



## Generation and fate of crop residues

Methodological treatment in SEEA and estimates for Italy



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# Contents

1. Possible fates of crop residues and their environmental meaning
2. Definition of crop residues and their treatment in SEEA
3. Istat's surveys: questions about crop residues generation and fate
4. Results from the surveys, integrated
5. Conclusions

## Crop *residues* – our “definition”

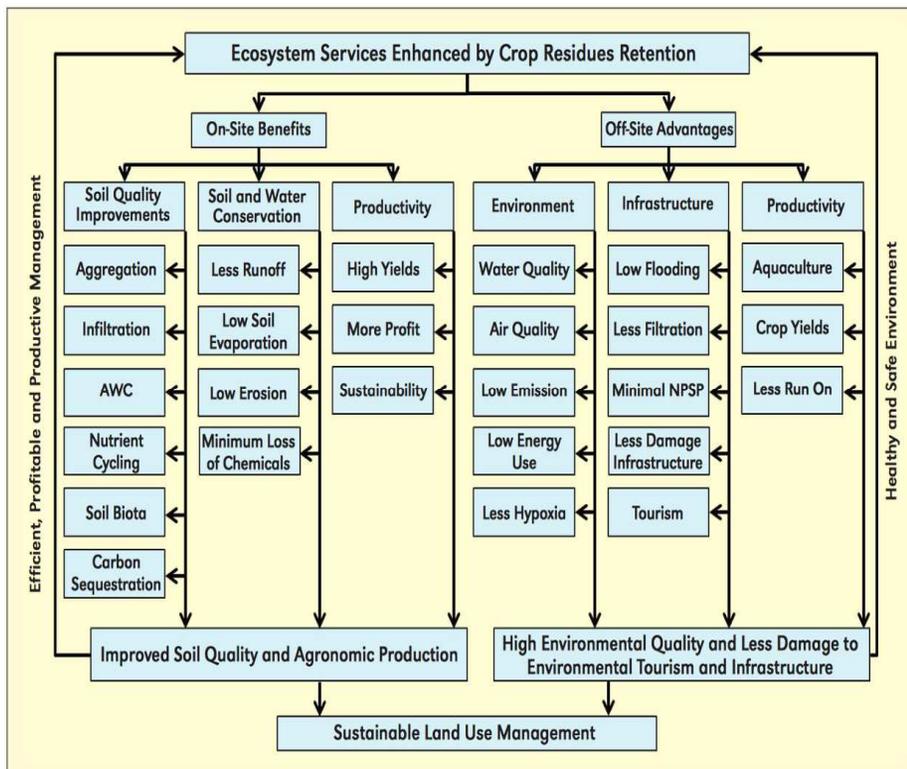
Not defined in the SEEA-CF or SEEA AFF, but used.

We try and define it consistently with the way it is used there.

“All the parts of cultivated plants different from their main useful product (excluding forests, as well as plants remaining in production, e.g. living fruit trees)”

- e.g. non-edible parts of vegetables’ plants, stalks or wood resulting from pruning, discarded fruits, crops grown but not harvested for whatever reason.

# Possible fates of crop residues 1: returning them to the soil

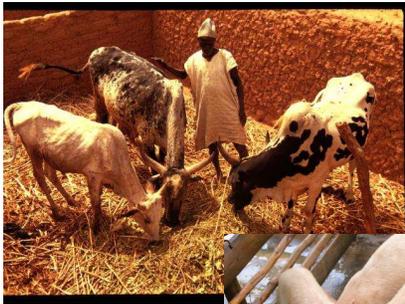


- Protects the soil from wind and water erosion
- Acts as mulch, reducing evaporation
- Maintains soil organic carbon, increases soil microorganisms and organic component
- Recycles nutrients
- Improves soil structure
- ...

“substantial long-term benefits are likely to far outweigh any short-term savings accomplished by destroying residue.”  
 (<http://www.agrivi.com/plant-residue-management/>)

<https://www.no-tillfarmer.com/blogs/1-covering-no-till/post/4678-check-out-the-many-benefits-of-retaining-crop-residue-in-a-no-till-system>

## Possible fates of crop residues 2: Using them in agriculture and animal production, directly or indirectly



Bedding and feed for livestock

⇒ Manure

if spread on soil, at least some of the benefits mentioned in the previous slide apply

Composting and using as amendment in agricultural soil

Both can be done even after digestion for biogas production – the material is poorer, but still provides benefits to the soil

Benefits of returning to soil are partially maintained, but most probably not the same soils which produced the residues are the benefiting ones

## Possible fates of crop residues 4: wasting

- Burning

implies loss of nearly all nitrogen and at least 75% of sulfur and also of some of the phosphorus and potash

releases C in the atmosphere, as CO<sub>2</sub>, that could (partly) be retained in the soil



- Landfilling and other open-air disposal

all potential benefits are simply squandered

# Crop residues in SEEA-CF / 1

We are talking about *cultivated* plants

## Plant Metabolism

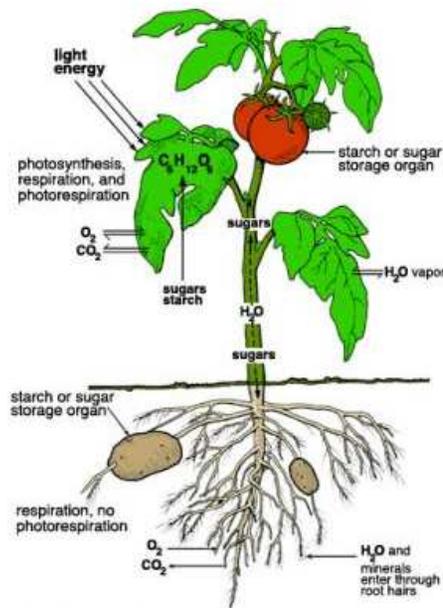


Figure 24. Photosynthesis, respiration, leaf water exchange, and translocation of sugar (photosynthate) in a plant.

In “standard” PSUTs, their metabolism defines the flows with the environment; the plant itself is in the economy

Crop residues include:

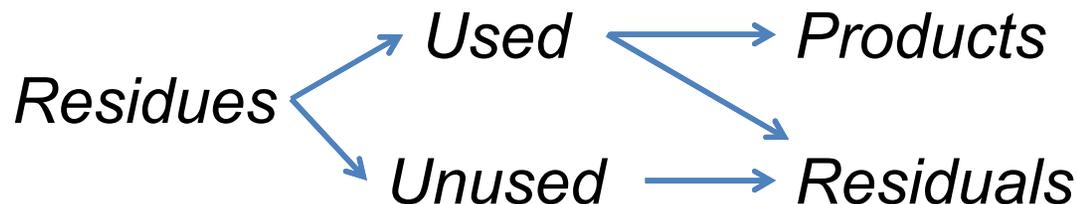
- *products* (SEEA-CF §3.64)  
e.g. straw gathered and sold or used on own purpose
- *residuals* (SEEA-CF §3.73)  
e.g. straw left on the soil

## Crop residues in SEEA-CF / 2

In Economy-wide Material Flow accounts (SEEA-CF; 3.6.6) also cultivated plants are outside the economy.  
=> Refer to Eurostat's and OECD's methodological guides

Crop residues include:

- *Used biomass*  
e.g. straw gathered and sold or used on own purpose
- *Unused biomass*  
e.g. straw left on the soil



## Crop residues in SEEA-CF / 3

Economy-wide Material Flow accounts (SEEA-CF, 3.6.6):  
also cultivated plants are outside the economy.

=> Better dealt with in Eurostat's and OECD's guides

Crop residues include:

- Used biomass: *“an input for use in any economy, i.e. whether a material acquires the status of a product”.*
- Unused biomass: *“extracted from the environment without the intention of using them”*

=> What about e.g. residues for which there is no market, fed into a digester or composted?

## Crop residues in SEEA-CF / 4

### Summarising

CROP RESIDUES	
PRODUCTS FROM CROP RESIDUES	RESIDUALS (SOLID WASTE) FROM CROP RESIDUES
USED CROP RESIDUES	UNUSED CROP RESIDUES
E.g. Burning for heat, composting, use in husbandry, use for biogas production	E.g. Leaving on soil possibly after shredding, open-air disposal (including burning), disposal as waste outside the holding

## Istat surveys and questions asked, other sources used

SURVEY	QUESTIONS	COMPLEMENTARY INFORMATION
Permanent Crops Survey PCS – 2012	Supply of pruning residues	Estimates for pruning of four species and for end-of-life trees (Supply and management) from <i>Paolantoni 2015</i>
	Management of all residues	
Farm Structure Survey FSS – 2013	Surface by crop (for supply estimation)	Yield by crop (for supply estimation) from <i>crop estimates survey</i>
	Residues management	

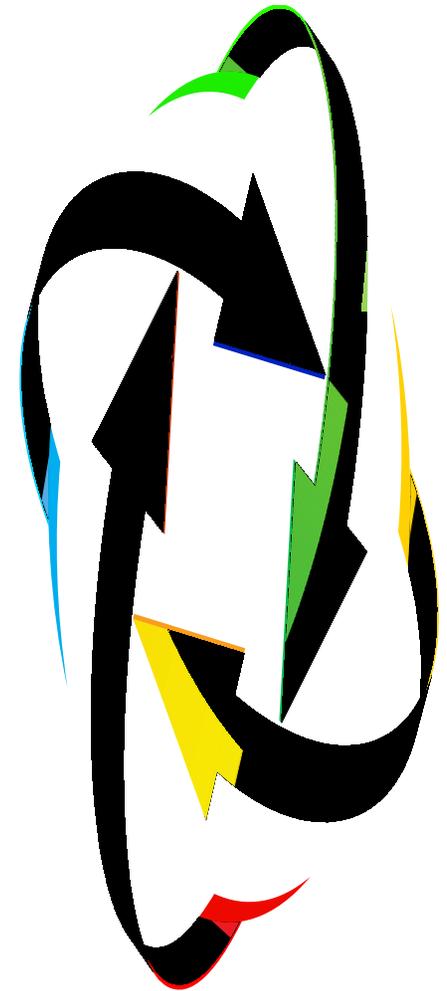
# Results

## Supply and management of crop residues, Italy 2012/3 (000 tons)

	Total Supply	Management								
		Used			Unused					
		within the holding	outside the holding	Total	within the holding	outside the holding	Total			
<b>TOTAL CROPS</b>	<b>43,573</b>	Not available			<b>12,233 (28%)</b>	Not available		<b>31,340 (72%)</b>		
Temporary crops	35,612	4,554	5,562	10,116 (28%)	24,970	526	25,496 (72%)			
<i>Of which Cereals</i>	29,040	4,356 (15%)	5,195 (18%)	9,551 (33%)	19,123 (66%)	366 (1%)	19,489 (67%)			
Permanent crops	7,961	Not available			2,117 (26%)	Not available		5,844 (73%)		
<i>Of which main species, excl. vineyards</i>	4,714	Heating	Other	Energy	Compost	1,249 (26%)	Left on soil	Open-air, burning	Waste	3,465
		948 (20%)	143 (3%)	152 (3%)	6		2,832 (60%)	612,4 (13%)	20	

## Concluding remarks

- It is of interest for research and policy knowing how the precious biomass flows of crop residues are distributed between possible destinations.
- Very little official statistics is available.
- In SEEA-CF PSUTs, information would be split between products and waste accounts; SEEA-AFF developments could consider unifying the description of biomass circulation.
- Supply side: reliable estimates are provided by agronomic information Official statistics however should provide some benchmark.
- Management and use side: can be considered in structural surveys on agriculture.
- Way forward: use of administrative sources, e.g. on compost, biogas and biomass-based electrical energy production plants.



# Thank you!

