

Annex2 to IO5 The Pilot

In the current annex, the experiences of the Biological Post-Secondary VET School are summarized giving an example for the other educational intuitions how the results of an eventual pilot can be formulised following the proposed methodology.

In case of any further questions regarding the pilot study, please contact Ms. Barbro Mattsson at barbro.mattsson@vgregion.se.

Is the Arable Area in Region Västra Götaland Enough to Feed Its Inhabitants?

Introduction

The purpose of the study is to investigate and map the food chains in Region Västra Götaland and thereby establish the possibilities for short food chains for the inhabitants of the region. The envisioned mapping of large-scale consumers at the demand side may be a matter of a further study. The current writing summarises the food chain mapping projects of the participating students at the Biological Post-Secondary VET School. Further information may be available in the documentation of student groups project work.

Background

Region of Västra Götaland has 461 542 ha of arable land and 1 666 055 inhabitants, approximately 0.28 ha per inhabitant, table 1. This is slightly lower than the national average in Sweden and the historical region, Skaraborg Region, has 54% of the arable land but only 16% of the population. These specific circumstances are the starting points for answering the question of how much arable land is needed to feed the inhabitants of a certain geographical area such as our region, Region Västra Götaland.

Table 1. Inhabitants and arable land in Sweden, Region Västra Götaland and Skaraborg (SCB, 2016)

	Sweden	Region Västra Götaland	Skaraborg
Inhabitants	9 954 420	1 666 055	263 911
Arable land, ha	3 021 272	461 642	251 245
Ha/inhabitant	0.30	0.28	0.97

Short food chains from farm to fork are assumed to have less negative impact on the environment, mainly due to shorter transportation. It is also important that the bi-products from the food industry are used within the region. In Region Västra Götaland, by-products from bakeries and dairies are used currently as animal feed or in energy production. By-products from abattoirs as well as dairies are also used in biogas production in the municipalities of Skövde and Herrljunga.

Application

The study was started by agrotechnician student classes of 2016 and 2017 at Biologiska Yrkehögskolan in Skara (Biological Post-Secondary VET School). Through problem based learning the students have mapped various types of food products. The group work exercises focused on the fundamental understanding of how much arable land is needed to feed the inhabitants of a certain geographical area such as our region, Region Västra Götaland. Therefore, the below results are restricted to this certain core question. The results do not claim to be universally valid, since this task was carried out during the very first months of the education and additionally the students may have gaps in their knowledge of both primary production and food processing.

The agrotechnician students of 2016 mapped:

- Egg
- Cereals for bread
- Cheese
- Pork

The agrotechnician students 2017 mapped:

- Beef
- Milk for consumption
- Lamb
- Porridge oat
- Chicken
- Potato
- Peas

The students have used statistical data from Statistics Sweden (SCB), the Swedish Board of Agriculture and the food processing industry. Information from books, the Federation of Swedish Farmers and other organisations are complementing the statistical data. For each type of food product there is a summary of data, the consumption statistic is national data and this data is assumed to be representative also for the inhabitants of Region Västra Götaland.

Further information may be available in the documentation of student groups project work.

Egg

A general Swedish consumer eats 222 eggs annually, while a hen lays 292 eggs per year. Average egg weighs 55 grams, i.e. an average hen lays 16.1kg egg per year. Given that the production of 1kg egg requires 2kg feed, the feed for a laying hen consists of cereals (80%) and concentrate (20%), we can stat that 1.6kg of cereals is required for producing 1kg egg. Moreover, 22% of the eggs consumed in Sweden are organically produced.

Cereals for Bread

The consumption of bread is 60kg per person and year and the mills produce flour corresponding to 80 kg per person and year. Cereals used for bread is mainly wheat, but rye is also quite common.

According to the Swedish Board of Agriculture the average yield is 6096 kg/ha for winter wheat, 3632kg/ha for spring wheat and 4988 kg/ha for rye in Region of Västra Götaland. In the pilot study we have assumed that the average yield is 5800 kg/ha for bread cereals. The total consumption of bread cereals in Region Västra Götaland would be approx. 100 000 tons which requires about 22 000 ha of cereals regarding the losses in bread production. However, it is worth to be noted the losses are used for feed and production of bio ethanol.



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Milk

In Sweden, the annual milk consumption is 85.5kg per person. And the consumption of other dairy products such as cream and soured products such as yoghurt, soured milk is 49.1kg per person and year. The average consumption of butter is 2.3kg per person and year. All consumption milk is produced in Sweden, while for the other dairy products about 75% is produced from Swedish milk.

A dairy cow produces about 10 000kg milk per year and we have calculated that a dairy cow eats 3 900kg forage, 822kg grass from pasture, 1091kg cereals (mainly barley) and 625kg concentrate per year. The annual yield is estimated to 5000kg/ha for pasture, 10 000kg/ha for ley and 5588kg/ha for cereals. Production of 10 000kg of milk requires 0.8ha according to our calculations. The total consumption of milk including other dairy products is approx. 185 000 tons in Region Västra Götaland. It means that there is a need for about 15 000 ha for feeding the dairy cows.

Cheese

The annual cheese consumption is 20.7kg in Sweden. One kilogram cheese production requires 10kg milk. According to the feed calculations for milk one kg of cheese requires 0.0008ha. 64% of the cheese eaten in Sweden is imported. Assuming that all the consumed cheese is produced by Swedish milk, about 26 500 ha arable area is needed for feeding the dairy cows to meet the demand of Region of Västra Götaland.

Pork

The annual per capita pork consumption has been decreasing from at most 36.6kg in 2013 to 32.7kg in 2017. During the same period, the market share of Swedish pork has increased from 66.8% to 73.2%. A sow produces 24 piglets per year and the average weight at slaughter is 120kg (89kg slaughtered weight). Subsequently a sow produces 2136kg slaughtered weight. A sow with 24 piglets eat 3320kg cereals and 480kg concentrate and a slaughter pig eats 202kg cereals and 57kg concentrate. The production of one kilogram slaughtered pork requires 3.2kg cereals and 0.64kg concentrate.

The cereals in pig feed are grain and wheat. If the yield is assumed to be 5800kg per hectare, 0.00054 ha is required to produce 1 kg of pork plus another 0.0002 ha per kg of pork for domestic cultivated protein crops. The total consumption of pork approx. 56 000 tons which requires about 43 000 ha arable area to feed Region of Västra Götaland.

The concentrate used for pig feed consists mainly of protein and it has become common in Sweden that farmers use broad beans instead of soy beans. It is better to feed the pigs with locally produced protein feed rather than imported soy beans, decreasing transportation. It is possible to cover the protein demand of pigs with domestic cultivated protein crops with added industrially produced amino acids to achieve a balanced feed state.

Chicken

The consumption of chicken meat has been increasing in Sweden reaching 23.6kg annual per capita consumption in 2016. A chicken weighs 1.5kg of slaughtered weight and has consumed 3.6kg feed. 70% of the feed are cereals. The cereals are mainly wheat and grains with an estimated harvest of 5800 kg per ha. To produce one kilogram of chicken meat 0.00032 ha arable area is required. The chicken consumption in Region Västra Götaland is approx. 39 000 tons annually. To feed that amount of chicken about 12 000 ha arable area is needed.



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Potato

The annual per capita consumption in Sweden is 47.1kg of potato and 36.5kg of processed potato. Most of processed potatoes are used in products such as snacks, fries, instant mashed potatoes etc. The harvest of food potato is about 35 tons per ha. To produce 1kg of potatoes, 0.000029ha is needed. The total consumption of potato is approx. 1400 000 tons in Region Västra Götaland. It requires about 3 900 ha arable area.

Peas

We have not been able to find any statistics for the consumption of peas. Therefore, we cannot estimate the eventual need for arable area. However, we can state that the yield for peas is 2893kg per ha. It means that for the cultivation of 1kg peas 0.00035 ha is required.

Porridge Oat

In 2017, the annual per capita consumption of porridge oat was 3.7kg in Sweden. To produce one kilogram of porridge oat, 1.3kg of oat is required. The average yield in Region Västra Götaland is approx. 4400 kg per ha. The total consumption of porridge oat in Region Västra Götaland is almost 6 200 tons which requires about 1 400 ha arable area.

Lamb

There is difference in the so-called spring and autumn lamb production. Their feed differs due to seasonal circumstances. Our mapping is based on the forage need of autumn lambs, i.e. those whom are born in spring and slaughtered in autumn. An ewe produces 1.8 lamb with an average slaughtered weight of 20 kg per lamb. An ewe with lambs need 350 kg silage, 500 kg grass from pasture and 90 kg of concentrate. The concentrate consists mainly of cereal, minerals and vitamins.

The pasture of sheep is generally of lower quality. The annual yield is estimated to 2500kg/ha for pasture, 9000kg/ha ley for lambs and 5588kg/ha for cereals. The total consumption of lamb is approx. 320 000 tons in Region Västra Götaland. It means that there is a need for about 22 500 ha arable area for lamb production in question.

Beef

The annual per capita consumption of beef was 26 kg in Sweden in 2017. It means that the annual beef consumption in Region Västra Götaland is approx. 43 000 tons. To produce one kilogram beef there is need for 0.0037ha arable land assuming that 40% of the beef is originated from suckling cow production and 60 % from dairy cows. To meet the regional demand, almost 160 000 ha arable land is required.

Conclusions

In Region Västra Götaland, there is approx. 460 000 ha arable land. For solely the mapped food products, there is a need for about 310 000 ha. Concerning the food products in the current study, beef requires the most arable land. Even other meat products require more arable area than crops. However, the animals can graze areas that cannot be used for crop production.

There are several more food products that are not mapped in the current study. Having the mapped food products which requires approx. 70% of the arable land in the region, we consider that the area of arable land is sufficient to feed the inhabitants of Region Västra Götaland.