IARIW 2021

Monday 23 – Friday 27 August

Valuing Agricultural Land: From Resource Rent and Willingness to pay to Values of Ecosystem Services

Hanne Marit Dalen

(Statistics Norway)

Lars Lindholt

(Statistics Norway)

Per Arild Garnåsjordet

(Statistics Norway)

Margaret Eide Hillestad

(Agri Analyse)

Ann Norderhaug

(Statistics Norway)

Iulie Aslaksen

(Statistics Norway)

Paper prepared for the 36th IARIW Virtual General Conference
August 23-27, 2021
Session 24: Productivity
Time: Thursday, August 26, 2021 [16:30-18:30 CEST]

This is a preliminary draft. Please do not cite or distribute.

Updated 30.07.2021

Valuing agricultural land: From resource rent and willingness to pay to values of ecosystem services[1]

Authors: Hanne Marit Dalen, Lars Lindholt, Per Arild Garnåsjordet, Margaret Eide Hillestad, Ann Norderhaug and Iulie Aslaksen

Contributing authors (tbc): Solveig Glomsrød, Gang Liu, Johan Nitter-Hauge

Abstract:

The article explores economic approaches to valuation of agricultural land in Norway and discusses the need for an extended approach, to express non-market values, such as ecosystem services. The economic approach currently used by Statistics Norway is based on resource rent as contribution to natural capital and national wealth. The article presents calculation of resource rent in agriculture in Norway for 1984-2020. Further, we apply explorative assessments of values of land, with calculations based on what farmers pay for rented land. Furthermore, we introduce a method interpreting the transfers to agriculture as an expression of society's willingness to pay for achieving overarching societal objectives. The different valuation methods include different aspects relevant for the valuation of agricultural land. Resource rent valuation follows a traditional economic interpretation of valuation where subsidies are deducted. In the rental price method, subsidies are included in the valuation. The third approach is looking at subsidies and support systems as society's willingness to pay for the agricultural sector beyond the market value of produced goods. It is crucial that trade-offs and synergies between agricultural policy and environmental and climate policy are based on approaches that reflect the value of different types of agricultural land as basis for economic values and ecosystem services. The United Nations' System of Environmental-Economic Accounting - Ecosystem Accounting (SEEA EA) is recently adopted as international statistical standard. While this system suggests a spatially explicit and ecological approach as basis for valuation of ecosystem services, an implementation of SEEA EA is beyond the scope of this article. However, as basis for monetary valuation, the SEEA EA suggests applying both resource rent, rental values of land, and willingness to pay, and we explore how these different approaches contribute to a broader picture of the values of agricultural land.

1. Introduction

The value of the agricultural sector in Norway may be evaluated in several different ways. The purpose of this article is to bring attention to valuation approaches that both focus on the value of agricultural crops and the value of pasture land including areas that have large value for biodiversity and ecosystem services. The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) points to loss of biodiversity as a global threat and calls for aligning policies for climate and

[1] The research is funded by the Horizon 2020 project *MAIA (Mapping and Assessment for Integrated ecosystem Accounting)* with aim to develop the System of Environmental-Economic Accounting – Ecosystem Accounting (SEEA-EA) as methodological basis for natural capital and ecosystem accounting (NCA).

biodiversity (IPBES, 2019). Present economic valuation does not capture the value of biodiversity and ecosystem services. In Norway, the area of agricultural land is only 3 per cent of the country, while 45 per cent is potential pasture land, including areas that are important for biodiversity, climate mitigation and food security. Hence, there is a need to explore approaches to valuation of agriculture that reflects these natural conditions. Three overarching global challenges that need to be addressed in agricultural policy are climate crisis, loss of biodiversity and the need for increased food production for a growing population. Neither agricultural policy nor climate policy address these intertwined challenges in a comprehensive way that reflects the natural conditions of agriculture in Norway. Recent changes in subsidies have strengthened the incentives for intensification of agriculture, with less focus on incentives for supporting ecosystem services and the role of small-scale farming to support sustainable agriculture. A UNEP report emphasizes that small-scale farming is necessary to feed the world (UNEP 2013). A study from Sweden suggested that a combination of high biodiversity and high production is enhanced by small-scale farming (Belfrage, 2014). Given the role of agriculture for providing food and sustaining environmental goods, agriculture needs to be evaluated by a more comprehensive approach than only by the narrow economic results achieved. It is crucial to measure the values of agriculture by the benefits it creates in terms of other services and benefits delivered to society, both in terms of ecosystem services, input to other industries, and achieving other societal objectives as food production and maintaining food security, and also for its role in maintaining social infrastructure and settlement patterns across the entire country.

The agricultural sector in Norway is strongly regulated by national policies, with yearly discussions in the Parliament. The agricultural goals are expressed in Government White papers and debated and revised by the Parliament. Currently the societal goals of agriculture are expressed in four overall objectives: (1) Food security and safety, (2) Agriculture in the entire country (3), Increased economic returns (value creation), and (4) Sustainable agriculture, including protection of agricultural land, production of environmental goods, maintaining biodiversity, achieve lower greenhouse gas (GHG) emissions, and reduce pollution (see e.g. Meld. St. 9 (2011-2012).

All these objectives cannot be achieved at a maximum level. There must be priorities and trade-offs, and synergies between the objectives need to be identified. The objectives themselves may also have different interpretations and may be measured in different ways.

The Norwegian agricultural policy is based on cooperation and yearly negotiations between the government and the farmers' associations taking place since 1922, and the results must be confirmed by the Parliament. However, there is a broad agreement in the Parliament to maintain an agricultural activity at least at the same level as today, and 96 per cent of the representatives have been found to be in favour of this ambition (Eldby, 2017). Having this political agreement in mind, the value of Norwegian agriculture may be assessed in different ways, and the use of different policy instruments may be discussed because of the different perspectives.

In this article, we present different types of data and analysis, to illustrate different aspects of the value of Norwegian agriculture and agricultural land. For economic data, we present time series and indicators that can contribute to give an overarching picture of Norwegian agriculture, based on market values and non-market values of agriculture and agricultural land. The approach to valuation of agriculture will first apply traditional economic theory using resource rent calculation methods, following the international Standard for Economic and Environmental accounting (SEEA) which is part of the Central Framework of the national accounts. Resource rent calculations will be supplemented with an explorative assessment of values of agricultural land, with calculations based on what prices farmers pay for rented land. In 2019 46 per cent of all agricultural land in use in Norway was rented.[2] Further, we will analyze the national subsidies provided to secure the benefits from agricultural activities with data from 1986. We will analyze the subsidies in terms of how they are

[2] https://www.ssb.no/statbank/table/12658/

targeted towards different overarching objectives for Norwegian agriculture, i. e. food production, maintain population in rural districts, utilize the land areas, secure diversified types of farms, secure animal welfare, and maintain biodiversity and ecosystem services. We will interpret the transfers to agriculture as an expression of society's willingness to pay for achieving these objectives.

These diverse approaches to valuation are in line with the idea of the United Nations' System of Environmental-Economic Accounting - Ecosystem Accounting (SEEA EA), recently adopted as international statistical standard (United Nations 2020; 2021). While this system suggests a spatially explicit and ecological approach as basis for valuation of ecosystem services, to express both ecological and economic values, an implementation of SEEA EA for agriculture in Norway is beyond the scope of this article. However, we explore how the approaches of resource rent, rental values of land, and willingness to pay, suggested by the SEEA EA as basis for monetary valuation, contribute to a broader picture of the values of agricultural land,

While agricultural land and its management are of overarching importance for food production today and in the future, and for biodiversity and ecosystem services, economic approaches such as resource rent calculation, paradoxically, show a low economic value of agriculture as contribution to natural capital. The purpose of this article is to explore economic and ecological approaches, to explain why economic valuation by resource rent suggests a low value for agriculture, and to explore how other economic approaches in line with the United Nations' System of Environmental-Economic Accounting - Ecosystem Accounting (SEEA EA) may give a broader picture and can express the value of multiple ecosystem services from different types of agricultural land.

The multiple goals of agriculture in Norway include food production, increased self-sufficiency, food security, livelihoods in rural communities, biodiversity, ecosystem services, and climate mitigation. An overarching objective is to utilize both the small areas, 3 per cent of the land, suitable for growing crops, and more of the large areas, 45 per cent of the land, suitable for outfield grazing (Rekdal, 2014), and to contribute to food production and related economic activity across the country. The outfield grazing areas are important for biodiversity and ecosystem services. The spatial approach of SEEA EA suggests a framework suitable to explore values both from cultivated land and from the large areas of outfield semi-natural grazing land. An implementation of this approach requires compilation of data beyond the scope of this study.

Improving the methods for valuation of agricultural land and ecosystem services from agricultural land can contribute to improve the knowledge basis for long-term sustainable use of all types of agricultural land. Improved valuation methods are needed to explore suggested changes in agricultural policy in a broad context, to make it profitable to maintain long-term sustainable land use and unprofitable to destroy nature.

The paper is organized as follows. Section 2 describes the resource rent based on national accounts (NA). In Section 3 we show results from agricultural land value based on the rental price method, focusing on the potential for analysing differences between regions and agricultural products. In Section 4 we expand the view on agricultural valuation by looking at total transfers to the agricultural sector. Viewing these transfers as society's willingness to pay and valuation of different aspects of a multifunctional agricultural sector beyond the market values of agricultural products. In Section 5 we look more closely at the ecosystem services from different types of agricultural land. Section 6 discusses the different approaches and Section 7 concludes.

2. Calculation of the resource rent using National Accounts

2.1 Calculation of the resource rent in agriculture and other sectors

Revenue from natural resources is related to the term resource rent (RR). The RR is the income from utilizing a natural resource that remains after all necessary input factors have received their remuneration (see e.g. SEEA, 2014). RR is thus the additional income of using a natural resource, or in other words; what you earn beyond the income you would normally have earned by investing in real capital and human capital in other industries.

There are several reasons why natural resources can give a positive RR. The starting point for all the explanations is that natural resources are scarce (with limited access) (see e.g. Brekke and Lurås in Brekke et al., 1997). This means that one can achieve positive profits on utilizing a natural resource over a long period of time, without entry of new suppliers. Or, to put it another way, the limited access prevents entry that would otherwise have pushed the profits down to the normal return on capital. In addition, locations with more favourable environmental conditions cam give rise to a higher resource rent compared to lower quality locations. However, not all natural resources will lead to a positive RR. In some cases it may simply be too costly to extract the resource compared to the market's willingness to pay. In other cases, the way the extraction is organized can entail too high costs and an inappropriate level of extraction so that RR becomes zero. The so-called tragedy of the commons is an example of the latter (Hardin, 1968). As natural resource wealth can be defined as the discounted stream of future RRs, the resources must be exploited on a sustainable basis for the resource wealth to be above a normal level. A very simplified measure is that the resource wealth is measured by the RR earned from the resource in perpetuity, after checking that e.g. the size of the agricultural area in operation is sustainable.

The World Bank (2018) calculates the national wealth of nations and found that natural resource wealth in industrialized countries constituted an insignificant share of the countries' total wealth. In high income OECD countries' natural resource wealth amounted to about 3 per cent of the total wealth on average, and for some countries the share was close to zero, e.g. Japan. This finding suggests that the natural resources are unimportant for developed countries. On the other hand, governments in developed countries may use the natural resource management regime to reach other goals than maximizing the rents from the resource. That is, instead of collecting the RRs and redistributing them to provide public goods, the management regime may be geared towards providing public goods directly without redistributing RRs. This appears to be the case for the current Norwegian agricultural regime, which we will return to in the discussion in Section 6.

Statistics Norway has calculated the value of Norwegian natural resources for several years based on data from the NA (see e.g. Greaker et al., 2016). The resources included in the Norwegian NA are the renewable natural resource sectors; agriculture, forestry, aquaculture, fisheries and power production (and occasionally also own use of nature), and the nonrenewable natural resources; oil, gas and minerals. The calculations show that except from aquaculture, fishery, petroleum and power supply, Norwegian natural resources generally do not contribute to the country's national wealth. For instance, in the calculations for 2013, Statistics Norway (2014) found that human capital comprised 72 per cent of national wealth, while the non-renewable natural resources (petroleum and mining) and physical capital comprised approximately 9 per cent and 13 per cent, respectively. Financial wealth was about 6 per cent of national wealth, while the contribution of the renewable natural resources; agriculture, forestry fisheries, aquaculture and power supply, taken together was negative. As will be clear in the following, due to the strong increase in resource rent in aquaculture and power supply and to a minor extent fisheries over the last years, the combined RR for all renewable natural resource sectors is positive and around 7 bn NOK in 2018.

In this paper we will study the development of the realized RR in Norwegian agriculture from 1984 to 2020. Thus, the calculations are therefor based on the existing management regime prevailing each year. The starting point for calculating the RR is that production of agricultural products can be expressed by a production function where one or more ecosystem services are included as input factors. It is the remuneration of these ecosystem services that we are looking to identify, and which we call the RR. The same production function also includes other input factors such as intermediate inputs, labour and capital. If we know the remuneration of all input factors except the remuneration of the ecosystem services, the RR will appear as the difference between the value of output and the remuneration of all other input factors. The calculations of output are based on figures of market goods from the NA as food and fodder. The agricultural ecosystem services include soil services as well as inputs as pollination and water quality that also affect production as it is registered in NA. However, agricultural land provides other public goods that is not covered in our NA calculations (see a discussion of the value of these goods in Section 4 and 5, e.g. landscape values, rural activity and viability of rural areas, food security, cultural heritage, biological diversity).

There are several definitions of RR in the literature. Since we apply figures from the NA, we use SEEA's definition (SEEA, 2014). The definition is in principle the same as in NOU (2005) and Greaker et al. (2005), but the terminology is somewhat different. The calculation method of RR in Norwegian natural resource sectors is presented in Table 1. The focus of the study is agriculture, but to have a basis for comparison, we also calculate the RR in aquaculture, power supply, forestry, fishery, own use of nature, mining and oil and gas. Below we go through the individual components:

Table 1. The composition of resource rent according to the System of Environmental Economic Accounting (SEEA).

Output
- Intermediate uses
= Value Added
- Other taxes on production
+ Other subsidies on production
- Compensation of employees (input costs for labour)
= Gross operating surplus (NA basis)
- Specific subsidies on extraction
+ Specific taxes on extraction
= Gross operating surplus (for the derivation of resource rent)
- Consumption of fixed capital (depreciation)
- Return to produced assets
= Resource rent (RR)

2.1.1 Output and resource rent

Output is equivalent to total revenues. This is total sales of extracted environmental assets at basic prices, and include all subsidies on products, while excluding taxes on products. The intermediate uses are goods and services consumed or used up as inputs in production measured at purchasers' prices including taxes (net of subsidies) on products. The value added earned through domestic production activity in an industry or sector, is defined as output minus intermediate uses. To get the gross operating surplus-SNA basis we deduct other taxes on production and add other subsidies on production and in addition we deduct compensation of employees. Since output includes all subsidies on products and excludes taxes on products, we must adjust for this by adding product taxes (i.e. specific taxes on extraction) and deducting product subsidies (i.e. specific subsidies on extraction) to get the gross operating surplus-for the derivation of resource rent. Finally, we deduct return on fixed capital and capital consumption from the gross operating surplus to get the RR.

2.1.2 Taxes and subsidies

In the calculation of the RR, we shall include product taxes and subsidies, which in Table 1 are called specific taxes/subsidies on extraction. These are taxes/subsidies that are put directly on the product. A product tax is paid by the specific resource industry and must therefore be added to the RR, while a product subsidy must be subtracted. This is because taxes on products can be regarded as a part of the value that is created by the industry when the resource is extracted, while a product subsidy can be seen as part of the costs of extracting the resource. Among the natural resource sectors only agriculture has product subsidies. Basically, the other natural resource industries don´t have product specific taxes, i.e. which vary proportionally with production.[3]

However, it is not evident which subsidies in agriculture that should be treated as product subsidies. In our reference scenario we include those that vary strictly with production, i.e. price support per kg/litre. We also include production subsidies that vary with the size of the area of the farm and/or number of animals. In addition, we include relief worker support as it varies with the size of farm. In the sensitivity analysis we apply data outside the NA and take into consideration the effect of the tariffs on import as it increases the domestic producer prices. This effect is called market price support and estimated by OECD (2020). The market price support is calculated as the difference between a domestic producer price (excluding product subsidies) and a reference price[4] times production. The market price support is calculated for each product and aggregated to total market price support.

In addition to the products taxes/subsidies there are more industry specific taxes/subsidies, which follow the industry and not products, i.e. they are imposed independently of the production volume. The NA give no guidance to whether these should be included or not. However, we follow NOU (2005) and Greaker et al. (2005) who conclude that industry specific taxes/subsidies should not be considered when calculating the RR. Therefore, e.g. transfers over the Agricultural Development Fund are not accounted for. The amount was around 9 per cent of the output in 2016. These industry specific taxes/subsidies can influence the cost structure in the industry, e.g. investment subsidies may have led to overcapitalization and disproportionately high labour use. Even though the industry specific subsidies in this manner indirectly may have reduced the RR as we measure it, we do not include them in the calculations.

The other production taxes should be deducted and vice versa for the other production subsidies. The reason is that these taxes/subsidies must be paid regardless of industry. They can therefore be regarded as normal operating costs/income by doing business. We have not found any examples of these non-industry-specific taxes/subsidies in the NA other than employer's social security and pension contributions and taxes on vehicles. We deduct the social security and pension contributions in the calculations of the compensation of employees in Section 2.1.3. However, we have not taken into consideration other production taxes as the annual tax on motor vehicles as it is very small. For agriculture it represented less than 0.1 per cent of the gross product in 2016. In Section 4 we look at total transfers to the agricultural sector, which includes all subsidies mentioned above.

2.1.3 Compensation of employees

Compensation of employees are wages and employer's social security and pension contributions. Both components are subtracted from the value added in the RR calculations. The deduction of employer's

[3] We disregard license fees and yield of power due to concession conditions in the power sector as they do not vary strict with production.

[4] The reference price shall reflect the relevant import price and be consistent with the reference price for other countries.

social security and pension contributions is consistent with the deduction of other production taxes (as described in Section 2.1.2). The reason is that these taxes must be paid regardless of industry and can therefore be regarded as normal operating costs in doing business.

Wage compensation must reflect the alternative use value of the labour force. To calculate the wage compensation, we have first calculated an average hourly wage rate. This rate is obtained by taking the wage costs for mainland Norway divided by the number of hours worked for employees in mainland Norway. The reason why we use wages for mainland Norway and not the whole of Norway is that wage rates are particularly high for the oil and gas industry, probably because the high operating results have allowed for local wage increases. To find the wage compensation in the individual industry, the hourly wage rate is multiplied by the total hours worked for wage earners and self-employed. Thus, the wage cost per man hour of agriculture farmers is assumed to equal the average wage rate in the mainland economy. We also emphasize that traditionally there are have been few wage earners in the family-owned farms that are the basis of Norwegian agriculture, however, seasonal migrant workers are increasingly employed in agriculture in Norway, in particular for harvesting vegetables and strawberries.

One can discuss whether the wage calculations as described above give a correct picture of the alternative value of the labour force. The level of education in the primary industries (agriculture, forestry, fishing and aquaculture) is relatively low, i.e. the average wage rate per year for mainland Norway is probably too high to apply to these industries and this reduces the RR. An alternative calculation method is to use the actual wage costs for each individual industry as they appear in the NA. This is done for agriculture in the sensitivity analyses in Section 2.3.

2.1.4 Capital costs

In the same way as wages reflect the alternative value of labour, the cost of capital must reflect the alternative value of capital. The capital cost consists of two components; capital consumption and the return on existing real capital stock.

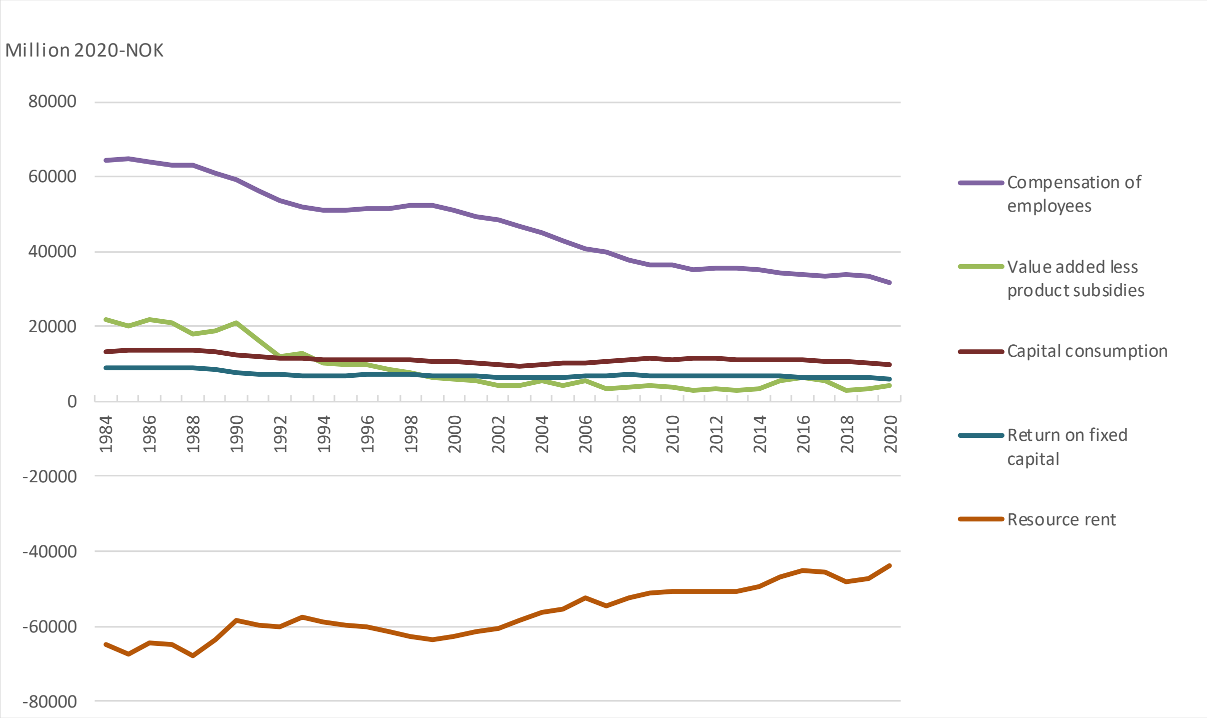
From NA we can collect the value of capital. The capital concept includes i.e. machinery and equipment, buildings, means of transport and R&D and other intangible capital. The value of livestock and fruit trees are included in the capital stock. The stock of cows and sheep yields a return without being slaughtered in the form of e.g. milk, offspring and wool.

The return on capital is extensively discussed in the Official Norwegian Report NOU (2012). The recommendation in this NOU for projects with normal risk and a horizon of less than 40 years is to use a 4 per cent per year real return rate, as adopted by the Ministry of Finance. In our reference scenario we follow this recommendation. The Ministry of Petroleum and Energy uses 7 per cent per year real interest rate in the assessment of new oil fields. We have therefore also made calculations with a 7 per cent per year capital return in the sensitivity analysis. In the implementation of SEEA EA for the Netherlands, a discount rate of 2 per cent is chosen for agriculture (United Nations, 2021) and we also include calculations with this discount rate.

2.1.5 The resource rent in Norwegian agriculture 1984-2020

All figures have been converted to 2020 prices to measure the purchasing power of the RR over time. The deflator is a weighted average of the ordinary consumer price index and the price index for public consumption. Figure 1 below shows a decomposition of the RR in agriculture for the period 1984 to 2020. We deduct product subsidies from the value added. Remember that there are no other production taxes/subsidies. For capital costs we use a rate of return of 4 per cent per year. The compensation of employees is based on the average wage costs for mainland Norway.

Figure 1. The components of the resource rent in Norwegian agriculture 1984-2020.



The RR is clearly negative over the whole period. The reason is primarily that the compensation of employees alone is considerably higher than the value added (less product subsidies) for all years. Further, the RR is generally on a rising trend over the period as it becomes less negative. This stems above all from the declining value of compensation of employees. The reduction in wage compensation over the period is 50 per cent. Behind this reduction lies the fact that total number of hours worked for workers and self-employed are over 70 per cent lower at the end of the period than initially. The RR is increasing even if the value added is on a declining trend due to the strong effect of lower wage compensation[5]. Both capital consumption and the return on capital declines by 25-30 per cent over the period. This is much lower than the reduction in the number of farms which is around 65 per cent (Statistics Norway, 2020), showing that the development signifies much more capital per farm (and farmer). It is illustrating to see that the value added (less product subsidies) is high enough to cover return on capital and capital consumption only for some initial years.

To sum up, the RR is up around 21 bn NOK over the period even if the value added falls with 18 bn. The reason is that compensation of employees declines by 33 bn NOK, while both capital consumption and return on capital falls with around 3.4 bn and 2.7 bn, respectively. The present resource rent in agriculture is around -44 bn NOK.

The World Bank (2018) applies two methods for estimating land wealth. The first method uses information from sales of land. The second method uses information on the annual flow of the RRs the land generates and takes the present value of such future rents. Given that information on land transactions is often missing, the second method is used (as is done for Norway). The Word Bank uses the Food and Agriculture Organization of the United Nations' (FAO's) country-specific data on producer prices to value output (rather than its export unit values, used in earlier estimates) and also use the production data from FAO. They use regional land rental rates for both crops and pastureland, and this rental rate is equal to the ratio of (price – cost)/price and rely on regional estimates by Evenson and Fuglie (2010). For Western Europe the rental rate is 0.17 for crops and livestock

[5] That the value added declines relatively less than hours worked reflects productivity gains.

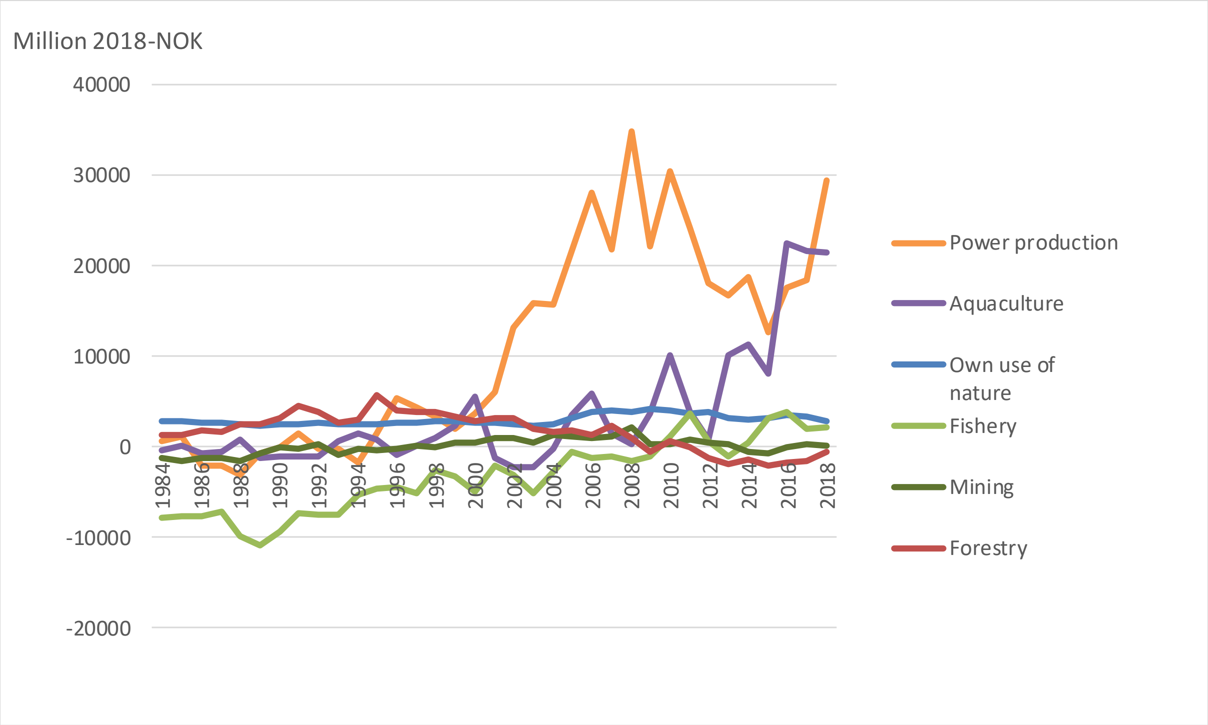
(intensive) and 0.34 for livestock (extensive). This means that for e.g. crop k in a Western European country like Norway, the RR is simply calculated as price x quantity (for crop k) x 0.17. For this reason, the RRs are always positive. This is a completely different approach than in e.g. SEEA (2014) where RR is the income from utilizing a natural resource that remains after all necessary input factors are paid for.

The World Bank does not estimate RR for the fisheries due to lack of data, but they comment that the revenues in many countries are not high enough to cover all costs and subsidies, i.e. the RRs are negative. However, when it comes to RR in agriculture (and forestry) they assume that income is always more than high enough to cover all costs as they apply a positive rental rate described above. They estimate the Norwegian agricultural RR to 4.8 billion (bn) NOK in 2014 (taking cropland and pastureland into consideration).[6]

2.2 The resource rent in other Norwegian natural resource sectors

The renewable natural resources are fishing, aquaculture, agriculture, forestry, power supply and own use of nature. We see from Figure 2 that the RR in power production is higher than in fishing, mining and forestry after 2000, while aquaculture is generally higher after 2005. The main reason for the increase in RR in power production in the 2000s is higher electricity prices. The increase in the RR in aquaculture as from 2012 is mainly due to higher prices of salmon.

Figure 2. The resource rent in other natural resource sectors 1984-2018.



The RR in fisheries is negative throughout the period except 2010-12 and 2014-18. The negative RR is largely due to the high compensation of employees in relation to the value added. The positive RR towards the end of the period is due to fewer fishermen and fewer but more efficient boats, while the value of the catches is maintained. This means that the value added keeps up, while wage costs and capital depreciation/return on capital decline. The RR in forestry is lower in the last half of the period

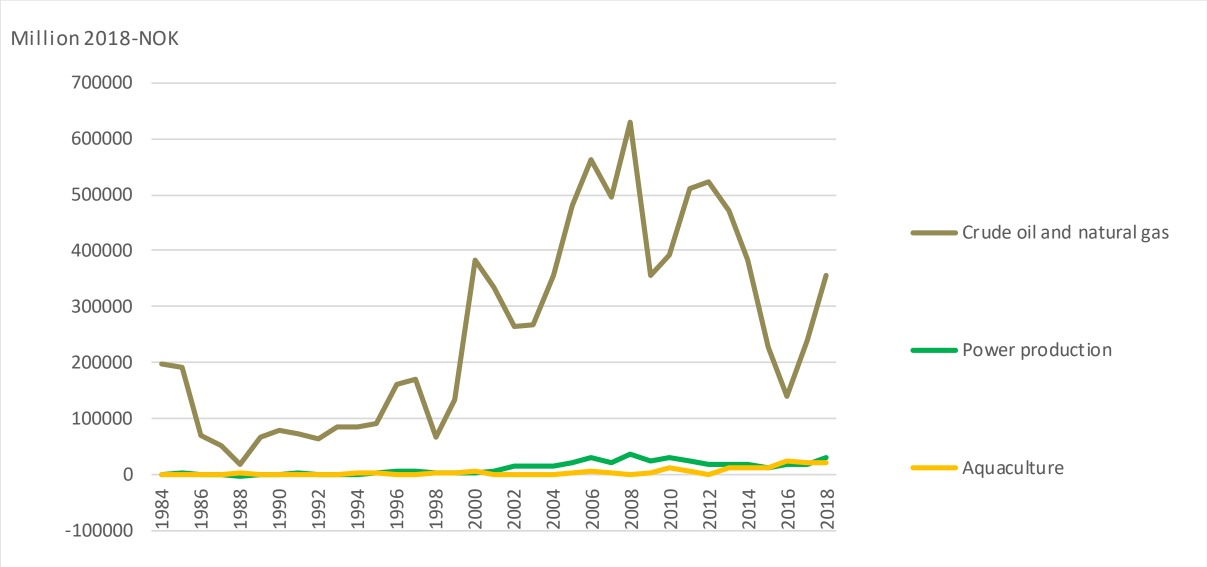
[6] In a personal correspondence the World Bank admits that due to budgetary limitations they had to take some short cuts in their wealth estimates, and that the estimates are rude and not suitable for many regions/countries.

than in the first, and in addition it has also been negative after 2011. This is due to a generally high capital stock and high labour costs compared to the value added. The latter is also the case for mining.

Own use of nature is agriculture and fishing for own use as well as hunting and gathering. The RR in this sector is generally higher than in fishery, forestry and mining. The reason is that the RR for this non-commercial industry is calculated without the deduction of labour costs and capital. It can be argued that both capital in the form of tools as well as working hours should be included, although this is not registered in NA (this is done in the satellite accounts for e.g. household work). One view may be that "working time" here must be regarded as the use of leisure time i.e. a consumer good, and that tools also are consumer goods. With this assumption RR is equal to the output minus the intermediate inputs where it exists. We emphasize that total RR for the renewable natural resource sectors is around 7 bn in 2018, even when we include the large negative RR in agriculture.

Figure 3 shows that the RR for oil and gas is considerably higher than in aquaculture and power generation, especially after 1999. The RR for oil and gas fluctuates strongly throughout the period in line with world market prices for oil and gas, e.g. we see the consequences of the drop in oil prices in 2014 and the subsequent price increase from 2016.

Figure 3. The resource rent in non-renewable natural resource sectors 1984-2018.

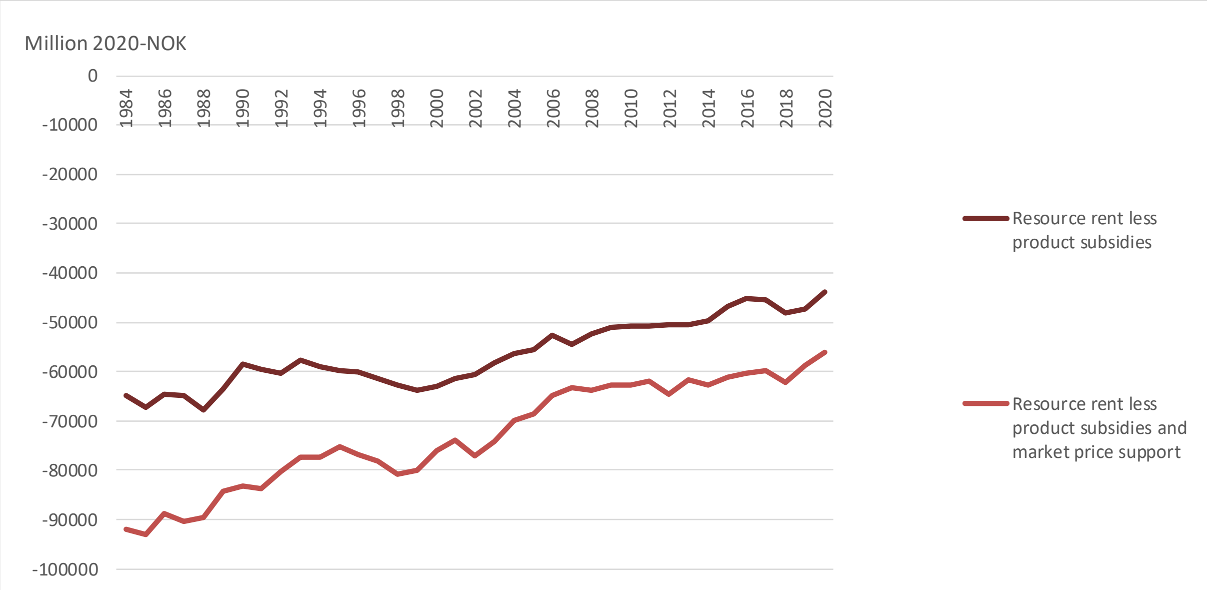


2.3. Sensitivity analyses

2.3.1. Subsidies

Figure 4 shows the RR in the reference scenario in agriculture when we deduct product subsidies. Figure 4 also shows the RR when we take into consideration market price support (due to tariffs on import) in addition to product subsidies. All in all, total RR declines by around 30 per cent over the period when we also include market price support. When we take all subsides into consideration the present RR is -56 bn NOK.

Figure 4. Resource rent in agriculture with different rules for the deductions of subsidies



2.3.2. Wage rates and capital costs

The development of the RR in agriculture can be calculated in two different ways. The first way is to calculate the labour costs as the hourly wage rate for mainland Norway multiplied by total hours worked for both employees and the self-employed, which is the way we have done so far. The other approach is to use actual labour costs as they appear in the NA. The results show that when we use the actual compensation of employees in agriculture, the RR increases on average with as much as almost 30 per cent over the period. One may argue that the latter approach is more reasonable as the educational level of those working in agriculture is relatively low, so that to use wage rate for mainland Norway leads to a too high alternative wage rate for this sector. In addition, a lower alternative wage rate may also reflect that employment possibilities are lower in rural areas.

Figure 1 shows that the return on capital with a 4 per cent return is small compared to the labour costs. Hence, the effect of a 7 per cent or a 2 per cent per year capital return on the RR will be very small.

3. Calculation based on prices farmers pay for rented land

The RR reflects the value of agriculture after all input factors have received their remuneration. Rent of land (Horlings 2020a and 2020b) can be defined as the income received by the owner of a natural resource for putting the natural resource at the disposal of another institutional unit for use in production.

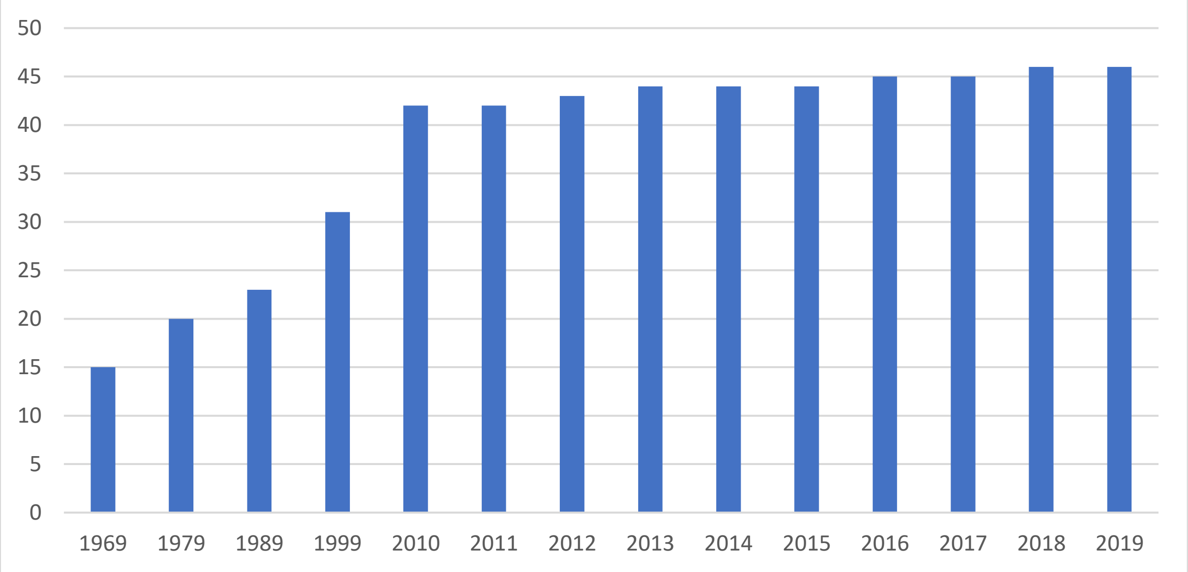
Rental price valuation is a market-based valuation method. Most public, non-market goods and ecosystem services, that do not contribute to production, are generally not reflected in the rental price. E.g. are scenic and wildlife benefits external to the land user not included in the price. However, some non-market ecosystem services, such as pollination and water quality are partly included, since they also contribute to production. Rental prices are the implicit price that reflects the value to the farmer. The rental prices also reflect the level of subsidies that will be available to the farmer utilizing the land for farming purposes.

A review of different methods to perform monetary valuation of different ecosystem services and assets in the Netherlands (Horlings, 2020a and 2020b) found that, from a conceptual and practical point of view, the best valuation technique for provisioning services are rent-based methods. In particular, they advocate the use of rent prices for valuation of crop and fodder production. The World Bank outlines the possibility to estimate agricultural land wealth using data on land sales but dismisses this alternative due to the lack of data on land transactions World Bank (2018) is also commented on in Section 2.1.5.

Land rent should reflect the revenue of the good produced minus the unit costs of turning the natural services of that land into the good. Rent prices should depend on price and quantity of the output and the cost of production.

Agricultural land value based on farm rent prices are taken from market data. Combining municipality data for rent prices on five different types of farm land with data on agricultural area for eight relevant area uses, we calculate the total value of Norwegian farmland. By applying rent prices in this way, we assume that these prices are also valid for land assets where no direct payments are done (user owned assets). Figure 5 shows that the share of agricultural land that is rented in Norway has increased sharply since 1969 and has been stable between 42 and 46 per cent since 2010. The share of rented land is generally high in all Norwegian counties (ranging between 36 and 62 per cent in 2019).

Figure 5. Rented agricultural land in use as share of total agricultural land in use in Norway, per cent.



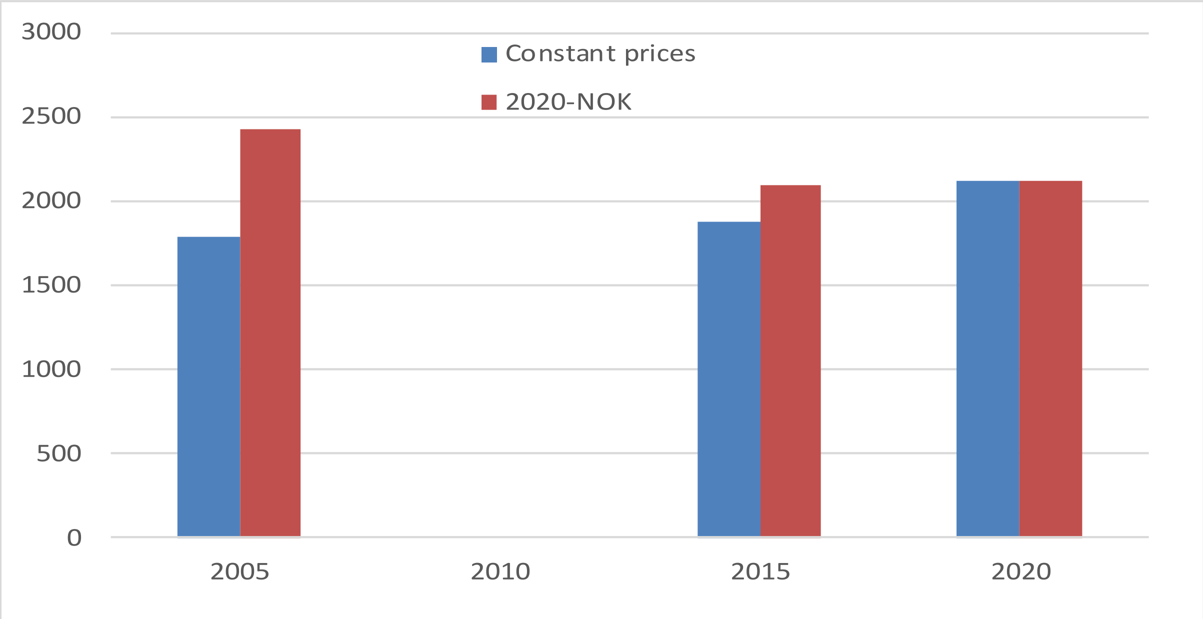
Source: Statistics Norway

Figure 6 show the total value of Norwegian agricultural land in use based on yearly rental prices on land used for production of different agricultural products collected by the Norwegian Agricultural Agency from Norwegian municipalities. In 2020 rental prices for land used for five different agricultural products are used (grain - divided between good and bad quality land, potato, vegetables and berries, grass - divided between good and bad quality land and infield pastures). For municipalities where rental prices were not available mean county prices were used. Where prices for good and bad quality land is available a mean average is used for the calculations of total value. In figure 10 the maximum and minimum values based on these prices are presented.

Rental prices for agricultural land are multiplied by corresponding agricultural area statistics from Statistics Norway by municipality, year and crop. In the calculations total agricultural area statistics specified for grain and oil seeds, potatoes, vegetables (field grown), crops for green fodder and silage, cultivated meadows, permanent grassland and surface cultivated land and a small residually defined area set to vegetables and berry production is used.[7,8]

In Figure 6 we see that the total value of agricultural land in Norway using this method has increased from 1.8 bn NOK in 2005 to 2.1 bn NOK in 2020. When using constant prices, correcting for price development using the consumer price index, we see a decline in the total value from 2.4 bn 2020-NOK in 2005 to 2.1 bn 2020-NOK in 2020.

Figure 6. Total value of Norwegian agricultural land in use based on rental prices (excluding outfield areas). Mill-NOK and 2020-Mill NOK. (NB! constant prices should be current prices in legend)

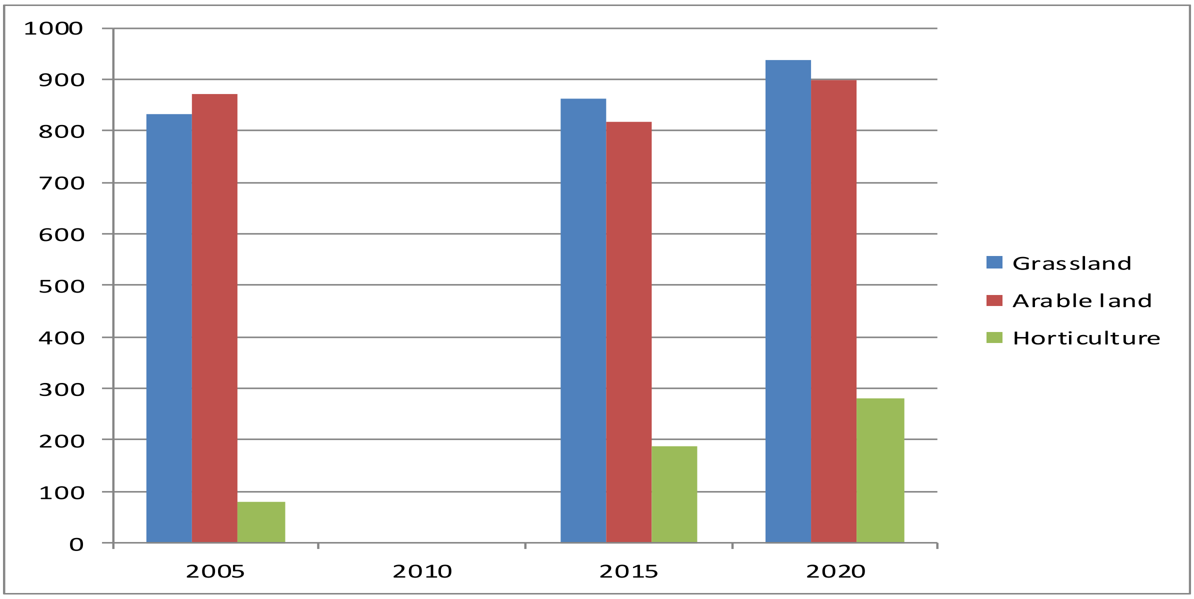


Source: Calculations based on data from Statistics Norway and Norwegian Agriculture Agency

In Section 2 we regarded the subsidies as costs for society. When we now take the standpoint of an institution or a person who rents land, the subsidies are part of the value of output and we do not deduct these from the value added. Total value added in 2020 is 16.8 bn NOK (in 2020-prices). The capital consumption is 10.0 bn and a normal rate of return is 6.1 bn (with a 4 per cent discount rate). The net income before the deduction of wage compensation is 0.7 bn. Hence, the rental price of around 2 bn is even not high enough to cover the capital outlay. Halving the discount rate makes the net income increase to around 3.8 bn.[9] Now the net income pays the rental price and in addition there is 1.8 bn to cover the wage compensation. If we disregard compensation for the self-employed and let their remuneration be part of the operating profit, the compensation for the wage earners was 6.1 bn NOK in 2020 when we apply the average wage rate in agriculture. Hence, the lessee is only compensated with 30 per cent of the wage rate in 2020. The same calculation in 2015 leads to a compensation rate of 25 per cent, while in 2005 the net income cannot even cover the work effort. Hence, the lessee seems to be worse off than a traditional wage earner in agriculture.

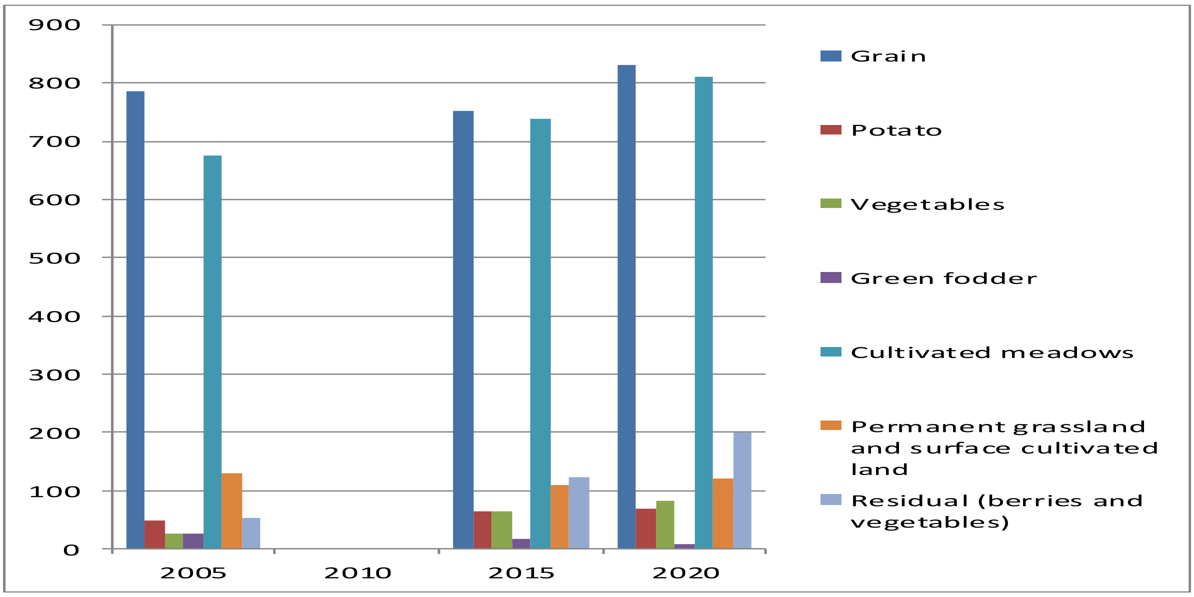
[7] Due to confidentiality issues cannot all agricultural land be defined at the necessarily detailed level regarding crops in all municipalities. To secure that all agricultural land is counted in the calculations a residual definition is therefor used. Comparing with national figures this is set to be production areas for vegetables and berries.
[8] For more details and descriptive statistics on input data se Appendix A and Statistics Norway's Statbank table 06462.
[9] In the SEEA EA framework (SEEA 2014 and SEEA 2021) the application of a lower social discount rate is advocated in valuations related to ecosystem services contributing to collective benefits, e.g. agriculture.

Figure 7. Value of Norwegian grassland, arable land and horticulture land. 2005-2020. Current Mill NOK.



Source: Calculations based on data from Statistics Norway and Norwegian Agriculture Agency

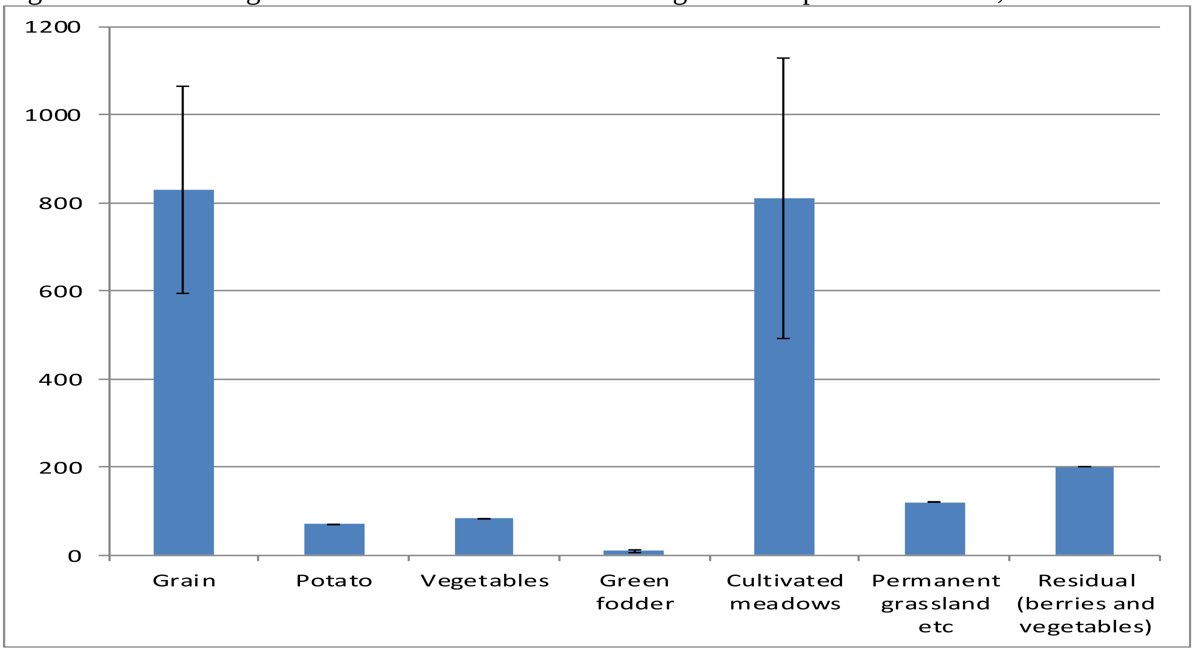
Figure 8. Value of Norwegian agricultural land for different production purposes. 2005-2020. Mill NOK.



Source: Calculations based on data from Statistics Norway and Norwegian Agriculture Agency

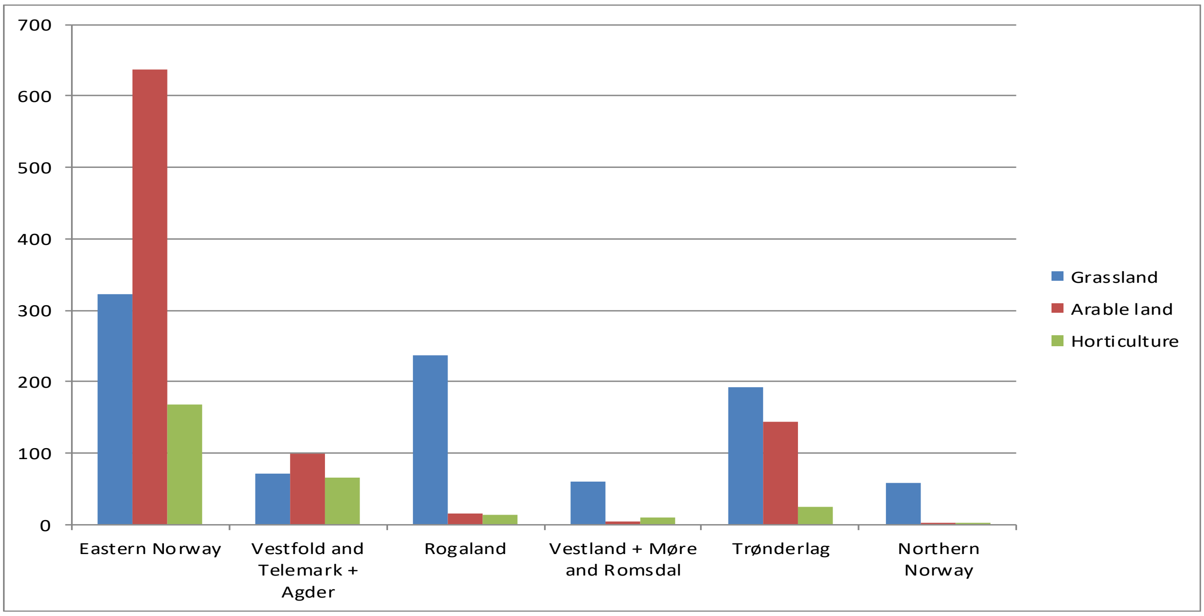
Figure 7 and 8 show relatively stable levels of the value of agricultural land for grain, potatoes and permanent grassland over the time period. The increase in the value of land for horticulture, seen in Figure 7, is driven by both an increase in the value of land used for growing vegetables and in the residually defined share of land used for berries and vegetables, as shown in Figure 8. The residually defined share of land set to be used for berries and vegetables is encumbered with more uncertainty. We also see an increase in the value of land used for potatoes and cultivated meadows during the period. The value of land for green fodder production has been reduced during the period.

Figure 9. Value of agricultural land in use for different agricultural production areas, 2020. Mill-NOK



Source: Calculations based on data from Statistics Norway and Norwegian Agriculture Agency

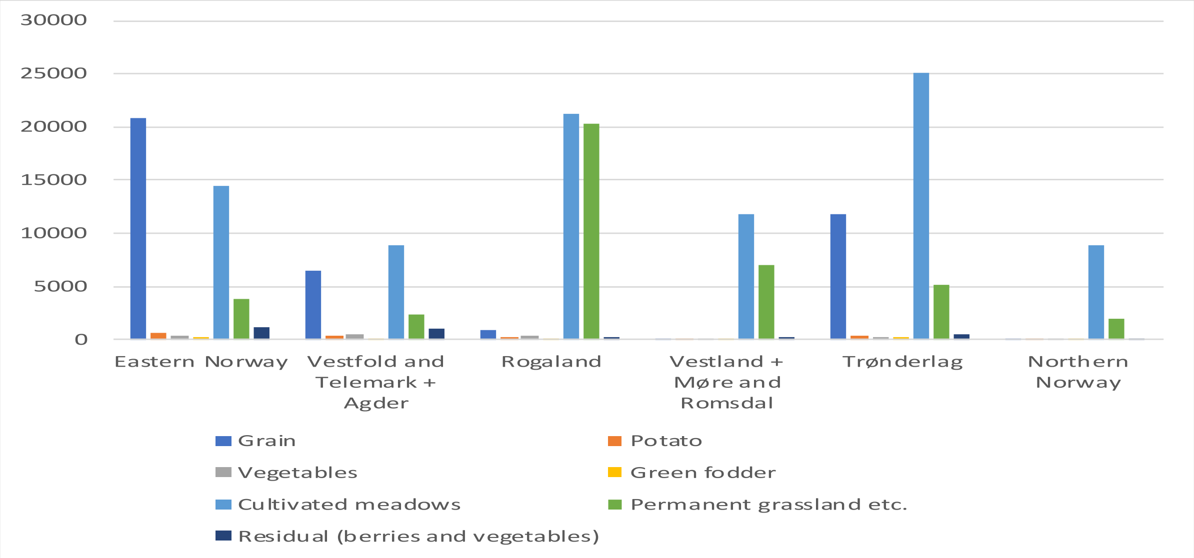
Figure 10. Value of Norwegian grassland, arable land and horticulture land in six Norwegian regions in 2020. Mill NOK.



Source: Calculations based on data from Statistics Norway and Norwegian Agriculture Agency

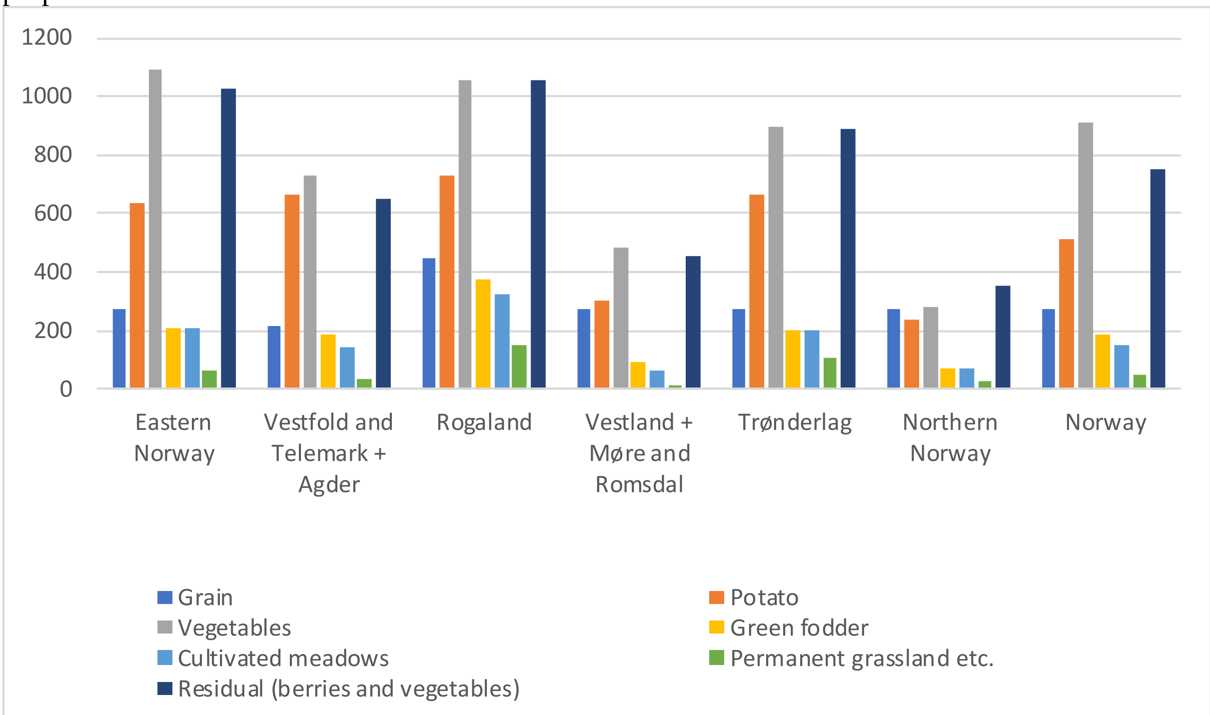
Focusing on the year 2020 we see in Figure 9 that the value of agricultural land for different production purposes varies greatly. In Figure 10 we further see that there are large differences between the value of different agricultural land types between regions in Norway. Due to very different climatic prerequisites between different areas of Norway the particularly large difference in the value of arable land is according to expectations. The differences between regions are driven by large differences in cultivated acres (see Figure 11) and to some extent by differences in prices (see Figure 12 and Table A1 in appendix A).

Figure 11. Agricultural areas in use for different regions in Norway in 2020. Acres



Source: Calculations based on data from Statistics Norway and Norwegian Agriculture Agency

Figure 12. Average rent prices in Norwegian regions for agricultural land for different production purposes in 2020. NOK/acres.



Source: Calculations based on data from Statistics Norway and Norwegian Agriculture Agency

The assessed values of different types of agricultural land in Norway, a country where agriculture is constrained by climate and topography, reflects that the values of the small areas of agricultural land suitable for cultivating grain and other crops, certainly are much higher than the values of pasture land, which are found in abundance in forest and mountain regions.

4. Agricultural support and transfers as an expression of society's willingness to pay

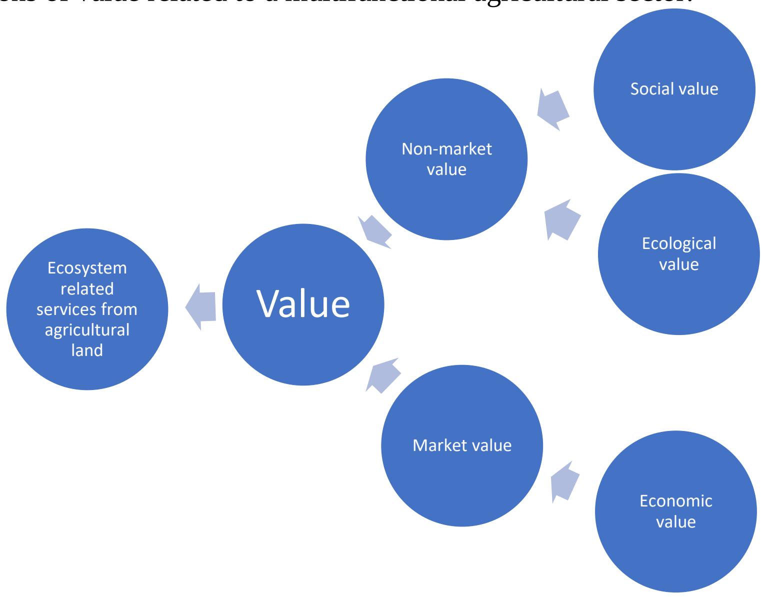
Valuations based on NA data (e.g. resource rent) and rent market data (e.g. rent prices) reflect only some of the ecosystem related services stemming from agricultural land (Horlings et al., 2020a and Horlings et al., 2020b) (e.g. soil services and inputs such as pollination and water quality that also affect production).

The notion of multifunctional agriculture, both in an international and Norwegian context, captures value creation in the agricultural sector that cannot, or can only partly, be measured using the market-based approaches (Romstad et al., 2000). The multifunctionality addresses that ecosystems dependent on agricultural land provides public goods (e.g. landscape values, rural activity and viability of rural areas, food security, cultural heritage, biological diversity) in addition to traditional private goods such as food and fiber. These public goods are often site or region specific.

The concept of multifunctionality was adopted as a policy principle by OECD in 1998 (OECD, 2001). The multifunctional agricultural sector was viewed to respond to both social, ecological and economic drivers and producing output within all these realms. The notion recognized the production of both private and public goods in multifunctional agriculture and the need for government intervention to support activities leading to all this production (Randall, 2002). The additional functions of agriculture are referred to as non-trade concerns (NTCs) in World Trade Organization. Most NTCs have public good characteristics that justify governmental interventions (e.g. under-provision and internalizing of externalities) and are produced jointly with, and often dependent on, traditional agricultural products. Agricultural production is site specific and most NTCs must be provided by domestic agricultural production.

The entity of the benefits from a multifunctional valuation can be referred to by the concept of total economic value of agriculture (Randall, 2002). Combining the notion of the multifunctional agriculture and a more complete understanding of the value of the agricultural sector both economic, ecological and social value is considered. An understanding of value based on this is illustrated in Figure 13.

Figure 13. Notions of value related to a multifunctional agricultural sector.



To get an understanding of the economic value we have calculated the resource rent and land value based on rental prices. Measurements of ecological values will be discussed in Section 5.

Measurements and developments of social, ecological and economic values are exemplified based on governmental subsidies in the following. This is an indirect valuation where we infer values from observing economic behavior through the choice of subsidy areas and levels by policy makers.

As pointed out in Öhlund et al. (2020) there is good reason to enrich the value concept beyond economic market value from agriculture products and agriculture land. As exchange prices on land and food may be low the use-value is potentially very high. Food has low marginal utility when there is no scarcity, but a much higher marginal utility when scarce. As such, food and land prices may not be a good sole indicator of the welfare contribution of agricultural land and food if faced with e.g. potential scarcity in the future. As pointed out by the official report NOU (2018:17) on climate risk agriculture in Norway might be more profitable in the future. E.g. can international food prices become higher and input factors like soy may not be available in sufficient quantities. Projected climate change impacts imply that conditions for agricultural food production may continue to be relatively good in the north compared to other global regions.

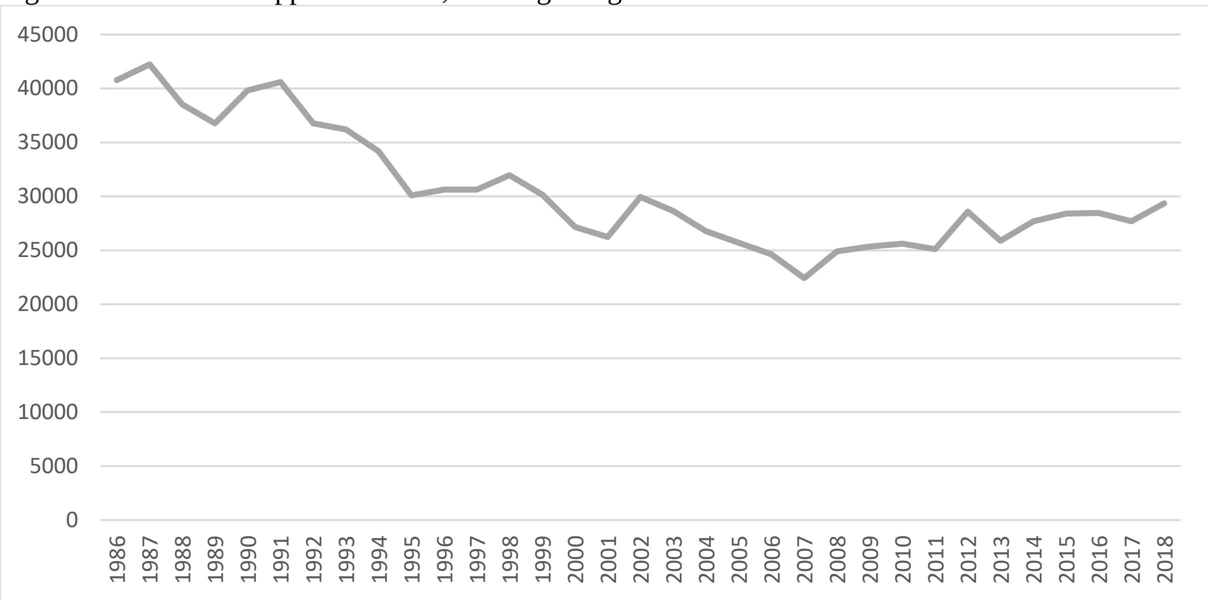
Norwegian agricultural policies and policy goals captures to a large extent the notion of a multifunctional agricultural sector. There is a broad political agreement that Norwegian agricultural production serves multiple societal goals. As stated in the Introduction, the main goals for Norwegian agricultural policies are food security and food safety, securing agricultural production in all parts of the country, increased wealth creation and sustainable agriculture (including protecting land, producing environmental goods, securing biodiversity, lower greenhouse gas emissions, and reduced pollution) (see e.g. Meld. St. 9, 2011-2012).

These diverse goals make it clear that a one sighted focus on the resource rent to describe the value of agriculture is not in line with the political valuation of Norwegian agriculture. As described earlier the RR will e.g. increase with fewer farmers and more efficient farms. This is in direct conflict with the policy goal of agricultural production in all parts of the country and its secondary goal strengthening and contributing to employment and settlement.

Given the policy targets of the Norwegian agricultural sector, implemented polices should be designed to pay the agricultural sector not only for their production of commodities that can be traded in markets, but also for the sector's production of externalities viewed as beneficial for society, but not rewarded within conventional markets. These externalities are typically non-commodity production like e.g. diverse settlement, biodiversity protection, food security, carbon sinks, and protection of cultural heritage. A narrow emphasis on the market income of the agricultural sector can lead to an undersupply of such externalities.

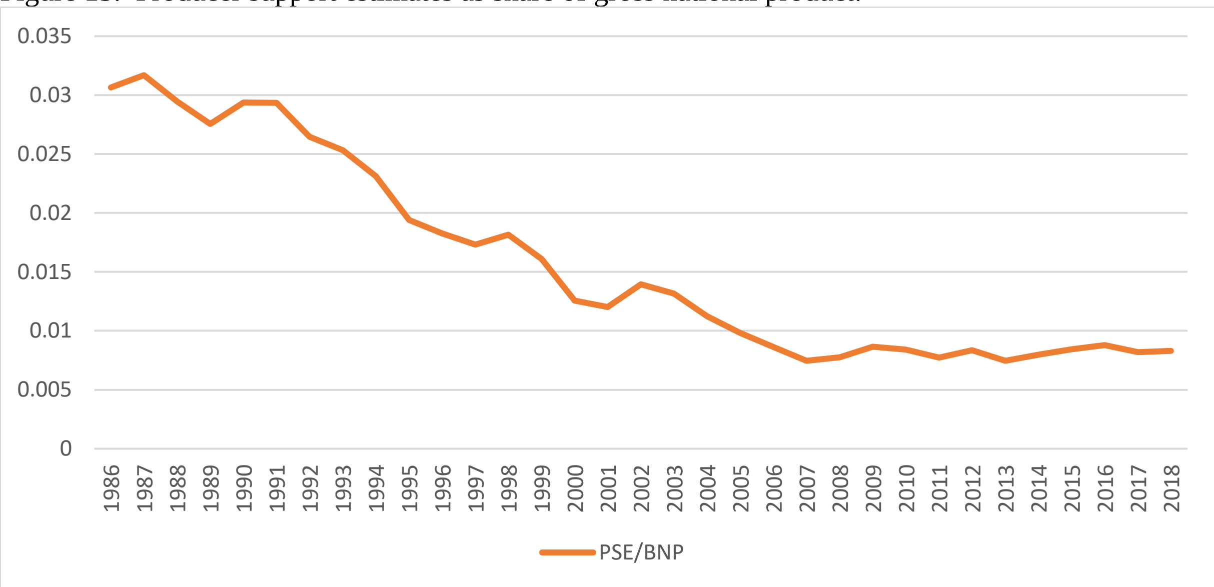
When measuring the value of agricultural production, a way to ensure that more means are included in the measure of value is to look at society's willingness to pay expressed as total transfers to the agricultural sector. In Figure 14 we see that the producer support estimate, as calculated by the OECD, declined from about 40 bn 2018-NOK in 1986 to 22 bn 2018-NOK in 2007. Since 2007 we have an increase in total agricultural support to about 29 bn 2018-NOK in 2018. Looking at the support as share of GNP in Figure 15 we see a strong decline in the same period and a flatting of the curve from around 2007 indicating a decreasing, but stabilizing willingness to pay for agricultural products (both private and public goods).

Figure 14. Producer support estimate, Norwegian agricultural sector. 2018-Mill NOK



Source: OECD

Figure 15. Producer support estimates as share of gross national product.



Source. OECD and Statistics Norway

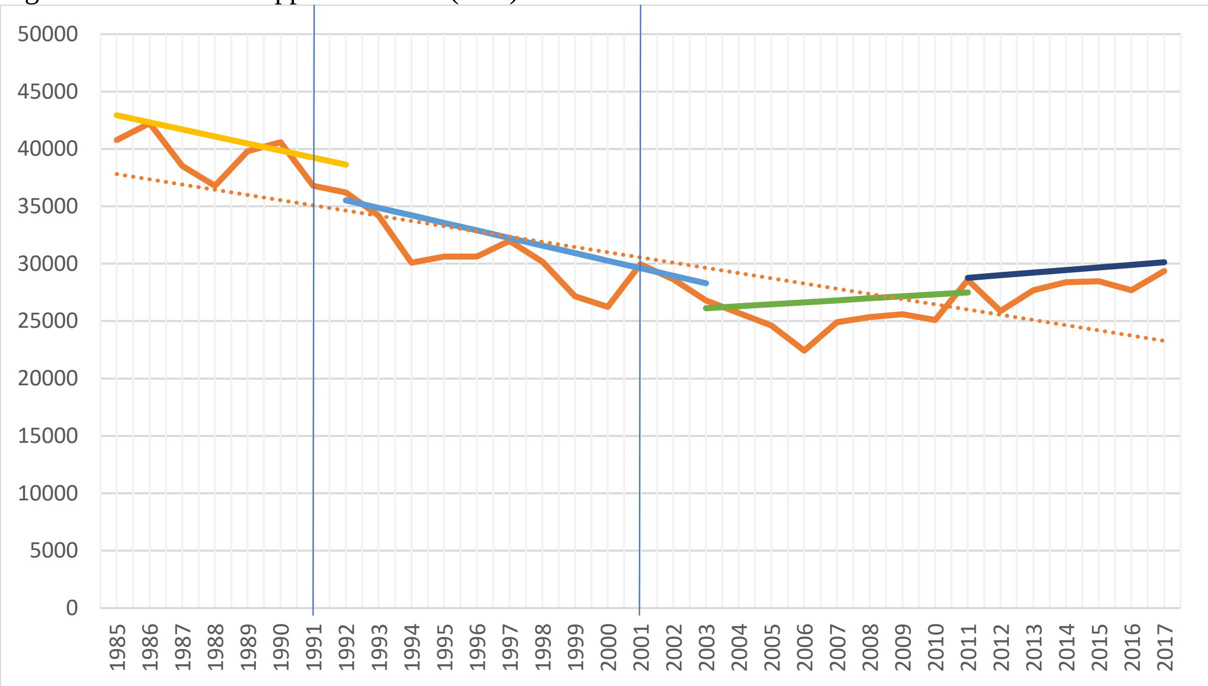
Important shifts in Norwegian agricultural policies.

In the beginning of the 1990s agricultural policies in Norway shifted from being wage oriented (securing the wage of farmers) to focusing on development and targets related to the agricultural industry. An explicit target of a more robust agricultural sector, i.e. less dependent on strong border protection, was introduced.

In early 2000s an increased notion of the multifunctional agricultural sector is seen in policy formation. The national environmental program was, e.g., introduced in 2003 (amounted to about 400 mill NOK in 2013). This program was designed to support many non-commodity products e.g. area and cultural landscape support.

In Figure 16 we see trend shifts in the producer support estimate potentially stemming from these changes in the views on and design of agricultural policies and support systems. In the beginning of the 2000s we see a shift from a strong negative trend in the producer support estimate (measured in constant prices) to a positive trend corresponding to the increased focus of the multifunctional agricultural sector in policy formation in the early 2000s.

Figure 16. Producer support estimate (PSE) and trend lines. 2018-mill NOK



Source: OECD

Taking the subsidy view does not answer to the complete ecosystem valuation, but to societies valuation of a sector. In principle the producer support estimate gives a complete measure of the public support to producers. The agricultural subsidies are not designed to only support agricultural markets production, but to a large degree non-commodity production, therefor giving a partial description of the valuation of social, economic and ecological values (as shown in Figure 13).

Societies valuation of the different market and non-market valuations of agricultural production and land is reflected differently in the different types of subsidies and support to the sector. Abler (2004) argues that price and income support policies does not necessarily promote a multifunctional agricultural sector efficiently. Especially the output-based policies (such as price supports, export subsidies etc.) does not support the public goods aspects of the agricultural sector well since these goods are generally not directly linked to production, but to the land use and agricultural structures.

In Figure 17 the Norwegian agricultural subsidies are, following (Kvakkestad et al., 2015), divided into border protection, direct payments and price support (market price support, as discussed in Section 2, is equivalent to border protection).[10]

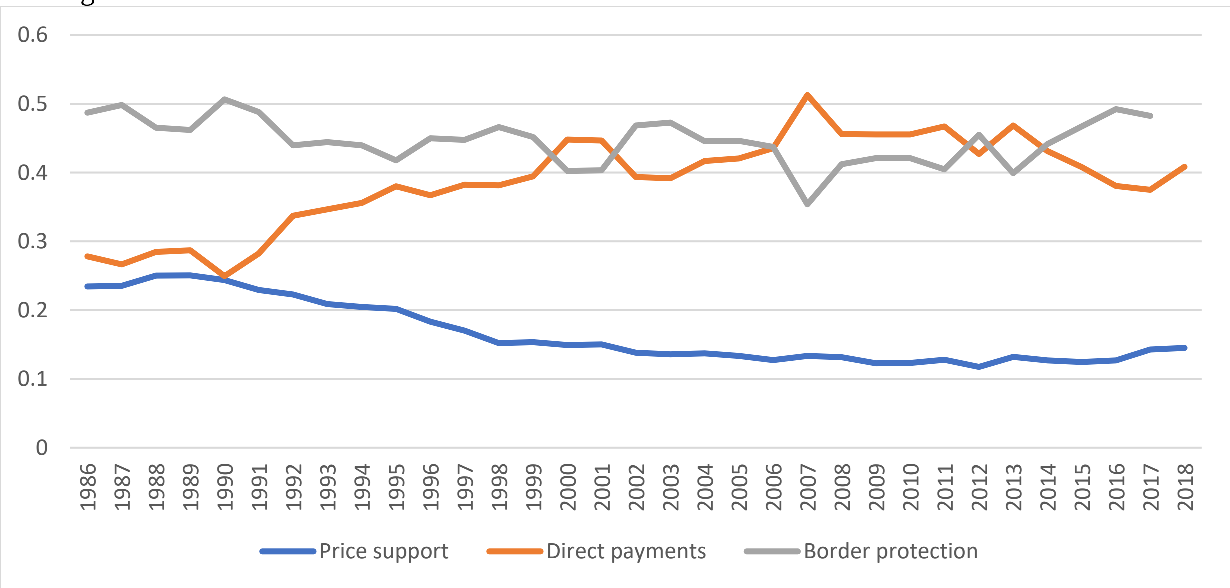
Border protection are tarifs, import quotas etc. Direct payments (called industry specific subsidies in Section 2) are budgetary support payments based on input use, production method, landscape maintenance, cultural heritage etc. Price support are also budgetary support where payments are based on per unit of food production or area/number of animals. A large part of the direct payments supports elements related to public goods production. These payments are based on production method (e.g.

[10]Not all types of support relevant for the agricultural sector are included in these calculations. See OECD (2021) for further details on the included support systems.

organic agriculture), grassland maintenance and cultural heritage support and input use (acreage and livestock).

In Figure 17 we see a decline in the share of subsidies being labelled price support over the period and an increase in direct payments. This strengthens the findings indicated by Figure 16 that there is a shift in societies' valuation of the different aspects of Norwegian agricultural sector toward a potential stronger valuation of production of public goods stemming from agricultural production.

Figure 17. Share of price support, direct payments and border protection of total producer support to Norwegian farmers. 1986-2018.



Source. OECD[11]

5. Valuing ecosystem services from agricultural land

Extensive use of outfield grazing land create semi-natural vegetation types (Emanuelsson, 2009), often with rich biodiversity (Bignal and McCracken, 1996; Burel et al., 2013) and capacity for ecosystem services, including being pollinator habitats (Smith, 2017). Intensification of agriculture and abandonment of grazing causes loss of biodiversity of semi-natural grasslands, and policy action is urgent to ensure agricultural management to maintain biodiversity and ecosystem services (Ihse (ed.) 2017; Bele et al., 2018; Pykäla 2007). The Nature Index for Norway shows large biodiversity loss for semi-natural grasslands (Jakobsson & Pedersen, 2020; Framstad ed. 2015; Nybø ed., 2010). About 24 per cent of red-listed species in Norway (including vascular plants, mushrooms, butterflies, beetles, and wasps) depend on semi-natural grasslands (Henriksen and Hilmo, 2015).

Large areas of Norway have grazing resources that only ruminants can transform to food. Grazing on alpine meadows and other semi-natural grasslands keeps the landscape open, maintains biodiversity, and, moreover, provides high-quality niche food products (Sickel et al., 2012; Kinn, 2020), contributing to multiple agricultural goals (Bele et al., 2018; Karlsson et al., 2017). Targeting agricultural subsidies for maintenance to ensure biodiversity is used e.g. for mowing semi-natural grasslands identified as an endangered nature type and biodiversity hot spot, with a national action plan (Handlingsplan for slåttemark). Similar subsidies are used in EU-countries (Wrbka et al., 2008; Kumm, 2011). However, targeted agricultural payments for maintaining biodiversity and ecosystem services have been low compared to subsidies related to production volume, in Norway and EU

[11] To get comparable posts during the period structural income support for milk production is placed under price support for the whole period. In the original data from OECD there is a shift of this support from what here is labelled as price support to direct payments in 2003.

(Auditor General of Norway, 2010; OECD, 2013; Wramner and Nygård, 2010; Ihse (ed.), 2017), see also Section 4).

A challenge for agricultural policies is to take into account how management of ecosystem services from the cultural landscape impacts the potential for other ecosystem services and how the ecosystem services are utilized in the rural community, e.g. for tourism and other economic activity in rural areas where agriculture has been the basis for economy, population and public services (Norderhaug and Stokke, 2019). In order to improve the knowledge basis for policy trade-offs and synergies between agricultural goals, and optimal allocation of agricultural production according to ecological suitability, a comprehensive approach to valuation of ecosystem services is needed, to express the values of different types of agricultural land and ecosystem services, reflect the relation between ecosystem services, and explore how agricultural organization impacts the provision of ecosystem services.

Well-functioning ecosystems, including soil, have the potential to deliver high levels of ecosystem services associated with climate mitigation (Griscom et al., 2017; Malcolm, Holtsmark and Piascik, 2020; Dahlberg, Emanuelsson and Norderhaug, 2013). While trade-offs and synergies between climate mitigation and biodiversity are central to policy development, the knowledge base is diverse, uncertain and contested. The official Climate cure (KLIMAKUR) (Norwegian Environment Agency 2020) spurred discussion on the impacts of climate policy related to nature areas, biodiversity, ecosystem services, and food security (e.g. Naturvernforbundet 2020). One response to Climate cure was the suggested Nature cure, a nature-based solution with emphasis on the carbon storage potential of ecosystems (Bartlett et al., 2020). Nature cure (Bartlett et al., 2020) suggests that given the knowledge gaps and considering that large outfield areas in Norway are not included in the climate accounting, an approach that considers synergies between climate and biodiversity could more effectively account for the carbon storage capacity of Norwegian ecosystems.

The policy question is how the approaches suggested by Climate cure can be combined with Nature cure to support an agricultural land use that maintains biodiversity and ecosystem services and in particular enhances the use of outfield grazing land, for supporting biodiversity and food security, identified as national agricultural policy goals (Meld. St. 9, 2011-2012). To assess the value of agriculture in Norway, it is crucial to develop a knowledge basis for a comprehensive policy approach to agriculture, climate and environment.

The potential of grasslands and grazing for climate mitigation has gained increased attention in research and policy (Chang et al., 2015; Ward et al., 2016; Burrascano et al., 2016). In Norway, outfield grasslands represent the largest grassland areas. The semi-natural areas of the outfield land also represent the highest biodiversity. A study of the carbon balance of alpine plant communities at Dovre in Norway indicates that grasslands may have higher soil carbon potential than shrub land (Sørensen et al., 2017). A report on soil carbon in Norway indicated that long-term effects on soil carbon of transition from (semi-natural) grassland to forest is uncertain, and based on European studies, that loss of soil carbon from forest planting on semi-natural grassland cannot be excluded (Sørgaard et al. 2019). A Swiss report presents different studies indicating that from the point of view of climate mitigation, management of grassland in mountain areas with ruminants performs significantly better than previously assumed (Spengler 2020).

Protection of cultivated land is high on the political agenda (Meld. St. 9, 2011-2012). It has been suggested that outfield agricultural land needs protection in the same way as cultivated land (Hatlevik, 2020). Different types of agricultural land, both cultivated land and outfield semi-natural grazing land, are exposed to different types of pressure. More knowledge is needed on municipal land management as framework condition for agricultural land use (Slätmo, 2014). Loss of agricultural land, ranging from development of urban areas on cultivated land, to development of energy infrastructure, wind turbine development, and roads and vacation homes in outfield areas, are urgent challenges that call for policy responses and improved approaches for valuation of different types of agricultural land, as basis for trade-offs and synergies between different societal objectives.

As climate policy in general emphasizes recommendations to reduce grazing, a comprehensive perspective on ecosystem services calls for exploring synergies and trade-offs between the goals of agricultural, environmental and climate policy. The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) calls for aligning goals for climate and biodiversity (IPBES, 2019). It is necessary to explore and further develop valuation methods for agricultural ecosystem services that consider trade-offs and synergies between biodiversity, climate mitigation and future food security (Peña-Lévano et al., 2019).

As stated in the national agricultural policy goals, the global food security perspective calls for each country to utilize their natural conditions for food production (Meld. St. 9, 2011-2012). The large outfield grazing areas represent an important source of food security in Norway. The goal of utilizing outfield areas, based on grazing and small-scale milk and meat production, may be in conflict with the goal of intensified agricultural production. Compared to other European countries, Norway does not have large-scale agriculture, however, the recent trend is towards increasing intensification. In large-scale production it is less profitable to let animals graze in outfield areas than on infield areas. Another barrier towards more outfield grazing is the increased use of milking robots that make it difficult to have the cows in mountain summer farming. The current types of milking cows are also targeted for high milk yield, requiring high input of supplementary fodder, usually imported soy. Other issues of conflicting goals related to large-scale and small-scale agriculture, need to be explored in value assessments, including animal welfare and the issue of antibiotics resistance. Reduced and more targeted use of antibiotics, also for domesticated animals, is among the most important measures for reduce development of antibiotic resistance (Meld. St. 9, 2011-2012).

The official report "Nature goods – values of ecosystem services" (NOU, 2013:10) presented some assessments of values of ecosystem services from agriculture, both from cultivated land and semi-natural grazing land. To give more comprehensive assessments of the value of agriculture in Norway, data are needed on the area of cultivated and semi-natural agricultural land, land management, economic value estimates for agricultural land, and data for biodiversity and assessments of ecosystem services. In future research, beyond the scope of this article, the values of the ecosystem services from agricultural land may be assessed by implementing the spatial and ecological approach of the United Nations' System of Environmental-Economic Accounting - Ecosystem Accounting (SEEA EA). The building blocks for developing ecosystem accounting are the spatially explicit extent accounts (area of ecosystems) and biophysical and ecological condition accounts (state of ecosystems). A key feature of developing ecosystem accounts is to explore how the current use of ecosystem services may affect the capacity of the ecosystem to provide different ecosystem services in the future. SEEA EA is currently under development and has been applied in many contexts, in particular for developing ecosystem accounting for the Netherlands (Remme, Schröter and Hein, 2014).

Data sources for future ecosystem extent accounts for agricultural land in Norway include agricultural statistics form Statistics Norway, data from Norwegian Institute for Bioeconomy (NIBIO), and data from research and development projects. Data from the applications for farming subsidies (available form Norwegian Agriculture Agency) are an important data source, e.g. in areas with much abandonment of land which is difficult to cultivate. The Agricultural Census 2020 from Statistics Norway (Landbrukstelling, 2020) includes data on types of crops and data on rented land. To develop statistics on conversion of farmland to non-agricultural uses, Statistics Norway in cooperation with NIBIO designed a model to provide statistics about type of non-agricultural use, proximity to urban areas and soil quality (Gundersen, Steinnes & Frydenlund, 2017). Converted farmland was identified by GIS analysis using area resource map and Statistics Norway's land use map. It is important to take into account the connection between different parts of the agricultural landscape, which also includes edges between cultivated land, forest, and built-up land, with numerous green areas that are important for biodiversity and ecosystem services, especially as habitats for pollinators. Data sources for future ecosystem condition accounts for agricultural land in Norway need to be based on data for biodiversity and other biophysical and ecological conditions that represent the basis for ecosystem services.

6. Discussion

The starting point for calculating the RR is that production of agricultural products can be expressed by a production function where one or more ecosystem services are included as input factors.[12] It is the remuneration of these ecosystem services that we are looking to identify, and which we call the RR. The same production function also includes other input factors such as intermediate inputs, labour and capital. If we know the remuneration of all input factors except the remuneration of the ecosystem services, the RR will appear as the difference between the output at basic prices and the remuneration of all other input factors. These services include soil services as well as inputs as pollination and water quality that also affect production as it is registered in NA. In addition to food and fibre agricultural land provides public goods that is not covered in our NA calculations. These are e.g. landscape values, rural activity and viability of rural areas, food security, cultural heritage, biological diversity.

The RR of renewable resources as e.g. agriculture is low or even negative. The government could have maximized resource income, taxed RR and transferred tax revenue to provide public goods or increase the income for less affluent groups (e.g. in rural areas). However, if the resource is managed in a way that provides public goods or redistributes potential income from the resource to (less affluent) groups in Norwegian society, the estimated RR may be close to zero or negative. In the former case, the resource would have been highlighted as much more important to the economy, but it may be politically preferable to transfer the resource revenue directly (to transfers to rural areas and employment measures). In addition, agriculture provides other collective goods mentioned above. The maximization approach is done by Greaker et al. (2017) who find that Norwegian fisheries could contribute to national wealth over four times more than indicated by 2011 NA figures. This would entail fewer fishers and fewer and more effective vessels. Such a consolidation for agriculture is in direct conflict with the policy goal of agricultural production in all parts of the country and its secondary goal strengthening and contributing to employment and settlement. However, it would support the goal of increased economic return.

The structure and data available when calculating the RR makes it impossible to differentiate between different products and regions. Hence, we apply one measure for total agriculture each year. The RR is negative over the whole period 1984-2020. Further, the RR is generally on a rising trend over the period as it becomes less negative. The present RR in agriculture is around -44 bn NOK if we only take product subsidies into consideration. When we take all subsides into consideration the present RR is -56 bn NOK. Applying the actual wage rate in agriculture instead of the average mainland wage rate increases the present RR with 10 bn.

Calculated total value of agricultural land in Norway using area statistics and rental prices was 2.4 bn 2020-NOK in 2005 and 2.1 bn NOK in 2020. Section 3 showed us that there are large differences in the calculated value both between regions and production of different agricultural products. Outfield and unused areas are not attributed any value in the rental price method calculations.

Valuation of agricultural land based on this method give a different picture than the resource rent method with positive values for agricultural land value. It is important to note that the method takes

[12] In NOU (2013) the ecosystem services can be defined as the ecosystems' directly and indirectly contributions to human welfare. The term includes both physical goods and non-physical services we receive from nature. The term natural goods are sometimes used synonymously.

the standpoint of an institution or a person who rents land, and consequently the subsidies are part of the value of output and they are not deducted from the value added. Using the rental price method gives possibilities to differentiate the values between production and regional areas.

Policy goals are explicitly supporting a multifunctional agriculture, but indicators such as resource rent and rent value only accounts for values traded in a market and consequently not covering all aspects of a multifunctional agriculture. A wider inclusion of the different values related to a multifunctional agricultural sector answering to all four main policy goals of the Norwegian agricultural sector is expressing the value of the agricultural sector, and the development of this valuation, based on societies willingness to pay for the agricultural sector expressed as total transfers to the sector.

In Section 4 we saw that using total transfers to the agricultural sector as a measure of the size and development of the value of the agricultural sector, we can include more values related to the agricultural sector than what is included in market-based valuations. As the level is difficult to interpret, we focused on developments in trends and saw a shift in trends from the beginning of the 2000s. This shift is potentially stemming from a shift from a support system constructed merely to support market-based outcomes in the agricultural sector to a wider inclusion of outcomes also including some non-market based, often public, products.

The Norwegian agricultural sector is characterized by large, mostly unexploited, outfield areas. These are large resources as while only 3 per cent of Norway is cultivated land, 45 per cent of the land is suitable for outfield grazing, being an important resource for food production, food security, biodiversity and ecosystem services. These large outfield areas are not valuated using the data for valuation in Section 2 and 3. When looking at total transfers some transfers related to these areas are included in the valuation estimates.

The knowledge basis for agricultural policies need to identify the multiple ecosystem services from agricultural land and identify how management for one type of ecosystem service also may improve the potential for other types of ecosystem services.

The calculation of resource rent and resource wealth as part of national wealth gives a “snapshot” of the relation between prices and cost in the current situation. However, an important reason to calculate the value of national wealth and its components is to assess whether the level and composition of national wealth in the future can give rise to future income and consumption possibilities. The official report NOU (2018:17) on climate risk acknowledges that agriculture in Norway might be more profitable in the future. International food prices may become higher. Input factors like soy may not be available in sufficient quantities. It could be useful to apply scenarios from FAO on expected food prices under different climate scenarios and illustrate in a precautionary perspective, the hypothetical value of agriculture in Norway, including the large areas of grazing land, in situations where food production needs to be based on increased self-sufficiency.

7. Conclusion

This article uses the NA figures from Statistics Norway to investigate the RR in agriculture in the period 1984 to 2020. The article first calculates the RR in a scenario where we deduct product subsidies, i.e. that vary strictly with production (price support per kg/litre) or that vary with the size of the area of the farm and/or number of animals. Further, in this scenario we apply a return on capital of 4 per cent per year. Furthermore, labour costs are calculated based on the average hourly wage for mainland Norway. The figures are adjusted for inflation with a price index based on a weighted average of the price indices for private and public consumption respectively. The basic alternative was then challenged by alternative calculations where we looked at: market price support, actual labour costs in agriculture and different alternative for return on capital.

A robust conclusion is that the RR in agriculture has been negative over the 1984-2020 period. At the same time the RR has become less negative, mainly due to less farmers, hence, lower compensation of employees and to a certain extent less real capital in the form of buildings, transport equipment etc. At the same time the farmers have become more effective so that value added has not declined as much as the number of hours worked. Both capital consumption and the return on capital declines much less than the number of farms, showing that the development signifies much more capital per farm. Our sensitivity analysis show that the RR is above all sensitive to the value of the alternative wage rate for farmers.

We emphasize that agriculture has a higher value than calculated RR from NA figures. There are many collective goods that is not covered by the NA figures; like activity and employment in rural areas, pristine nature, drinking water, clean air, security of food supply under climate risk, biological diversity, cultural heritage and cultural landscape.

The value of agricultural land in Norway using area statistics and rental prices was found to increase from 2.4 bn 2020-NOK in 2005 to 2.1 bn NOK in 2020. We found large differences in the calculated value both between regions and production of different agricultural products.

By using transfers to the agricultural sector as a measure of the size and development of the value of the agricultural sector we can include more values than what is included in market-based valuations. As the level is difficult to interpret we focused on developments in trends and saw a shift in trends from the beginning of the 2000s. This shift is potentially stemming from a shift from a support system in the 1980s and 1990s constructed to support mainly market-based outcomes to a wider inclusion of outcomes also including some non-market based, often public, products.

More knowledge is needed on the multiple ecosystem services from agricultural land and on how management for one type of ecosystem service also may improve the potential for other types of ecosystem services.

In future research, it is important to contribute to implement ecosystem accounts for agriculture in Norway, i.e. area accounts and nature accounts, within the UN System of Environmental Economic Accounting -Ecosystem Accounting (SEEA EA), where Eurostat is currently implementing area accounts (Eurostat, 2020). Such accounts are important as basis for exploring trade-offs and synergies between use of different types of agricultural land and capacity to deliver different types of ecosystem services. In future research, it is important to achieve more knowledge on the feasibility and political acceptability of current and suggested policies and explore to what extent the call for “green transition” to a low-emission society can be aligned with long-term sustainable management of agricultural land, considering biodiversity, ecosystem services, and food security.

References

Abler, D. (2004). "Multifunctionality, Agricultural Policy, and Environmental Policy." Agricultural and Resource Economics Review **33**(1): 8-17.

Alfsen, K. and M. Greaker (2007): From natural resources and environmental accounting to construction of indicators for sustainable development, *Ecological Economics* 61 (4), 600–610.

Auditor General of Norway (2010): Riksrevisjonens undersøkelse av måloppnåelse og styring i jordbruket. Dokument 3:12.

Bartlett, J., Rusch, G.M., Kyrkjeeide, M.O., Sandvik, H. & Nordén, J. (2020): Carbon storage in Norwegian ecosystems. NINA Report 1774.

Bele, B., A. Norderhaug and H. Sickel (2018); Localized Agri-Food Systems and Biodiversity. Agriculture, 8, 22.

Belfrage, K. (2014): Integrating Food Production and Biodiversity Energy and Scale Issues in Implementation. Doctoral Thesis, Swedish University of Agricultural Sciences Uppsala. Acta Universitatis agriculturae Sueciae 2014:57

Bignal, E.M. and McCracken, D.I. (1996): Low-intensity farming systems in the conservation of the countryside. J. Appl. Ecol. 33: 413-424.

Brekke, K.A., Lone, Ø. and T. Rødseth (1997): Økonomi og økologi, ad Notam Forlag, (in Norwegian)

Burel, F. , C. Lavigne, E.J.P. Marshall, A.C. Moonen, A. Ouin, and S.L. Poggio (2013): Landscape ecology and biodiversity in agricultural landscapes. Editorial. Agric, Ecosyst & Env. 166: 1–2.

Burrascano, S., M. Chytr, T. Kuemmerle, E. Giarrizzo, S. Luyssaert, F. M. Sabatini, and C. Blasi. (2016): Current European policies are unlikely to jointly foster carbon sequestration and protect biodiversity. Biological Conservation 201:370–376.

Chang, J., P. Ciais, N. Viovy, N. Vuichard, B. Sultan, J.-F. Soussana (2015): The greenhouse gas balance of European grasslands. Global Change Biology, 21, 3748-3761.

Dahlberg, A., U. Emanuelsson, and A. Norderhaug (2013): A. Kulturmark og klima – en kunnskapsoversikt. DN utredning 7-2013.

Emanuelsson, U. (2009): The rural landscapes of Europe. How man has shaped European nature. Swedish Research Council Formas.

Eurostat (2002): Natural resource accounts for oil and gas 1980 - 2000, European Communities.

Evenson, R. E., and K. O. Fuglie (2010): Technology capital: The price of admission to the growth club, *Journal of Productivity Analysis* 33: 173–90.

Spengler, A. (2020); Grassland and grazers – What Swiss mountain farming does for the environment, Research Institute of Organic Agriculture (FiBL).

Framstad, E. (ed) (2015): Naturindeks for Norge 2015.

Greaker M., Løkkevik, P. and M. A. Walle (2005): Utviklingen i den norske nasjonalformuen fra 1985 til 2004: Et eksempel på bærekraftig utvikling? Rapport 2005:13, Statistisk sentralbyrå (in Norwegian).

Greaker, M., Grimsrud, K. and L. Lindholt (2016): Ressursrenta i norske fiskerier – utvikling og politikk, Økonomiske analyser 5/2016, Statistisk sentralbyrå (in Norwegian).

Greaker, M., Grimsrud, K. and L. Lindholt (2017): The potential resource rent from Norwegian fisheries, *Marine Policy* 84, 156–166.

Griscom, B.W., Adams, J., Ellis, P.W. et al. (2017): Natural climate solutions. PNAS 114: 11645–11650.

Gundersen, G. I., M. Steinnes & J. Frydenlund (2017): Nedbygging av jordbruksareal En kartbasert undersøkelse av nedbygging og bruksendringer av jordbruksareal. Statistisk sentralbyrå. Rapporter 2017/14.

Hardin, G. (1968): The Tragedy of the Commons, *Science*, New Series, 162 (3859), 1243-1248.

Hatlevik, S. E. (2020.): Vi må begynne å tenke jordvern i utmarka. Plan. 18.02.2020.

Henriksen, S.; Hilmo, O. (2015): Norwegian Red List of Species; Norwegian Biodiversity Information Centre.

Horlings, E., et al. (2020a): Experimental monetary valuation of ecosystem services and assets in the Netherlands, CBS Den Haag, Wageningen University and Research.

Horlings, E., et al. (2020b): Experimental monetary valuation of ecosystem services and assets in the Netherlands. Technical background report, CBS Den Haag, Wageningen University and Research.
Ihse, M. (ed.) 2017. Utan pengar - inga hagar och ängar. KSLA-T 156(5).

IPBES (2019): Global Assessment Report on Biodiversity and Ecosystem Services. Summary for Policy Makers. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

Jakobsson, S. & Pedersen, B. (red.) (2020): Naturindeks for Norge 2020. NINA Rapport 1886. Norwegian institute for nature research (NINA).

Karlsson, J. et al. (2017): Future Nordic Diets. Exploring ways for sustainably feeding the Nordics. TemaNord 2017:566. Nordic Council of Ministers.

Kinn, K. (2020**)** Markens uforløste grøde. En bondefortelling. *Røyst*, 7 (13), 30-35.

Kumm, K.-I., (2011): Den svenska kött- och mjölkproduktionens inverkan på biologisk mångfald och klimat – skillnader mellan betesbaserade och kraftfoderbaserade system. Jordbruksverket Rapport 2011:21.

Kvakkestad, V., P. K. Rørstad, A. Vatn (2015): Norwegian farmers' perspectives on agriculture and agricultural payments: Between productivism and cultural landscapes. Land Use Policy, 42, 83-92.

Lindholt, L. (2021): The value of having the exclusive right to exploit a natural resource, in Glomsrød, S., Duhaime, G. and I. Aslaksen (eds): "The economy of the north 2020", *Statistical Analysis* 167, Statistics Norway.

Maes J, Teller A, Erhard M, Grizzetti B, Barredo JI, Paracchini ML, Condé S, Somma F, Orgiazzi A, Jones A, Zulian A, Vallecilo S, Petersen JE, Marquardt D, Kovacevic V, Abdul Malak D, Marin AI, Czúcz B, Mauri A, Loffler P, Bastrup-Birk A, Biala K, Christiansen T, Werner B (2018): *Mapping and Assessment of Ecosystems and their Services: An analytical framework for ecosystem condition*. Publications office of the European Union, Luxembourg. Retrieved from: http://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/pdf/5th%20MAES%20report.pdf

Malcolm, J. R., Holtsmark, B., & Piascik, P. W. 2020: Forest harvesting and the carbon debt in boreal east-central Canada. *Climatic Change*.

Naturvernforbundet (2020): Høring KLIMAKUR.

Norderhaug, A. & S. Stokke. 2019. Det nödvändiga helhetsperspektivet – Storfjordmodellen for bättre landskapsforvaltning. KSLA 158, 5.

Norwegian Environment Agency (2020): Klimakur 2030. Tiltak og virkemidler mot 2030. M-1625/2020.

NOU (2005): Enkle signaler i en kompleks verden **-** Forslag til et nasjonalt indikatorsett for bærekraftig utvikling, 2005: 5 (in Norwegian).

NOU (2012): Samfunnsøkonomiske analyser, Finansdepartementet, 2012:16 (in Norwegian).

NOU (2013): Naturens goder – om verdier av økosystemtjenester, Miljøverndepartementet, 2013:10 (in Norwegian).

NOU (2018): Klimarisiko og norsk økonomi, Finansdepartementet, 2018:17 (in Norwegian).

Nybø, S. (ed.) (2010): Naturindeks for Norge 2010. DN-utredning 3-2010. Direktoratet for naturforvaltning.

OECD (2001): Multifunctionality Towards an analytical framework, Paris, France

OECD (2013): Agricultural Policy Monitoring and Evaluation, Paris France.

OECD (2021): Agricultural Policy Monitoring and Evaluation 2021. Addressing the challenges facing food systems. Paris, France.

Öhlund, E., et al. (2020): The significance of different realms of value for agricultural land in Sweden. Land Use Policy **96**: 1-12.

Peña-Lévano LM et al. (2019): Climate change interactions with agriculture, forestry sequestration, and food security. Environ Resour Econ 74:653–675.

Pykäla, J. (2007): Maintaining plant species richness by cattle grazing: mesic semi-natural grasslands as focal habitats. Publications in Botany from the University of Helsinki.

Randall, A. (2002): Valuing the outputs of multifunctional agriculture. European Review of Agricultural Economics **29**(3): 289-307.

Rekdal, Y. (2014): Meir mat frå utmark. *Seterbrukaran* 2014/2, 6-7.

Remme, R., Schröter, M. and Hein, L. (2014): Developing spatial biophysical accounting for multiple ecosystem services. *Ecosystem Services*, 10, 6-18.

Romstad, E., et al. (2000): Multifunctional Agriculture. Implications for Policy Design. Ås, Agricultural University of Norway, Department of Economics and Social Sciences. **21**.

SEEA (2021): System of Environmental-Economic Accounting—Ecosystem Accounting: Final Draft (as adopted by the UN Statistical Commission in March 2021), United Nations.

SEEA (2014): System of environmental-economic accounting 2012, SEEA Central Framework, Chapter V Asset accounts, United Nations, https://seea.un.org/sites/seea.un.org/files/seea_cf_final_en.pdf

Sickel, H., Bilger, W. & Ohlson, M. (2012): High Levels of α-Tocopherol in Norwegian Alpine Grazing Plants. Journal of Agricultural and Food Chemistry 60(31):7573-7580.

Slätmo, E. (2014): Agricultural land use change in Sweden and Norway. An analysis of driving forces and the potential to influence change through policy. PhD thesis, Dept. of Geography, University of Gothenburg, Series B, no. 125.

Smith, H. (2017): Behövs ängar och naturbetesmarker i ett multifunktionellt landskap? KSLA-T 156(5), 50-53.

Statistics Norway (2020): Holdings, agricultural area and livestock, https://www.ssb.no/en/statbank/list/stjord

Statistics Norway (2020): Indikatorer for bærekraftsmålene.

Statistics Norway (2014): National wealth and sustainable development, https:// www.ssb.no/natur-og-miljo/barekraft/nasjonalformuen-og-barekraftig-utvikling, (in Norwegian).

Stenseke, M. (2017): Vem bryr sig om ängen og hagen? In M. Ihse (ed.) "Utan pengar – inga hagar og ängar", Kungl. Skogs- och Lantbruksakademiens (KSLA) tidsskrift, 156 (5), 54–58.

Søgaard, G. et al. 2019: Effekter av planting av skog på nye arealer. Betydning for klima, miljø og næring. NIBIO Rapport 5/3/2019.

Sørensen, M. V. 2017: Draining the pool? Carbon storage and fluxes in three Alpine plant Communities, *Ecosystems,* 21, 316–330.

United Nations (2021): System of Environmental-Economic Accounting—Ecosystem Accounting: Final Draft. Prepared by the Committee of Experts on Environmental-Economic Accounting. Statistical Commission, 1–3 and 5 March 2021. https://seea.un.org/content/seea-experimental-ecosystem-accounting-revision

United Nations (2020): S*ystem of Environmental-Economic Accounting- Ecosystem Accounting*. Draft for the Global Consultation on the complete document, Statistics Division, October 2020 United Nations. https://seea.un.org/content/global-consultation-complete-draft

United Nations Statistical Commission: Sustainable Development Goals.

UNEP United Nations Environment Programme (2013): Smallholders, Food Security, and the Environment.

Ward, S. E. et al. (2016): Legacy effects of grassland management on soil carbon to depth. Global Change Biology, 22, 2929-2938.

World Bank (2018): The changing wealth of nations 2018, Building a sustainable future, Washington, D.C.

Wramner, P. and O. Nygård (2010): Från naturskydd till bevarande av biologisk mångfald. COMREC Studies in Environment and Development no. 2.

Wrbka, T., et al. (2008): Impact of the Austrian Agri-Environmental Scheme on diversity of landscapes, plants and birds. *Community Ecology,* 9, 217-227.

Appendix A

Rental prices for agricultural land

In 2020 rental prices for agricultural land were available for 45 per cent of all municipalities in Norway. Prices available on municipality level were used to create mean county prices applied for agricultural land use where municipality prices were not available. If county prices were not available regional prices were used. Not all production types are applicable for all areas of the country.

Descriptive statistics for rental prices on municipality level for 2020 is shown in table A1-A3.

Table A1. Mean values for rental prices on agricultural land in use by county. NOK per acres.

County	Grain (good quality)	Grain (bad quality)	Potato	Vegetables and berries	Grass (good quality)	Grass (bad quality)	Infield pastures
Oslo	350	189	660	1024	293	50	62
Rogaland	542	350	727	1058	431	223	147
Møre and Romsdal	323	222	300	400	70	9	4
Nordland	323	222	250	280	103	61	43
Viken	345	196	550	1039	297	147	64
Innlandet	360	181	725	1013	290	104	61
Vestfold and Telemark	313	149	775	795	240	109	48
Agder	229	58	388	446	204	25	20
Vestland	323	222	300	500	127	36	14
Trønderlag	323	222	664	892	260	139	104
Troms and Finnmark	NA	NA	205	440	90	20	4

Includes prices for production areas not applicable for some regions. To be updated.

Table A2. Maximum values for rental prices on agricultural land in use by county. NOK per acres.

County	Grain (good quality)	Grain (bad quality)	Potato	Vegetables and berries	Grass (good quality)	Grass (bad quality)	Infield pastures
Oslo	350	189	660	1024	293	50	62
Rogaland	600	350	988	1150	750	500	280
Møre and Romsdal	323	222	300	400	150	70	25
Nordland	323	222	300	300	200	150	100
Viken	450	280	800	1800	400	375	123
Innlandet	550	300	1200	1800	435	200	150
Vestfold and Telemark	518	300	1500	1500	453	300	110
Agder	400	150	600	700	400	100	75
Vestland	323	222	300	500	250	100	30
Trønderlag	850	600	1100	1200	750	500	300
Troms and Finnmark	323	222	500	1000	200	80	20

Includes prices for production areas not applicable for some regions. To be updated.

Table A2. Maximum values for rental prices on agricultural land in use by county. NOK per acres.

County	Grain (good quality)	Grain (bad quality)	Potato	Vegetables and berries	Grass (good quality)	Grass (bad quality)	Infield pastures
Oslo	350	189	660	1024	293	50	62
Rogaland	475	350	600	975	210	110	70

Møre and Romsdal	323	222	300	400	0	0	0
Nordland	323	222	50	240	23	25	0
Viken	219	150	500	700	178	82	0
Innlandet	200	0	250	250	120	0	0
Vestfold and Telemark	175	25	300	300	100	0	0
Agder	100	0	150	180	10	0	0
Vestland	323	222	300	500	0	0	0
Trønderlag	150	100	400	600	100	0	0
Troms and Finnmark	323	222	19	120	19	0	0

Includes prices for production areas not applicable for some regions. To be updated.