ha l’oliveto?





L’oliveo offre diverse fonti di foraggio:

1) Erba (5 T/ha SS)
2) Sansa denocciolata(1-2 T/ha SS)
3) Potature (parte appetita 0.5 T/ha SS)
4) Olive cadute prima e durante raccolta
5) Foglie cadute in autunno (Frutteti)

Usare (invece di sprecare) queste risorse, aumenta e diversifica la produttività totale dell’oliveto,

Benefici anche per gli animali e per i consumatori (qualità dei prodotti, tannini, emissioni…)


Oltre al foraggio, l’oliveto fornisce:
Riparo e ombra
Protezione dai predatori
Habitat naturale
Stimolo al pascolo

USDA

United States Department of Agriculture

Economic Research Service

Economic Research Report Number 175

September 2014

Climate Change, Heat Stress, and U.S. Dairy Production

Nigel Key, Stacy Sneeringer, and David Marquardt

In 2010, heat stress lowered the value of annual milk production for the average dairy by about $39,000, which equates to $1.2 billion in lost production for the entire dairy sector. Climate model predictions indicate that, on average, U.S. dairies will experience an annual temperature increase between 1.45 and 2.37 degrees Fahrenheit by 2030.

Gli animali hanno bisogno dell’ombra

(exp. cambiamento climatico)

Foto P. Paris

Photo by João Palma

Anche gli animali sono utili all’oliveto:

Diserbo

Concimazione

Controllo parassiti

Diserbo

This Winery Employs 1,900 Sheep to Help With Its Grape Harvest

It's not a baaaad gig, if you can get it.

By Megan Friedman Feb 2, 2015

Mixed species weed better

Cut and carry, and hay making are also options, but…

Fertilizing

180 kg/ha N

220 kg/ha P_2O_5

More than enough for the orchard

Pecunia non olet

When animals provide weeding and fertilization, the environmental impact of the orchard is drastically reduced

ELSEVIER

Journal of Cleaner Production
Volume 131, 10 September 2016, Pages 351-363

Combining livestock and tree crops to improve sustainability in agriculture: a case study using the Life Cycle Assessment (LCA) approach

Luisa Paolotti [a], Antonio Boggia [a], Cesare Castellini [a], Lucia Rocchi [a], Adolfo Rosati [b]

Pest Control

The literature reports:

- Ruminants consuming fallen leaves reduce leaf diseases (e.g. apple scab)
- Pigs consuming fallen fruits reduce fruit pests
- Chickens can hunt several pests
- Grazing reduces voles

Animals can destroy suckers

Animali lavorano:

Gratis

24/24; 7/7, 365/365

No ferie, scioperi, DPI etc..

Sono felici di farlo!!!

Infatti, preferiscono “lavorare” che non poterlo fare!

Problematiche

Competizione per acqua e nutrienti
Danni agli alberi o alle colture consociate
Contaminazione dei frutti e degli animali
Gestione tecnica
Problematiche socioculturali and di politica
(Ecoschema 2!!!)

Ricapitolando

Consociare I frutteti con foraggi/pascolo e colture può aumentarne la produttività totale e il reddito:

- Producendo prodotti aggiuntivi all'olio
- Senza diminuire la produzione olivicola
- Riducendo gli input (es. concimazione, gasolio) e quindi i costi e l'impatto ambientale
- Migliorando il benessere animale

Ricapitolando 

Ci sono delle difficoltà da superare:

- Più impegnativo (tempo, conoscenze)
- Gestione tecnica da mettere a punto
- Difficoltà socioeconomiche
- Politiche agricole
- Mancanza di supporto (ricerca e assistenza)

Prospettiva globale

Agricultura: 20-25% emission antropiche, dovute soprattutto alla zootecnia (produzione di foraggi e mangimi).

Avremo bisogno di più zootecnica in futuro

Nel Mondo: 150 M ha a colture permanenti per lo più non consociate/pascolate (in EU 10%).

Prospettiva globale

Agricultura: 20-25% emission antropiche, dovute soprattutto alla zootecnia (produczione di foraggi e mangimi).

Avremo bisogno di più zootecnica in futuro

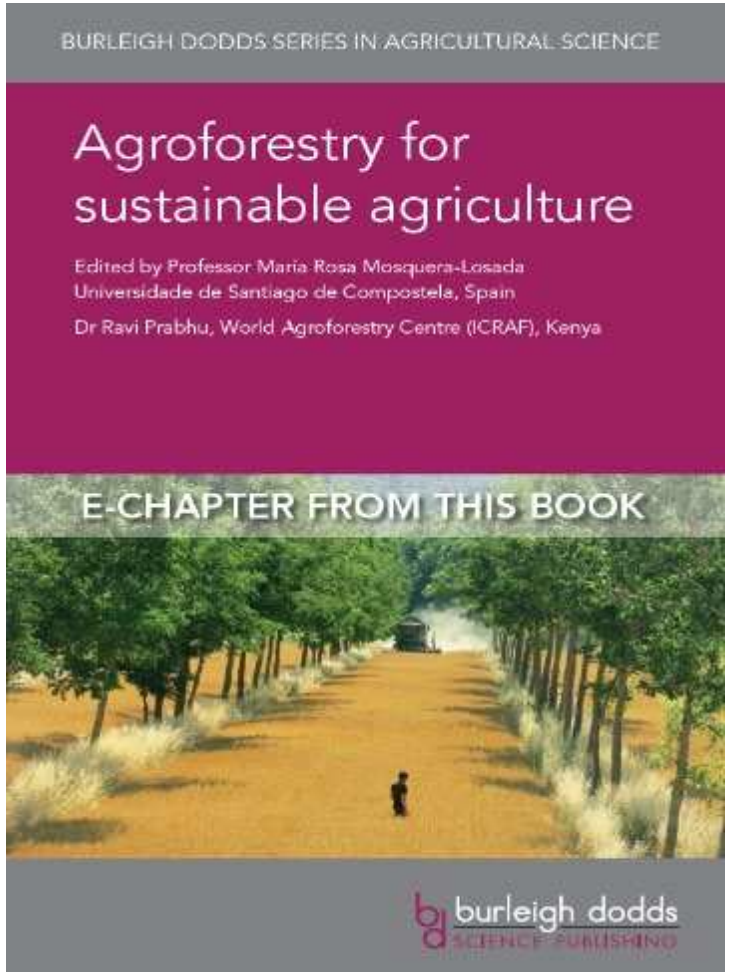
Nel Mondo: 150 M ha a colture permanenti per lo più non consociate/pascolate (in EU 10%).

Tra cui 11 M ha di olivo

Usare questa area per ricavarne foraggi e prodotti aggiuntivi: grande potenziale di aumento produttivo e di riduzione dell'impatto ambientale (intensificazione ecologica).

Agroforestry for fruit trees in Europe and Mediterranean North Africa

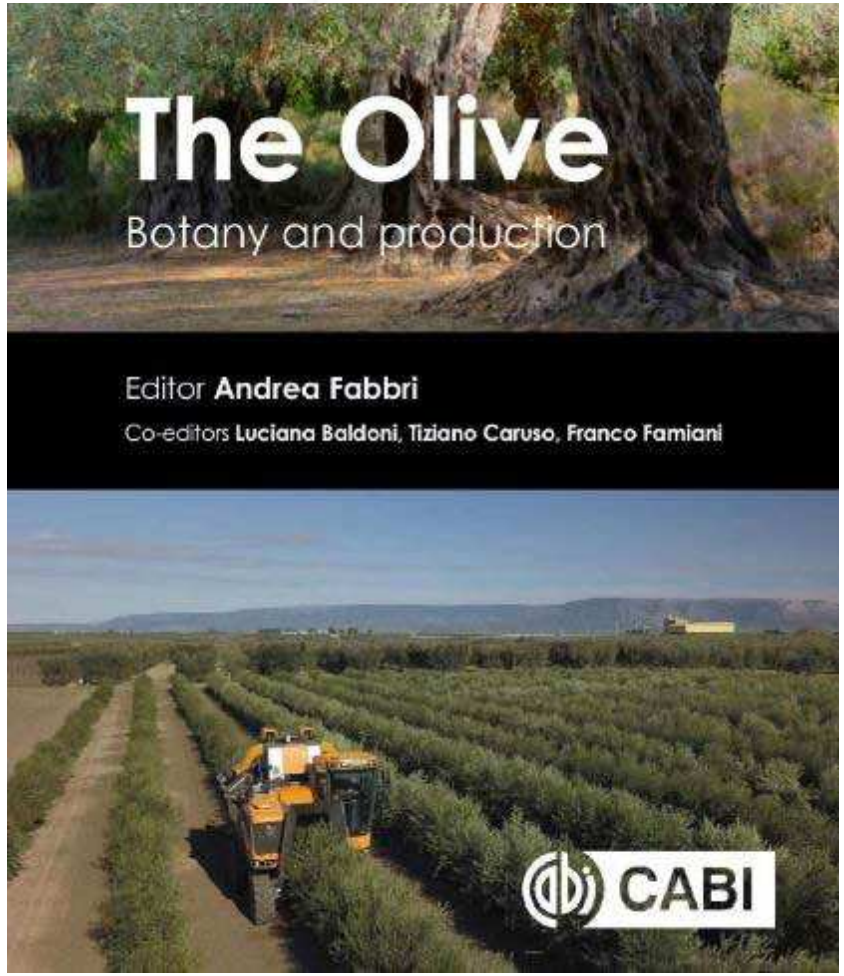
Pierre-Éric Lauri, INRA, France; Karim Barkaoui, CIRAD, France; Mohammed Ater, Abdelmalek Essaadi University, Morocco; and Adolfo Rosati, CREA, Italy



9.2 Towards Modern Olive Polycultures

A. Rosati[1], K. Barkaoui[2,3] and P.É. Lauri[3]

[1]Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (CREA), Centro di ricerca Olivicoltura, Frutticoltura e Agrumicoltura; [2]CIRAD, UMR ABSys, F-34398 Montpellier, France; [3]ABSys, Univ Montpellier, CIHEAM-IAMM, CIRAD, INRAE, Institut Agro, Montpellier, France



Advances in temperate agroforestry

Editor

Prof. Maria Rosa Mosquera-Losada, Universidade de Santiago de Compostela, Spain (mrosa.mosquera.losada@usc.es); Dr Ladislau Martin, Embrapa, Brazil (ladislau.martin@embrapa.br); Professor Anastasia Pantera, Agricultural University of Athens, Greece (pantera@aua.gr); Dr Allison Chatrchyan, Cornell University, USA (amc256@cornell.edu)

adolfo.rosati@crea.gov.it

Competition for Water and Nutrients

Contrasting literature:
green mulching (forages) can increase/decrease soil water/nutrient availabilty
Probably related to management:

- Species (**Legumes/grasses**, annual/perennial, root depth, water/nutrient needs…)
- Mowing/grazing (frequency, intensity)
- Termination time, etc.

Changing rootstock could be a promising new approach

Young trees suffer competition

and

need tilling/mulching

to

grow faster

Competition for Light

Nill for trees

Mild to strong for forages


Adult orchards typically intercept 50-75% of light:
25-50% light available for understory crops


70
60
50
40
30
20
10
0
Non-uniform light

In young orchards there is plenty more light

Deciduous species (most fruit trees, including vineyards) even better potential to produce forage (exp in dormant season, when water is not limiting)

Yield

Fruit tree yield tends to:

- decrease with crops and grass forages
- increase with legume crops and forages

Forage yield tends to be lower (shade), yet considerable (>50% of sole + tree by-products) and more uniformly available seasonally

Damage to trees

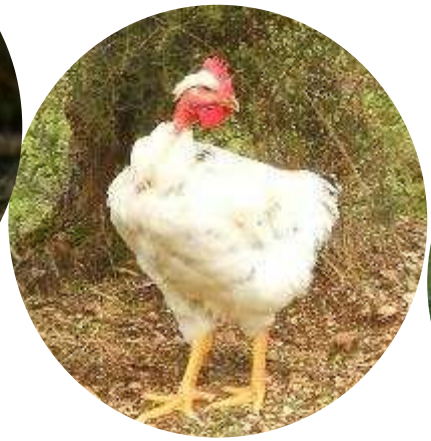
- Browsing
- Rubbing
- De-barking

Level of damage to trees



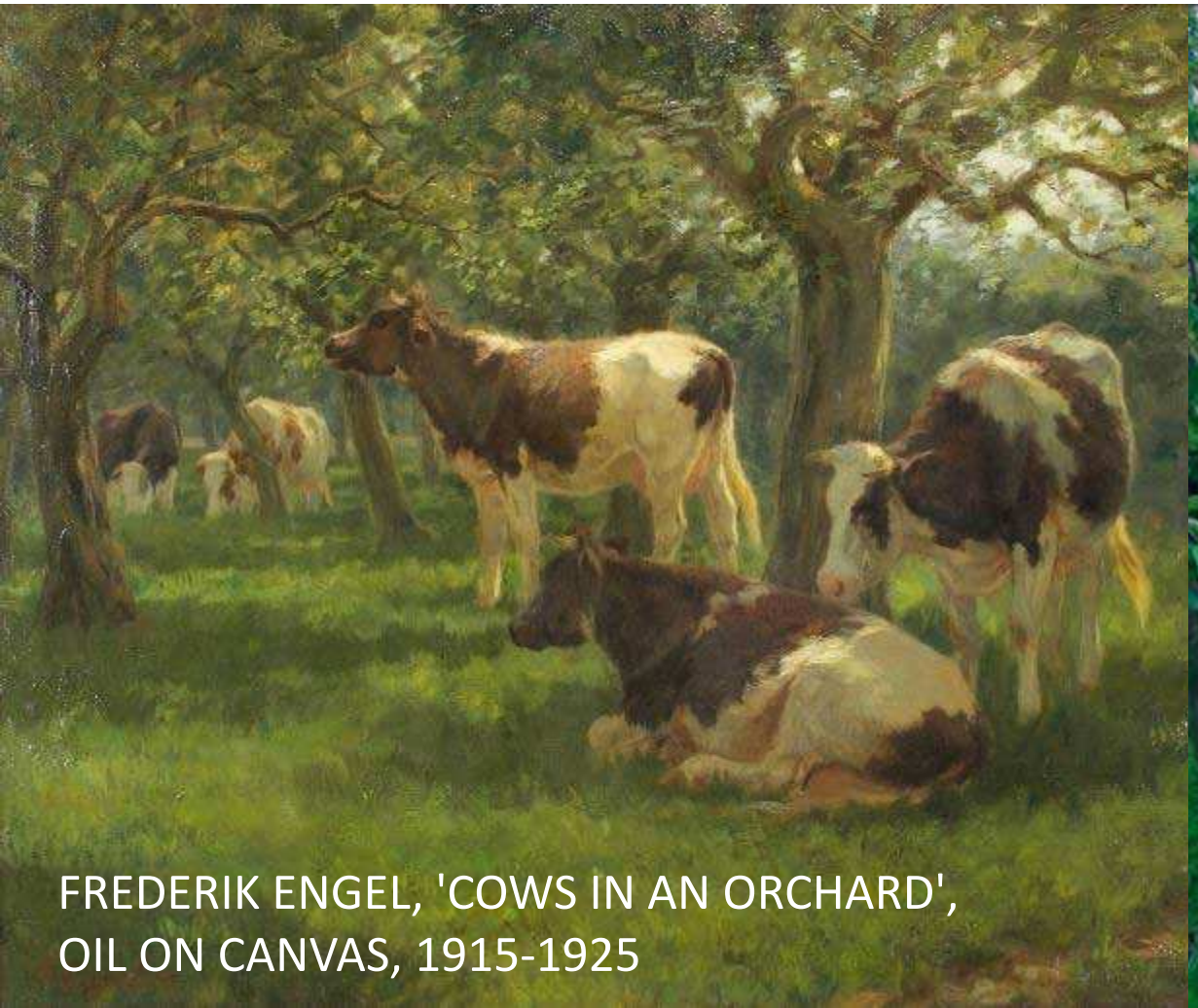





Orchards trees used to be large and could be grazed by large animals

Now they are small and can be grazed by smaller animals



FREDERIK ENGEL, 'COWS IN AN ORCHARD',
OIL ON CANVAS, 1915-1925

Large animals can still be used, but with good management

- Close monitoring
- Right period
- Right breeds and individuals (removing the black sheep!)
- Pree-feeding pruning materials (olive)
- Avertion therapy (Lithium Chloride)
- Tree protection (shelters, fencing, sprays and paints)




De-barking seems to be less of a problem in vineyards

But donkey will chew on dormant twigs

Animal withdraw rules
(USA vs. EU)

Contamination

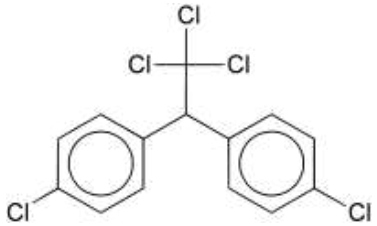
Of fruit,
by pathogens carried by animals and manure
(Salmonella, Campilobacter, Listeria, etc.)

Of animals and derived products
by pesticides applied on trees

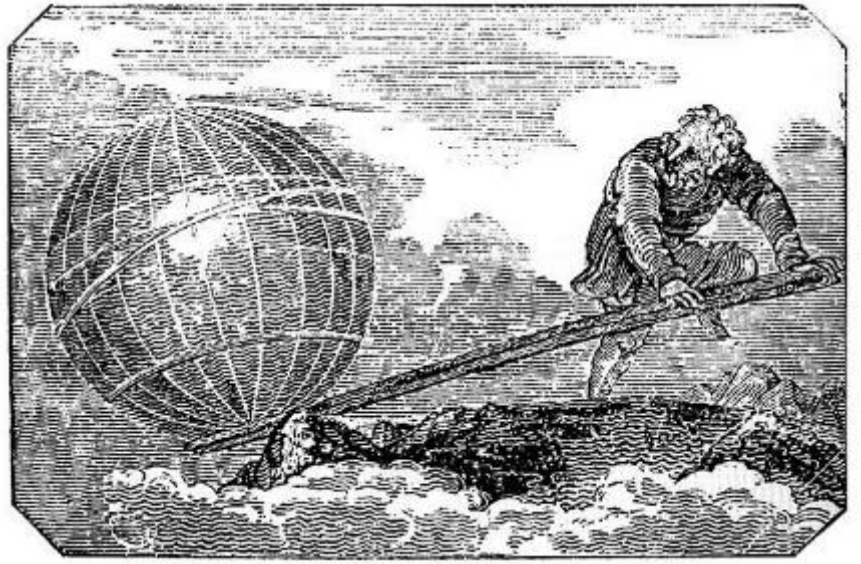
Easier with organic farming

Rientry period rules
(lack of data and policy)

Persistent chemicals (DDT, Cu etc.)



Technical/management challenges



To make it work the right techniques are needed

They depend on objectives (fruit or forage):

- Right forage species: legumes or mixture, annual (possibly re-seeding) or perennial, shade tolerance, bloating…
- Difficulties in finding the right seeds (species/CV)
- Right mowing/grazing frequency/intensity
- Right machinery (e.g. sod seeding (echoschemes))

Social/policy challenges

Dealing with animals + crops is a big commitment, often beyond socially acceptable (time, status…)
Difficulty in reaching markets (policy/bureaucracy limitations and consumers’ acceptance)

However, good collaborations are happening

Sheperds bringing sheep into neighbors' orchards and vineyards, exp. in winter when livestock returned from mountains would otherwise be indoor

Research (and other) gaps

- Earlier CVs (seed production for direct feeding)
- Greater winter growth (facilitated by Climate Change)
- Greater persistence/self re-seeding
- Greater condensed tannins (feed conv. eff.; bloating)
- New rootstocks to adjust for increased competition
- New machinery (e.g. for sod seeding, hay making…)
- Finetuning management (species/CV choice, sowing, grazing/mowing, termination, etc.)
- **Innovative research and dissemination approaches**
- **Policy lobbying**