What is the interrelationship between primary production side flows and side flows in the other parts of the value chain?

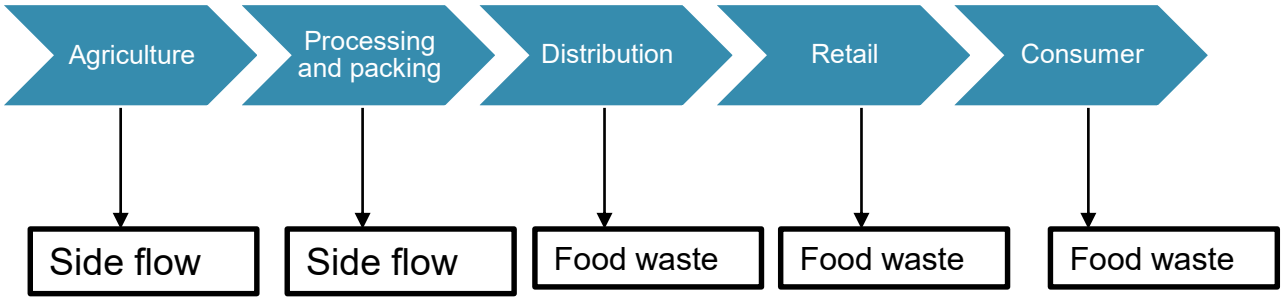
Erik Svanes, Østfoldforskning

Nordic Food Waste Prevention Conference,
April 27th 2017 Gardermoen, Norway

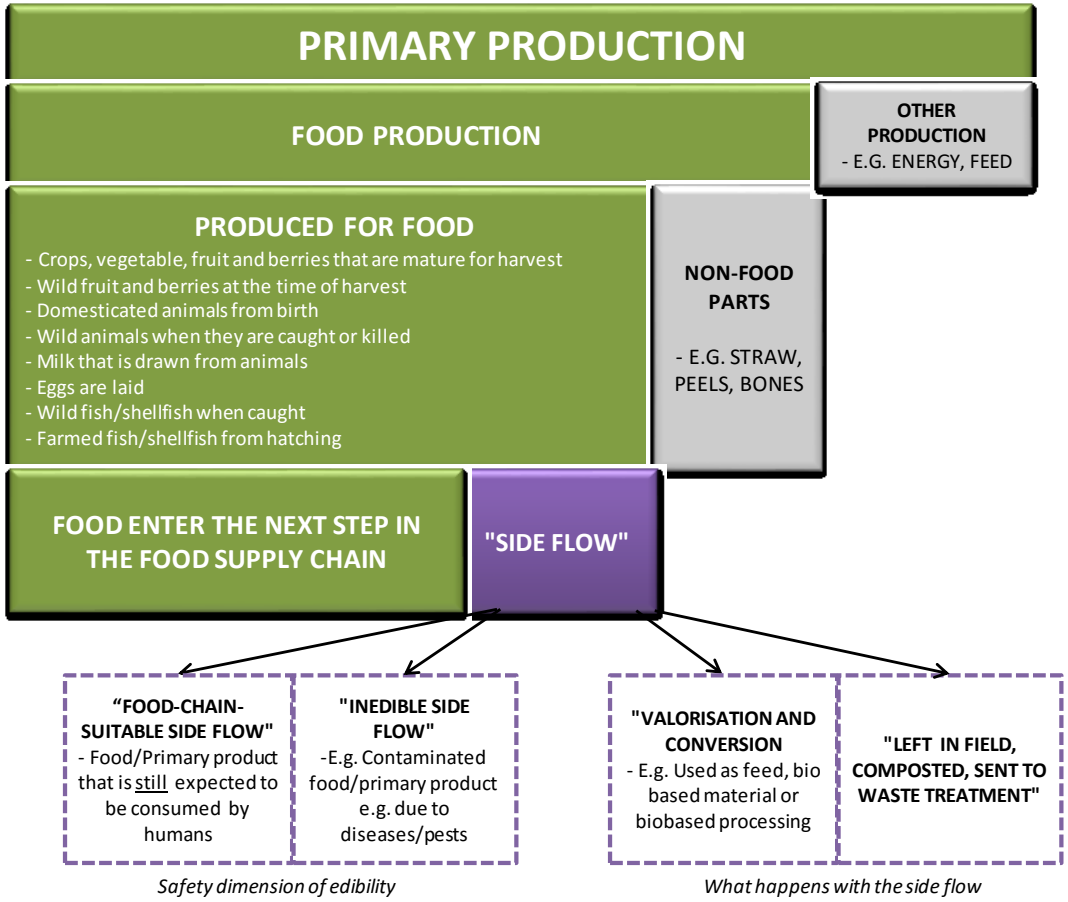
Important objectives for food waste studies

Value Chain of food Products

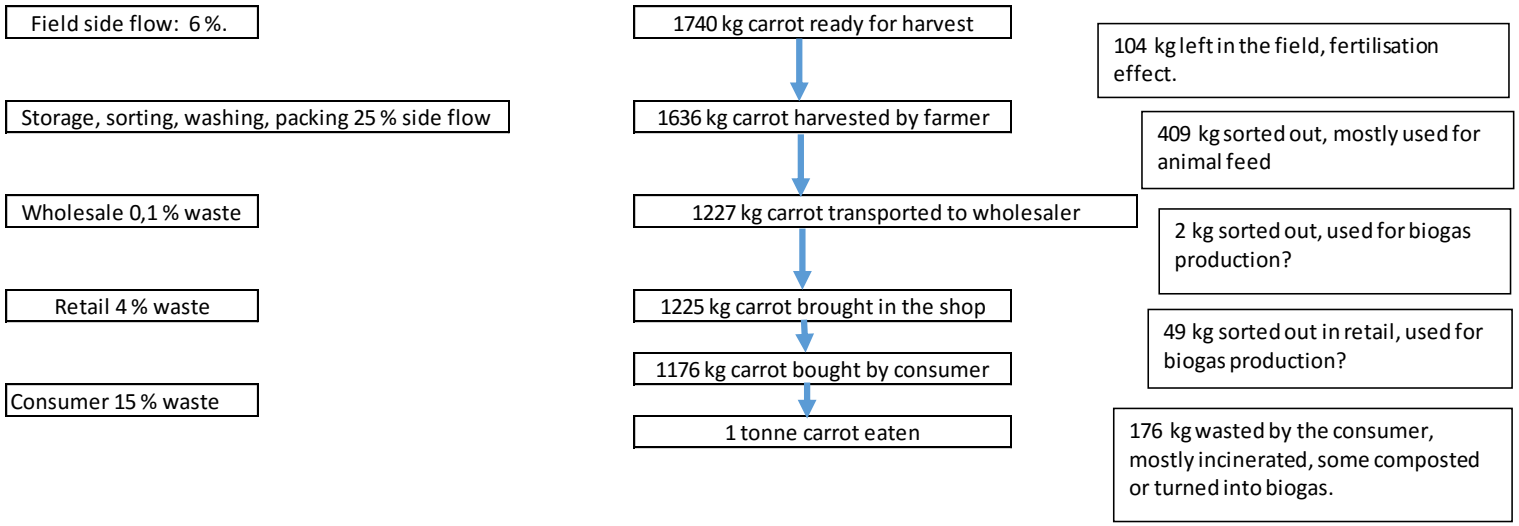
- Products go through a value chain from farm to fork.
- At all points along the value chain, products are sorted out, for various reasons. Some will enter other food value chains, e.g. vegetables for ready meals or fruit for juice. Other will be used for animal feed or non-food purposes. A small proportion is not used at all.



Material balance for food production.



Carrot side flows and waste

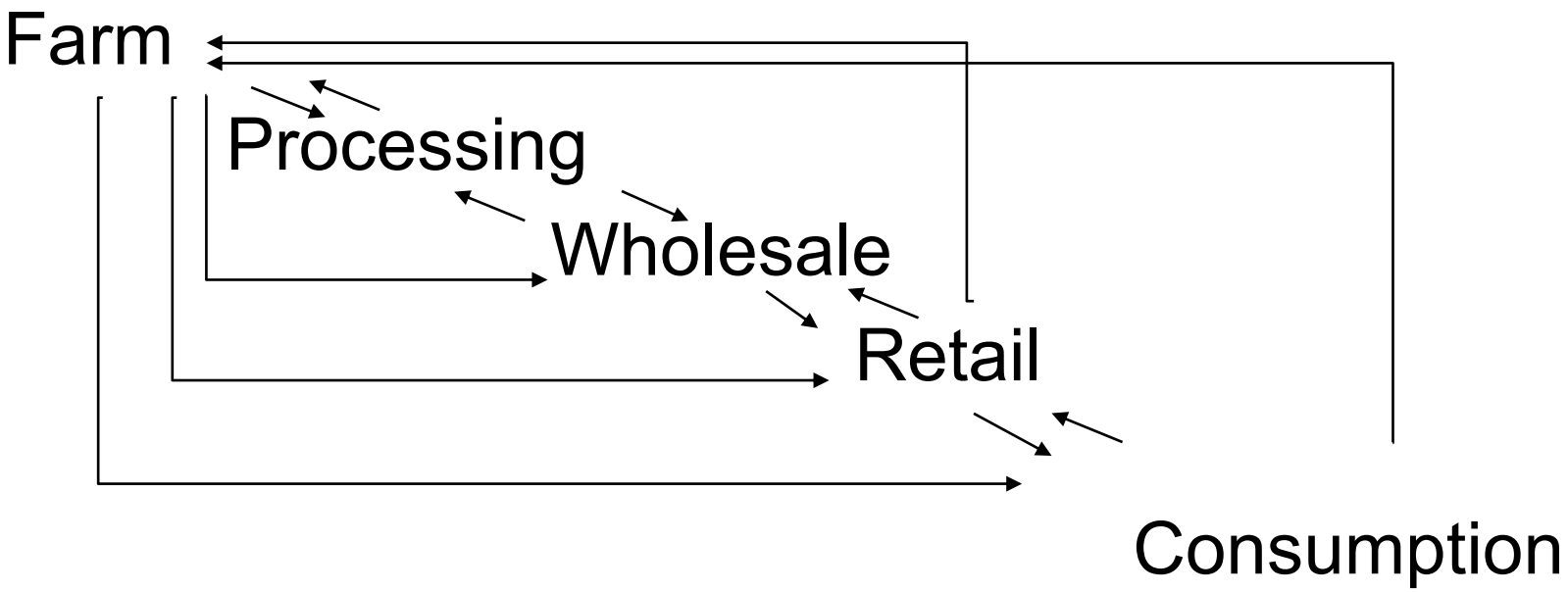


- In order for one tonne of carrot to be consumed, 1740 kg must be grown.
- Most of the wasted carrot is used for some purpose, so not totally wasted.
- The most important environmental impact is not from waste handling, but from producing the extra 740 kg we need to eat one tonne carrot.

Who has the responsibility for side flows (SF) and food waste (FW)?

- The consumer wastes the most, so is the problem mostly about sloppy consumers (and to a lesser extent retail)?
- No: Research has shown that side flows/food waste in a certain part of the value chain is partly caused by conditions and actions within that same part and partly by influence from other parts of the value chain.
- So we can not distribute “blame” proportionately to how much each life cycle actor wastes.
- The influence from upstream parts of the chain are of a more physical and direct nature (e.g. inoptimal cooling) whereas influence from later life cycle stages are more indirect and structural (e.g. requirements on product appearance).

Causes for SF/FW lie in several different parts of the value chain.



- The figure illustrates the fact that there is a complex web of factors for food waste and side flows.
- Sometimes, the causal factors are internal, causing waste in the same part, other times external, causing waste in another part of the chain.

Side flows driven by consumers.

Consumer → farming, processing, retail.

- Consumer preferences affects retailers quality requirements. Based on these requirements e.g. vegetables and fruits are sorted out at farm or in processing.
- The product sorted out may be clearly unsuited for consumption but often it is only wrong size and shape or “cosmetic” imperfections like small spots and blemishes on the outer skin that is the reason.

Consumer → retail

- The consumers expects products to be available at all times and enjoys large displays of product. This can increase retail food waste.

Side flows driven by farmers

Farm → increased food waste in processing, retail, consumption:

- Agronomy and post-harvest handling on farm can give rise to waste in later stages:
- Inadequate cooling after harvest/slaughter
- Inadequate sorting of product after harvest.
- Products not handled careful enough at harvest and later at farm.
- Inoptimal storage conditions.
- Inoptimal fertilization and pesticide use gives wrong size, shape, damaged product.
- Bad production planning can lead to overproduction.

Side flows driven by external factors

- Side flows can also be driven by external factors, for example bad weather. In such cases one can argue that the SF is «nobody`s fault»

  BUT

  the farmer can take action to reduce the impact of such factors.

Side flows driven by retail

Retail → farm

- Overproduction caused by contract obligations.
- Sorting out products based on very stringent quality requirements. Can be based on consumers preferences but not always.

Food waste not related to primary production

Production or wholesale → retail

- Minimum delivery amounts specified by processor/producer/wholesaler can drive wastage rates in retail, because the shop cannot sell everything in time.

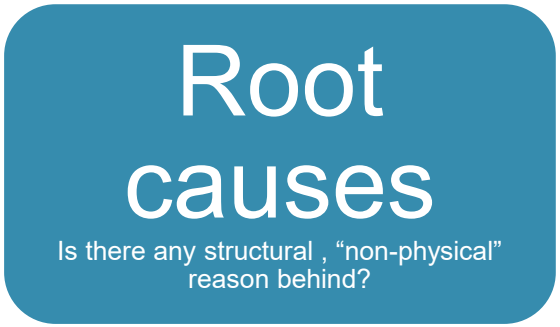
Retail → consumption

- Improper storage and handling in retail can increase consumer waste (cooling, lighting, not following «first in – first out», rough handling).
- Price campaigns can tempt consumers to buy more than they can consume, driving wastage.

Production ↔ wholesale ↔ retail

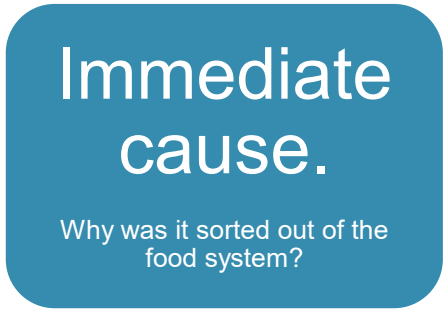
- ST001: Standard dividing the shelf life between these actors and consumers. Can be too rigid, leading to food waste.

Several layers of causes



- Examples: Part time/full time farmer, inadequate training, low profitability, economic incentives, government regulations such as catch quota, contract terms, minimum delivery size, too little research on cultivars.

- Examples: bad weather, incomplete control of animal health, suboptimal fertilisation and pesticide use, not using the right soil for the right crop, inoptimal cultivar, post-harvest handling not careful enough.



- Examples: too small fruit, rotten vegetable, spots and blemishes fruit and veg, low starch quality for wheat, death of an animal. milk with antibiotics.

Establish causal relationships and quantifying effects.

- In order to understand the studied systems and finding ways to reduce the SF/FW we want to establish clear causal relationships and quantify the effects.
- Example: 5 % of the rocket lettuce was sorted out in retail due to inadequate cooling and 10 % of the lettuce got sorted out at farm because of overproduction due to contract obligations.
- This is very difficult because there are often several factors behind the waste of a certain bunch of lettuce and we can often not say exactly what the factors are, and certainly not quantify the contribution of each cause.
- While this is a difficult exercise for immediate causes it is even more difficult for underlying reasons and virtually impossible for root causes.

Examples from our research

	Denmark	Finland	Norway	Sweden
SF rate	21	11	8,4	17
Response rate	41	10	32	36
Reasons given	Quality issues, plant diseases, pests and weather conditions.	Diseases and damage, quality, appearance.	Pests, plant diseases and quality reasons a	Damage at harvest or handling; unacceptable size and appearance; diseases in the fields.

- Post-harvest onion SF studied with the use of questionnaires in 4 countries.
- Most reasons given are connected to apparent reasons, quality issues being most important. Some underlying reasons mentioned like weather, diseases in field, damage at handling.
- However, when looking in more detail, several farmers state that requirements on cosmetic appearance are important reason. These requirements are set by buyers but presumable originate from end users.
- Famers were asked to give reasons, with a priority of 1, 2 and 3. This did not give sufficient data to make quantitative correlations between SF amount and reason behind.

Conclusions

- SF in primary production is partly caused by reasons in primary production and partly by factors in later life cycle stages (storage, processing, transports, retail, consumption).
- FW in these later life cycle stages are partly caused by factors in primary production.
- It is possible to establish causal relationships between layers of SF causes (immediate causes – underlying causes –root causes) but it can be complicated.
- Finding a quantitative effect of a certain SF reason is even more difficult but it is an interesting thing to do.
- In order to find such relationships and effects, it is necessary to study products in several stages of a life cycle.