



University of Pennsylvania
ScholarlyCommons

Summer Program for Undergraduate Research
(SPUR)

Wharton Undergraduate Research

2022

Effects of Government Intervention in Agricultural Sustainability and Profits: Study of Dutch And American Agricultural Policy

Fatima F. Figueroa
University of Pennsylvania

Follow this and additional works at: <https://repository.upenn.edu/spur>

 Part of the [Agricultural Economics Commons](#), and the [Business Commons](#)

Recommended Citation

Figueroa, F. F. (2022). "Effects of Government Intervention in Agricultural Sustainability and Profits: Study of Dutch And American Agricultural Policy," *Summer Program for Undergraduate Research (SPUR)*. Available at <https://repository.upenn.edu/spur/43>

This paper is posted at ScholarlyCommons. <https://repository.upenn.edu/spur/43>
For more information, please contact repository@pobox.upenn.edu.

Effects of Government Intervention in Agricultural Sustainability and Profits: Study of Dutch And American Agricultural Policy

Abstract

This conceptual paper raises questions about the influence policy plays in forming culture, a consumer's willingness to pay, and ultimately profits of a farmer. I look at the Netherlands and compare it to the U.S., as the top two agricultural exporters.

Keywords

Circularity, Agro-economy, Climate policy, Soil Carbon Sequestration

Disciplines

Agricultural Economics | Business

Effects of Government intervention in Agricultural Sustainability and Profits: Study of Dutch And American Agricultural Policy

Abstract: This conceptual paper raises questions about the influence policy plays in forming culture, a consumer's willingness to pay, and ultimately profits of a farmer. I look at the Netherlands and compare it to the U.S., as the top two agricultural exporters.

Keywords: Circularity, Agro-economy, Climate policy, Soil Carbon Sequestration

Introduction

The Netherlands is the second largest agricultural producer in the world yet the 135th largest country, about 1/3 the size of New York state. Despite its size, the country has been able to export some € 65 billion of agricultural produce annually. This summer I spent time working on a Dutch farm, speaking with professors and reading policy to see how the EU and the Dutch national government impact how farmers interact with the environment and how this creates a fiscal impact on their profits. Recently there has been conversation about how ESG initiatives within a company create real tangible value in the sense that the way you manage your company will either create or destroy value. This is particularly important in agriculture since it leaves a scope 1 material impact on the environment.¹ In short, agriculture policies are more inclined to affect how farmers run their business, because of the impact on the environment. McKinsey found that currently about one-third of corporate profits are at risk from state intervention due to environmental regulation.² Yet they do not speak specifically about the agriculture sector, only note that different sectors are more susceptible to government intervention. Agriculture, depending on the country, can be especially susceptible. Therefore from a business perspective there are large potential risks associated with new sustainability regulations expected to be passed by governments looking to lessen their carbon footprint.

¹ <https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance>

² <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/from-principle-to-practice-making-stakeholder-capitalism-work>

As it becomes more urgent for governments to move towards a greener future, I wanted to analyze the quantifiable effect of sustainable policy in agriculture.

In the Netherlands governmental regulations come from both the EU and national government. Around 80% of all laws and rules pertaining to agriculture in the Netherlands are the result of agreements made by the EU member state.³ Both of which have led more astringently with sustainable practices than other countries such as the United States. The difference in positions of the governments is clear in the differing mission statements of the Ministry of Agriculture in the Netherlands, the European Commission of Agriculture and Rural Development, and of the Office of Agriculture Policy in the US. Where the EU defines its goal as to “support EU farmers, food security, the environment, and rural areas,” and the Netherlands mimics a similar sentiment in its goal to “ensure good prospects for the Dutch farming, horticulture and fishing sectors...[in] producing good quality food that is safe and affordable..[and work] with all stakeholders to restore and maintain natural areas.”⁴ The U.S. Office of Agriculture Policy defines its goal as “boosting the economic prosperity for American farmers and ranchers by opening foreign markets to American farm products; promoting transparent, predictable, and science-based regulatory systems overseas; and reducing unnecessary barriers to trade around the world.”⁵ The context in which agricultural policies are being passed in Europe and the Netherlands is very different from that of the United States. Where each government focuses on economic prosperity it is only in the EU and Netherlands and not the U.S. that environmental protections are a clear set goal. This is susceptible to change however the differences in contexts that policy is being passed must be noted. The EU has invested heavily in pushing sustainability efforts which shows in the lifestyle, agriculture research progress such as in vertical farming, and overall culture Growing up in Texas and spending time in the

³<https://www.government.nl/topics/european-union/the-netherlands-and-the-eu-policy-areas#:~:text=Around%2080%25%20of%20all%20laws%20and%20rules%20pertaining,prices%20for%20agricultural%20products%2C%20and%20promoting%20rural%20conservation.>

⁴ https://agriculture.ec.europa.eu/index_en

⁵ <https://www.state.gov/agricultural-policy/>

Netherlands, it was interesting to see how little importance cars played in personal transportation compared to bikes or trains for longer distances. The cultural differences were also obvious in the way the Dutch viewed the disposal of waste. They had a fundamentally different approach. The way I saw it, especially in terms of waste, was that European's minimum expectation was the American standard of excellence. It was the standard, I noticed, in many European households and public waste systems to have

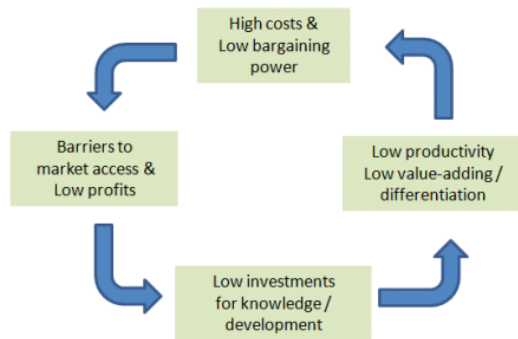


Figure 1. The “vicious” cycle of small farmers.

three compartments - food, recyclable, and trash - compared to the more common singular or dual system seen in the US - trash and sometimes recycling. These individuals' actions are largely influenced by policies such as the EU’s waste framework directive which sets a waste hierarchy and prioritizes reducing waste as well

as the EU’s ban on single-use plastics. This promotion of circularity spills off into the way people live their lives and leads to two very different realities. Looking at how policy quantifiably affects waste, there are metrics that support this narrative. According to the Sensoneo global waste index published in 2022, the United States generates the largest amount of private waste at 811 kilograms per capita whereas the Netherlands produces 535 kilograms per capita of which 28% is recycled.⁶ These tangible differences play a key role in the context in which policy is being passed. Policy and action act as living in which they both continuously influence one another. Or in the case of the U.S., the policy can also influence inaction. In farming practices, I saw key differences when speaking with Dutch farmers. I found that many of them had invested in creating a system of capturing rainwater for their crops. I found rainwater harvesting to be a more common practice in Dutch farming practices than in the U.S. This is only one example of how Dutch and American context experience differences but in short I found that European countries have priorities and catalyzed sustainability initiatives for longer and stronger than in the US, which inevitably

⁶ <https://sensoneo.com/global-waste-index/>

means the impact reported by Mckinsey will lead to different findings in countries like the Netherlands versus the U.S. This means that impacts cannot be directly applied to American markets.

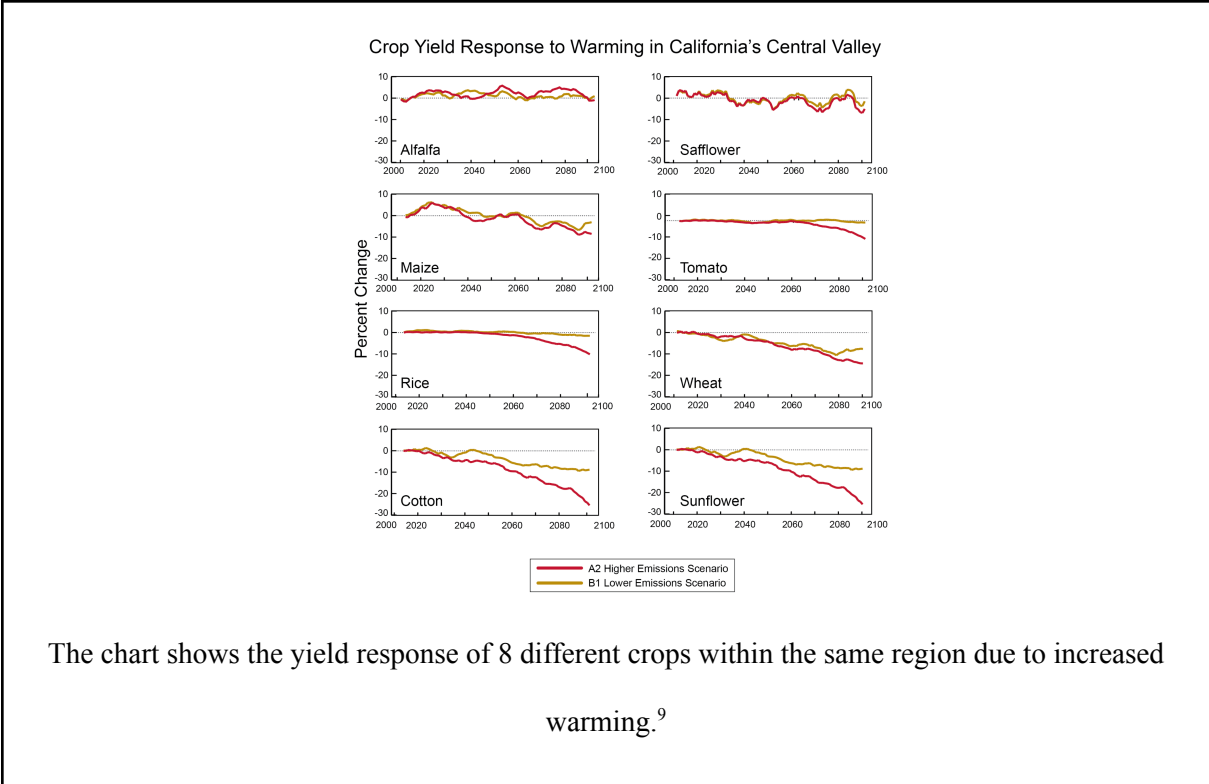
Yet there are some challenges that are faced by both Dutch and American farmers. For small to medium farmers, which in 2010 accounted for 85% of all EU farms⁷, and in 2021 accounted for 88% of U.S. farms,⁸ it is hard to reach economies of scale. Additionally, because there is little differentiation in agricultural products they are mostly price takers in agreement with the law of one price in economics. In addition to this, the agricultural system faces a lot of cost, and risk, and is currently characterized by many wasted resources such as misallocation of water. Some technological solutions such as smart water sensors are being recommended but this technology is new and very costly at the commercial level. Farmers are unable to access these technologies as they mostly prioritize cutting costs. In conversations with farmers, the common consensus is that they would like to invest in sustainability initiatives but sustainability comes second since they must create profits at the end of the day and it takes money to invest in these initiatives. However, not focusing on sustainability will definitely hurt production and profits. I will speak further on the impacts of inaction from both the policy and farmer perspectives.

Inaction

Not enacting policy to reduce emissions, control soil degradation and restore biodiversity will result in a less direct disturbance on a farmer's balance sheet in the short term, but in the long run will reduce crop yields and profit. However, we are already seeing a loss in profit premature budding due to a warm winter

⁷ A_Community-Based_Agro-Food_Hu.pdf

⁸ <https://www.nass.usda.gov/Newsroom/archive/2021/01-22-2021.php>



caused \$220 million in losses of Michigan cherries in 2012.¹⁰ Because of an ultimate decrease in yields and arable land, agricultural supply will lessen, which basic economic concepts state that this will cause prices to increase, however also meaning less food accessibility. This is undesirable because according to estimates compiled by the Food and Agriculture Organization (FAO), by 2050 we will need to be producing 60% more food to feed a growing population of 9.3 billion.¹¹ In addition to soil degradation resulting in a reduction in the capacity of soil to feed crops and fertilizers and pesticides only further exacerbating the issue, there is also a real concern about the future of water in agriculture. Agriculture irrigation currently accounts for 70% of water use worldwide yet only about 60% of said water reaches intended crops.¹² Because climate change also means drought farmers will likely have to increase irrigation however this will prove impossible in some areas. Presently, the excessive use of animal manure and fertilizer threatens the quality of ground and surface waters. A decrease in water accessibility raises

⁹<https://data.globalchange.gov/report/nca3/chapter/agriculture/figure/crop-yield-response-to-warming-in-californias-central-valley#>
¹⁰ <http://nca2014.globalchange.gov/report/sectors/agriculture>
¹¹<https://www.un.org/en/chronicle/article/feeding-world-sustainably#:~:text=According%20to%20estimates%20compiled%20by,toll%20on%20our%20natural%20resources.>
¹² <https://www.oecd.org/agriculture/topics/water-and-agriculture/>

concerns about increased water prices. The OECD, or The Organization for Economic Co-operation and Development is an intergovernmental organization comprised the United States, Netherlands, France, and 35 other countries, that recommends creating incentives for farmers to improve their water use and better manage the use of polluting agricultural inputs; and remove policies that support excessive use of water and polluting activities.¹³ In 2016 they published the OECD Council Recommendation on Water which recommends installing a polluter pays system, where the cost to clean polluted water, falls on the polluter which would leave a monetary impact on farmers.¹⁴ Currently in the US there is no direct cost on farmers and any policy of this sort would likely take longer to be implemented here compared to other countries since agriculture in regards to its nutrient and sediment contribution remains largely unregulated in the United States. The main tools for reducing agricultural water quality impacts are through voluntary means (e.g. economic incentives).¹⁵ This is especially clear looking at policy since agriculture has been exempt from many sustainability initiatives such as the exemption given to agriculture by the EPA in reporting of fertilizers, pesticides, and other chemical substances when “applied, administered, or otherwise used as part of routine agricultural activities use under Sections 311 and 312 (October 15, 1987, 52 FR 38344).”¹⁶ In the Netherlands there is a monitoring system in place by the government in the form of permits, Fertilizer Acts, and connected regulations which define the acceptable levels of nitrogen and phosphate used by farmers and the way to handle and use manure and fertilizers but no “polluter pays” system.¹⁷ Historical exemptions, however, are no stranger to change as the EU government is lessening the long-standing exception granted to Dutch farmers for their use of livestock manure as fertilizer. This unfortunately means that livestock farmers will have to dispose of the manure they can no longer spread on their lands, which is expected to cost thousands of euros annually.¹⁸ The Cabinet is working on

¹³ <https://www.oecd.org/agriculture/topics/water-and-agriculture/>

¹⁴ <https://www.oecd.org/environment/resources/Council-Recommendation-on-water.pdf>

¹⁵ <https://www.oecd.org/agriculture/topics/water-and-agriculture/documents/oecd-water-policies-country-no-te-united-states.pdf>

¹⁶ <https://www.epa.gov/epcra/agricultural-use-exemption-and-fuels#:~:text=The%20exemption%20for%20routine%20agricultural,1987%2C%2052%20FR%2038344.>

¹⁷ <https://www.oecd.org/agriculture/topics/water-and-agriculture/documents/oecd-water-policies-country-no-te-netherlands.pdf>

¹⁸ <https://nltimes.nl/2022/09/05/european-union-definitely-changing-netherlands-fertilizer-policy>

financial compensation for the affected farmers which could fall under the new Common Agriculture Policy (CAP) which I will speak further on later in the paper.

Taxes, Subsidies, Financing

In behavioral economics we learn that governments can choose to influence actions through taxes and subsidies. Subsidies are common in agriculture where both the U.S. and the Netherlands have poured billions of dollars into subsidizing costs through CAP and the Farm bill. In 2019, the EU set a budget of 41.43 billion euros for the purpose of providing income support for EU farmers through direct payments, and/or public services.¹⁹ The New Common Agriculture Policy (CAP) focuses on achieving economic sustainability through direct payments to farmers for “greening.” A process which the EU defines as “preserving natural resources and providing public goods, which are benefits to the public that are not reflected in market prices.”²⁰ All EU member countries have to allocate 30% of their income support budget specifically to “greening” where they must meet specific criteria of promoting crop diversification, maintaining permanent grassland and dedicating at least 5% of arable land to areas beneficial for biodiversity. The USDA’s Natural Resources Conservation Service also provides financial assistance and one-on-one technical support to assist producers in implementing climate-smart conservation practices such as no-till, cover crops, prescribed grazing, and silvopasture.

Subsidies mean that farmers are economically benefiting from promoting government goals. Another form governments can promote the economic viability of farmers is by granting contracts and other interventions. This point is one of five highlighted in McKinsey’s study on five ways strong ESG propositions create value for a company by regulatory and legal interventions. The Netherlands is making organic farms more competitive with regular agriculture by signing covenants with supermarkets, the Dutch Confederation of Agriculture and Horticulture (LTO), and other parties for the joint promotion of organic products which will cause a 10% increase in the sale of organic products.²¹

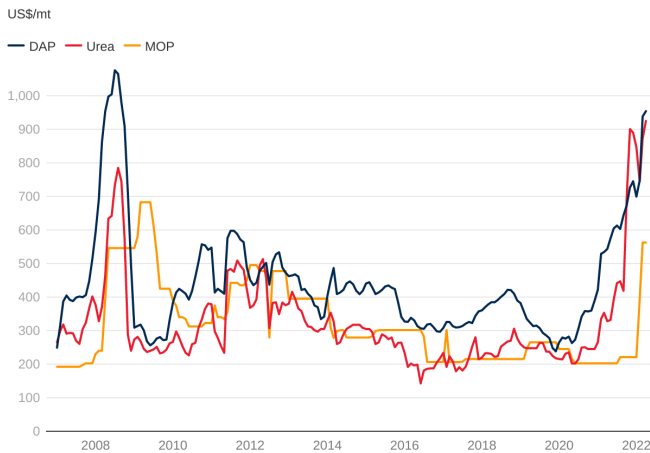
¹⁹ https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-glance_en

²⁰ https://agriculture.ec.europa.eu/common-agricultural-policy/income-support/greening_en#penalties

²¹ <https://www.government.nl/topics/agriculture/agriculture-and-horticulture>

Even without subsidies or other government interventions, farmers have to look for alternative

Fertilizer prices



Note: DAP = diammonium phosphate. MOP = muriate of potash. Last observation is April 2022.
Source: Bloomberg; World Bank.

products because of rising prices. This is especially clear in fertilizers. Farmers who still rely on fertilizer, even with the environmental externalities, are facing a tough reality as prices continue to rise. Fertilizer prices rose nearly 30% since the start of 2022 following an 80% surge in 2021.²² This increase is due to economic sanctions, and environmental limits.

Fertilizers provide crops with nutrients like potassium, phosphorus, and nitrogen, which allow crops to grow bigger, and faster, and produce more food. Alternate techniques are being developed.

advancing pest control by techniques such as intercropping which is helpful in increasing biodiversity, restoring soil fertility, and reducing pests but labor intensive and costly to a sector focused on reducing costs.²³ Environment and farmers will both benefit from a widespread subsidy for this practice.

No-Till & Intercropping

Total carbon in soil accounts for more than that in the atmosphere and vegetation, plants naturally eliminate CO₂ from the atmosphere either using it for growth or return to the soil. Carbon in solid improves soil aeration, water drainage, and retention, and reduces the risk of erosion and nutrient leaching. However, tillage causes a significant amount of carbon to escape soil since exposing soil organic carbon or humus to the sun and oxygen destroys it and releases CO₂. Increased CO₂ in the atmosphere

²² <https://blogs.worldbank.org/opendata/fertilizer-prices-expected-remain-higher-longer>

²³ Broek, R.C.F.M. van der, Alebeek, F.A.N. van and W. van den Berg. 2008. Ecological infrastructure and polycultures to improve natural control of insect pests in cabbage: first year results. IOBC/ WPRS Bulletin 34: 109-112.

also reduces the nutritional value of most food crops. Rising levels of atmospheric carbon dioxide reduce the concentrations of protein and essential minerals in most plant species; this direct impact of rising CO₂ on crop nutrition poses a potential hazard to human health.²⁴ No-till farming successfully reduces carbon released from the soil, fuel, and labor cost and can help restore soil health. However, in conversation with farmers, I found that the lack of extensive research on the topic caused doubts since many of their livelihoods ultimately depend on their yields. Some mentioned that no-till could potentially make the soil more susceptible to weeds and cause farmers to increase their use of herbicides which has its own environmental externalities.²⁵ Intercropping, the process of harvesting crops simultaneously, has been found to decrease the risk of pests and improve biodiversity yet also requires more research.

Carbon Capture & Carbon Credits

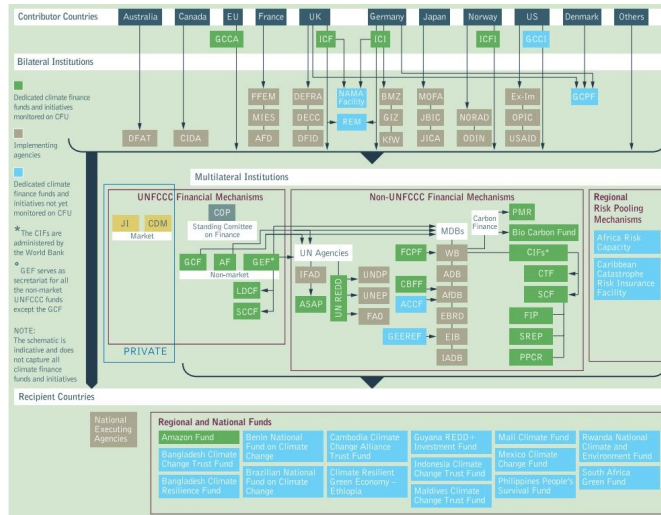
Carbon sequestration is important to soil health but also vital to reducing emissions and achieving the carbon neutral or carbon negative emissions that some governments are striving for. A concept that could prove to truly impact the climate crisis. Carbon capturing is a strong point of circularity since it mimics a fundamental concept of circular ecosystems, what happens in nature, on a larger scale. There is potentially a large market for carbon sequestration where governments can push policy or create subsidies for capturing carbon. Climeworks, a carbon capture, and storage plant in Iceland is currently removing carbon from the air. They hope that by the middle of this decade, the cost of removing carbon will cost \$500 per ton of carbon dioxide removed and around \$300 per ton by 2030.²⁶ There are very real conversations happening about a future where farmers can participate in a market where they sell carbon credits to polluters. However, we know that we cannot regulate what we cannot measure and there is still not a perfect system for accurately measuring carbon capture in soil. This system for measuring impact would require significant scientific and political advances

²⁴ <https://climatechange.chicago.gov/climate-impacts/climate-impacts-agriculture-and-food-supply#ref1>

²⁵ <https://www.usda.gov/media/blog/2017/11/30/saving-money-time-and-soil-economics-no-till-farming>

²⁶ <https://www.cnbc.com/2022/06/28/climeworks-carbon-dioxide-removal-company-building-iceland-plant.html>

The world bank has created a model to demonstrate funding available for climate-smart agriculture called The Global Climate Finance Architecture, these programs such as others funded by the EU, Netherlands, and the U.S. have the potential for funding huge technological advances ready to be taken to market.²⁷



Conclusions

If the future is so dark, why does independent action not happen without policy? Well the answer is that there are not enough resources. Change is happening in small amounts in both the Netherlands and the U.S. but it is clear that more policy influences more action. Farmers depend very much on government policies such as subsidies and sponsored research to innovate the sector. Looking forward, a more sustainable agricultural approach has to be spearheaded by goal oriented policy. It is both environmentally and economically unsustainable to continue on our current path because of the impacts on the environment but also the environmental impact on production. However the truth is the government can very much influence the economic viability of these solutions. Doing so will require substantial investment in climate-smart agriculture, restoring biodiversity, carbon capturing, reducing food waste, and lessening the impact of agriculture on water.

²⁷ <https://csa.guide/csa/overview-of-sources>

Going Forward, New Business Opportunities

Although farming is now more critical than ever farmers also have the opportunity to diversify. We must prioritize economic growth and sustainable development and it seems that the answer lies somewhere between government interventions and scientific development.