An overview of primary production side flows in the Nordic region

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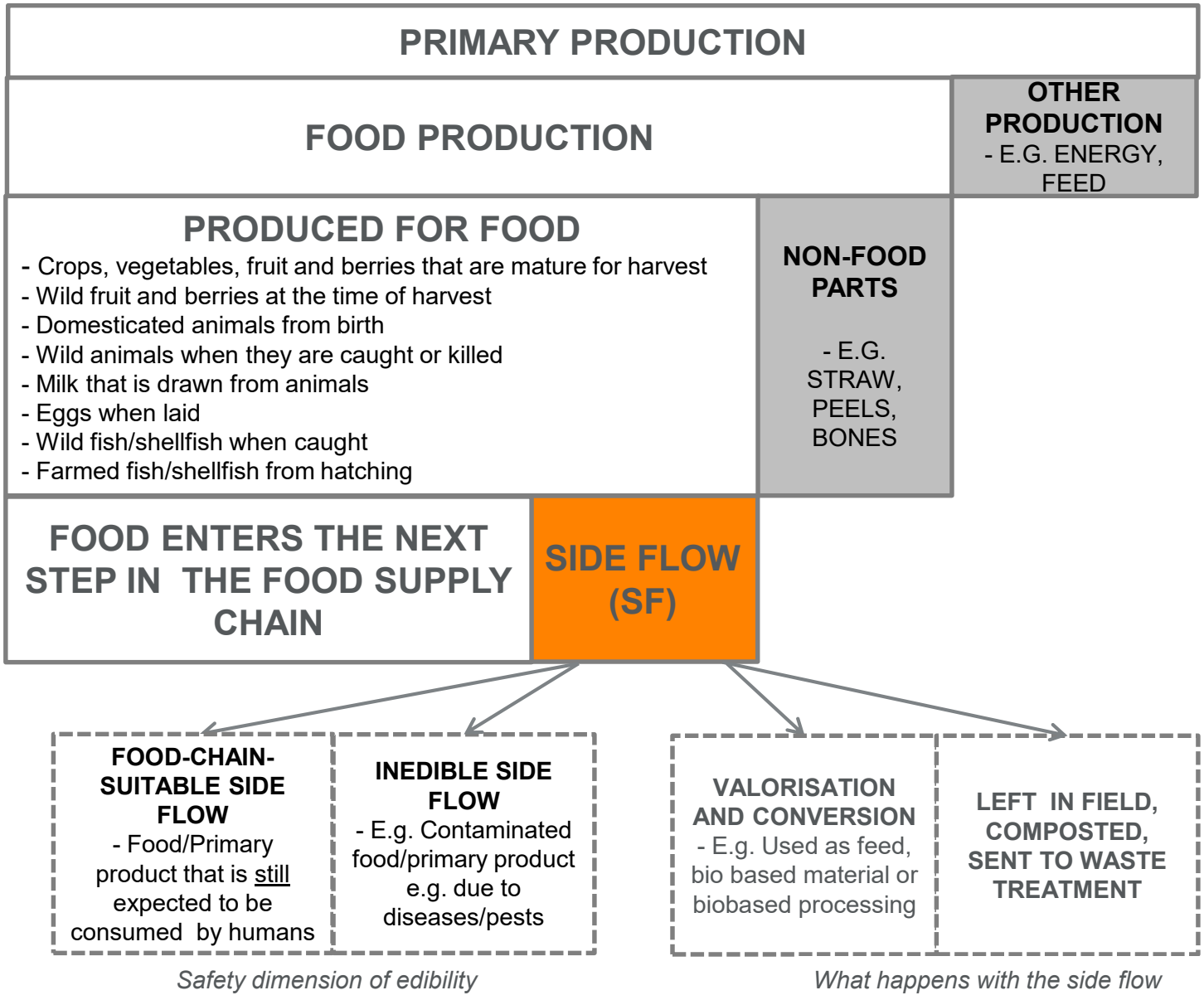
Methodological framework



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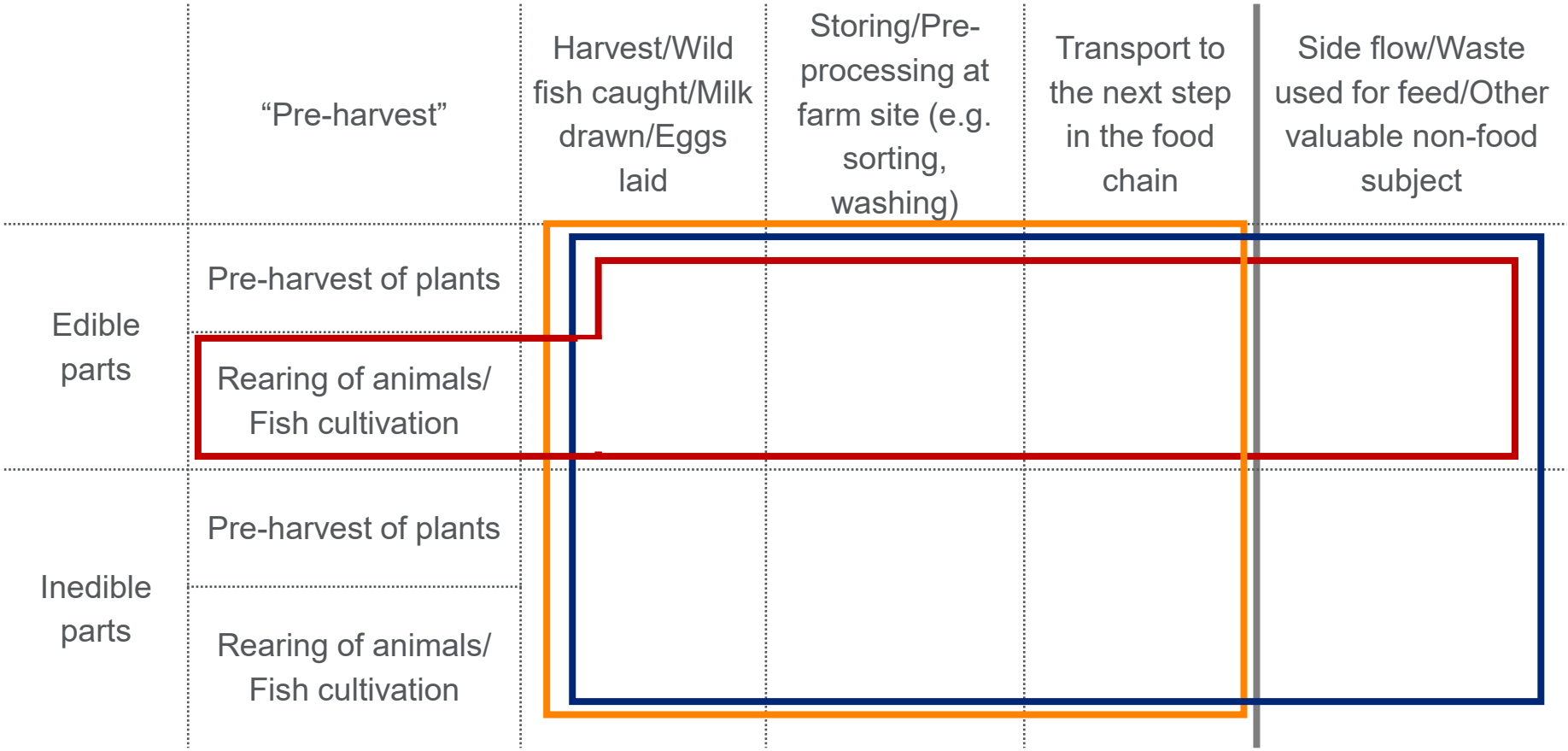
Side flow -definition

"The flows of primary products that were meant to be eaten by humans, but never entered the next step in the food supply chain (e.g. slaughter, retail, processing), and instead were used for other purposes or sent to waste treatment. Non-edible parts of wasted food, e.g. peels and bones, are not included as part of side flow."

Methodological framework



This study
FUSIONS Definitional Framework for Food Waste
FLW Standard

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Methodological framework

Total yield = $p * 1/(1 - SF)$

Side flow (SF) = $p * 1/(1 - SF) * SF * CF$

FUSIONS food waste (FFW) = $p * 1/(1 - SF) * \mathrm{FW}$

Where

p = food production amount (sold product)
CF = conversion factor
SF = side flow percentage
FW = FUSIONS food waste percentage

Conversion factor	
Wheat, rye, barley, oats	0.78
Starchy roots	0.82
Sugar crops	0.20
Vegetables	0.77
Fruits	0.77
Meat: bovine, pig, poultry	0.70, 0.80, 0.60
Fish, seafood	0.50

Waste percentages

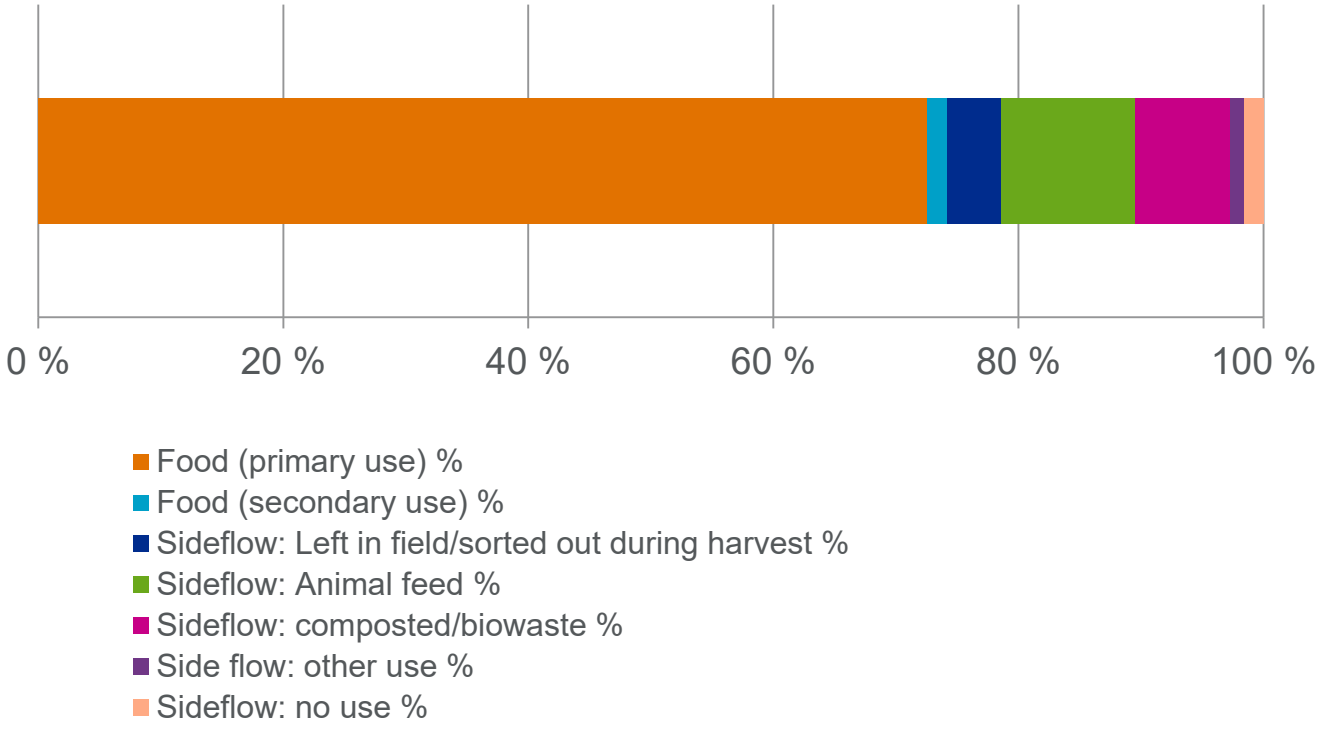
	Food waste (%) FAO report (Gustavsson et al. 2011)		Side flow (%) Our study
	Agriculture, aquaculture, fisheries	Postharvest handling and storage	Primary production (including postharvest handling and storage)
Cereals	2%	4%	4-14%
Roots and tubers	20%	9%	10% potatoes 26% carrots and turnips
Oilseeds and pulses	10%	1%	3% oil crops 17% pulses
Fruits and vegetables	20%	5%	1% greenhouse 10-26% open field
Meat	3.1%	0.7%	0.2-1.7% excluding rearing 3.0-9.0% including rearing
Fish and seafood	9.4% wild fish	0.5%	2.6% farmed fish
Milk	3.5%	0.5%	0.3%

Case-studies in project

Products	Methods applied
Carrots	Questionnaires (D, F, N, S), Field studies (F, N), Interviews (F, N)
Onions	Questionnaires (D, F, N, S), Field studies (S), Interviews (S, F)
Green peas	Questionnaires (D, F, N, S), Interviews (S, F)
Field peas	Questionnaires (D, F, S), Field study (F), Interviews (F)
Wheat, Rye	Questionnaires (Wheat) (D, N, S), Questionnaires (Rye) (F), Field study (Wheat) (F) , Interviews (Rye) (F)
Rainbow trout, Char	Questionnaires (Rainbow trout) (D, F, S), Questionnaires (Char) (S), Interviews (F)

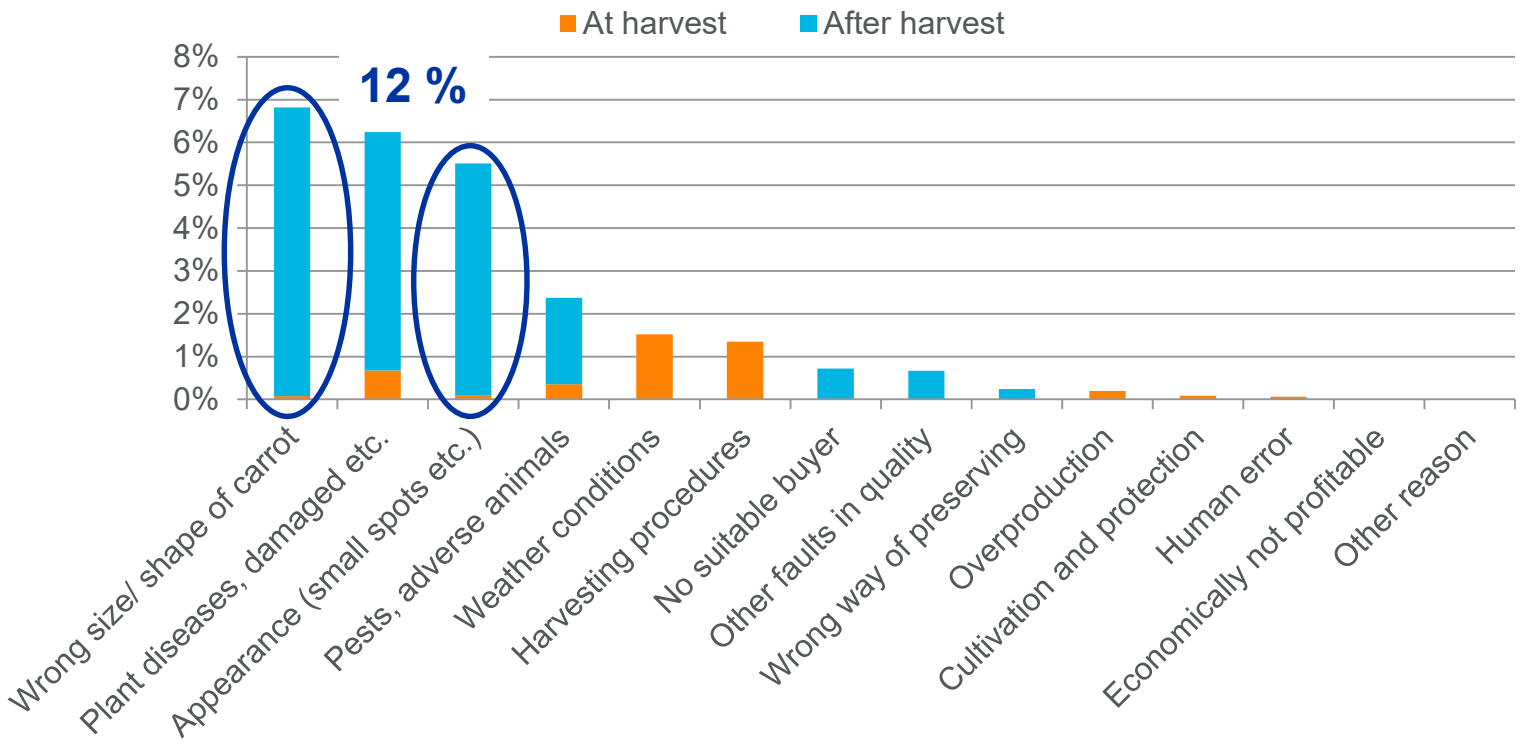
Case-studies in project – Example: carrot, Finland

The uses of carrot yield (weighted average), 27 producers answered:



Case-studies in project – Example: carrot questionnaire, Finland

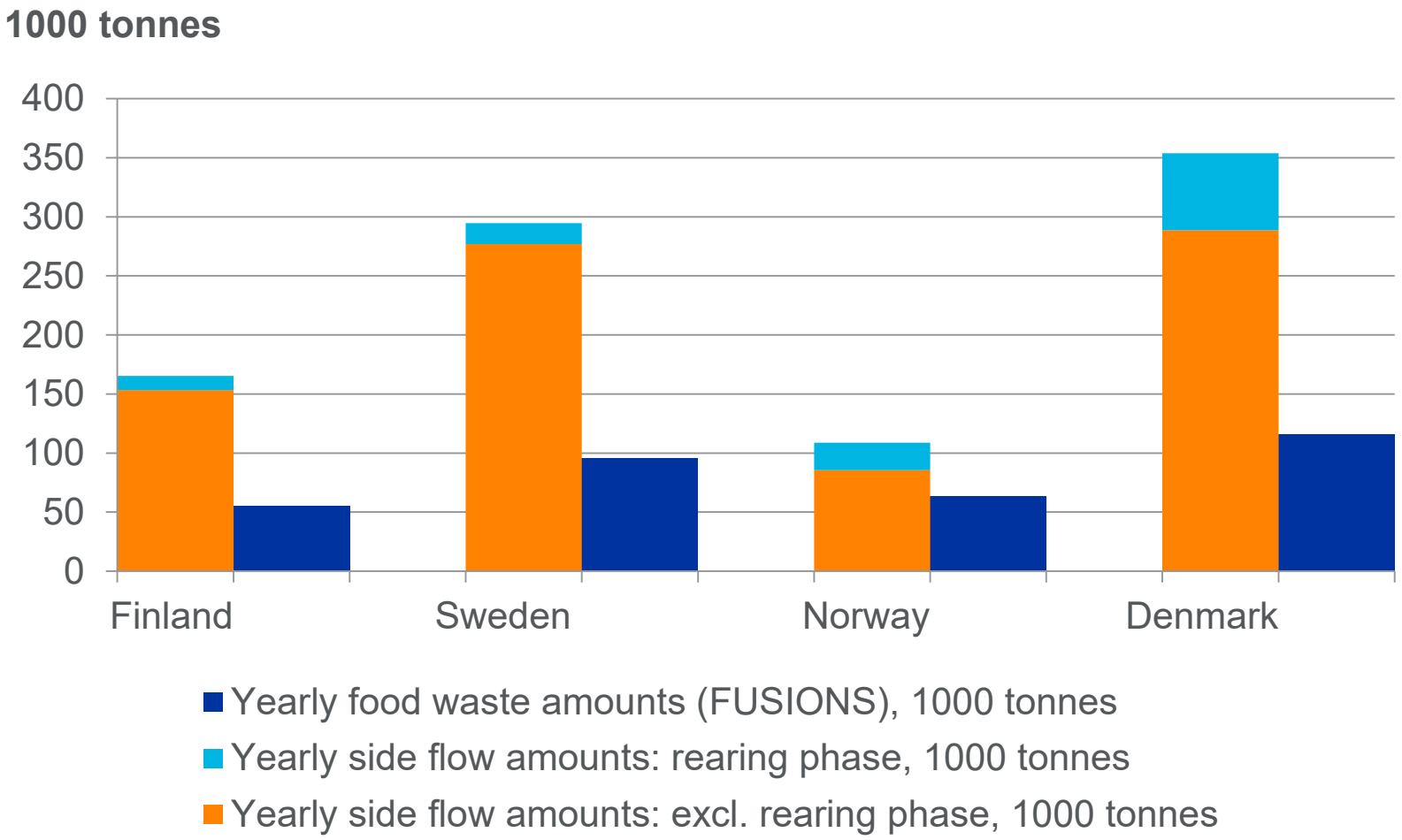
Reasons for the side flow (weighted averages), 26% of the carrot production was side flow:



Case-studies in project – Example: carrot questionnaires

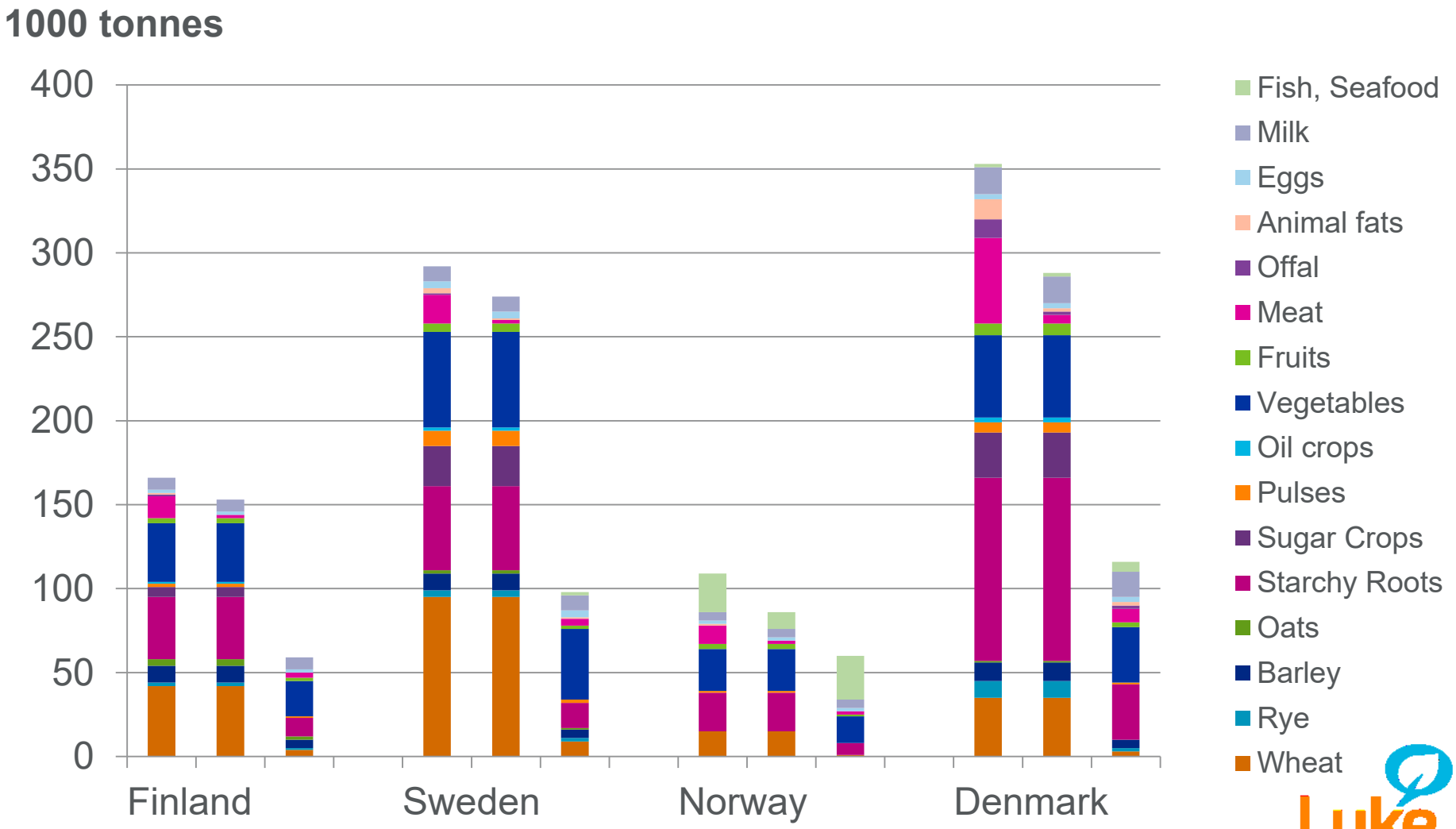
Country	Response rate (of all who received the questionnaire)	Side flow amount (standard deviation)	Side flow treatment (of total side flow)	Reasons for side flow
Denmark	32%	20.8%	10% left in the field, 61% used for animal feed, 25% composted, 4% other.	Quality issues, pests, plant diseases, harvesting methods.
Finland	10%	25.8% (15%)	Three major usages: Composted, animal feed, left in field.	Most important: After harvest: Quality (appearance, size), plant diseases and damage. During harvest: Weather conditions, plant diseases and harvesting procedures.
Norway	23%	17.6% (4.6%)	25.5% left in the field, 66% used for animal feed, 8.5% other.	Quality issues, pests, and plant diseases and are the main reasons.
Sweden	35%	13-31% (different storage time and storage practice)	51% animal feed, 16% bioenergy or deposited, 15% brought back to the field, 9% not harvested, 9% other use.	Unacceptable size and shape, damage during harvest and handling, insect or animal damage. Main post-harvest side flow reasons: Unacceptable size and shape, unacceptable appearance, damage during handling.

Yearly side flow and food waste amounts in primary production



Yearly side flow and food waste amounts in primary production

- Side flow, Side flow (- rearing), Food waste (Fusions)



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Conclusion

- Side flow: amount of food that does not end up for human consumption
- The total amount of side flow in Denmark, Finland, Norway and Sweden is 922,000 tonnes: approximately 3-4%,
  - of which 119,000 tonnes occurs during the rearing phase of fish and meat
- The side flow estimates of this study are still fairly uncertain
  - Need to get better data
- Food waste in primary production needs special focus
  - Side flows are largely caused by factors outside the farmers' control such as weather conditions and consumers' demand for 'cosmetically perfect' products.
  - Side flows are often put to very good use, such as animal feed.
- There is need for more open discussion on the reasoning and motives behind different approaches and outcomes

Publications

- *Franke et al. 2016 Food losses and waste in primary production, Data collection in the Nordic countries* https://norden.diva-portal.org/smash/get/diva2:945862/FULLTEXT02.pdf

- *Hartikainen et al. 2017 Food losses and waste in primary production: Case studies on carrots, onions, peas, cereals and farmed fish* http://urn.kb.se/resolve?urn=urn:nbn:se:norden:org:diva-4762

- *Hartikainen et al. Food waste quantification in primary production – the Nordic countries as a case study, Submitted in 2017*

- *Svanes et al. 2017 Interview and questionnaire guide: Quantification of food losses and waste in primary production http://norden.diva-portal.org/smash/record.jsf?pid=diva2%3A1086448&dswid=2415*


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