

Zeitschrift: Agrarwirtschaft und Agrarsoziologie = Économie et sociologie rurales [2014-ff.]
Herausgeber: Schweizerische Gesellschaft für Agrarwirtschaft und Agrarsoziologie
Band: - (2021)

Rubrik: SGA Newcomer Award 2021

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SGA Newcomer Award 2021

1st rank

Wie beschafft Zürich? Systemanalyse und Einsatz biologischer und regionaler Lebensmittel in der öffentlichen Verpflegung der Stadt Zürich

Mirjam Schleiffer

“Far from being a prosaic back office function [...] public procurement is potentially one of the most powerful instruments that governments have at their disposal for effecting social, economic and environmental change.” (Morgan & Morley, 2014, S.1)

Die Ernährungsgewohnheiten der Menschheit bedrohen die natürlichen Ressourcen unseres Planeten (McIntyre, Herren, Wakhungu, & Watson, 2009). Wegen der zunehmenden Urbanisierung entsteht ein Grossteil dieser Nahrungsmittelnachfrage in Städten, was Städte zu wichtigen Akteuren der Ernährungspolitik macht. Weltweit reagieren Stadtregierungen auf diese Entwicklung und fördern nachhaltige Ernährungssysteme (Moragues-Faus & Morgan, 2015; Morgan, 2015). Oftmals wird damit der Konsum von biologischen und regionalen Produkten verstanden (Mikkelsen, 2018; Sonnino, 2009; Von Koerber, 2014). Ein wichtiges politisches Instrument in dieser Mission ist die öffentliche Beschaffung, also der Einkauf von Lebensmitteln für die Verpflegung in öffentlichen Betrieben (Barling et al., 2013; Sonnino, 2016). Dank der erheblichen Kaufkraft und Reichweite der öffentlichen Beschaffung, beeinflussen Stadtregierungen so das Marktgeschehen und die Ernährungsweise der Kundschaft (Morgan & Morley, 2014).

Auch die Stadt Zürich setzt sich Ziele, um den Einkauf von nachhaltigen und regionalen Produkten in den städtischen Verpflegungsbetrieben (SVBs) zu steigern (Stadt Zürich, 2019). Unklar ist jedoch, wie die öffentliche Lebensmittelbeschaffung der Stadt bisher gestaltet ist. Für die Beurteilung einer

Beschaffungspolitik ist eine empirische Untersuchung unerlässlich (Smith et al., 2016). Dazu gehört die Analyse der aktuellen Lebensmittelflüsse hinsichtlich der Art und Menge der eingekauften Lebensmittel und ausgewählter Nachhaltigkeitskriterien. Aus diesem Grund untersucht die vorliegende Masterarbeit (1) wie die öffentliche Lebensmittelbeschaffung in der Stadt Zürich organisiert ist und (2) wie gross die Anteile an biologischen und regionalen Produkten in den SVBs sind. Ausserdem beleuchtet eine dritte Forschungsfrage (3) die Beschaffungskriterien, Hürden und Lösungsansätze einer regionalen Lebensmittelbeschaffung der öffentlichen Hand und deren Implikationen für die Stadt Zürich.

Methodik

Für die Behandlung der ersten beiden Forschungsfragen wurde das Untersuchungsgebiet eingegrenzt. Die Untersuchung beschränkt sich auf SVBs, welche der Verwaltung der Stadt Zürich angehören. Die SVBs wurden in drei Beschaffungstypen abhängig von Management und Koordination des Beschaffungsprozesses eingeteilt in «Eigenbetrieb mit koordinierter Beschaffung (EkB), Eigenbetrieb mit dezentraler Beschaffung (EdB) und Betrieb durch eine private Cateringfirma (pC)». Zusätzlich erfolgte eine Einteilung der SVBs in fünf Institutionstypen. Die Organisation des Zürcher Beschaffungssystems wurde mit Hilfe von Geodaten, einer Internetrecherche und einem Interview in einem Systembeschrieb zusammengefasst. Zudem wurde für jeden Beschaffungstyp die Relevanz für die städtische Gesamtbeschaffung berechnet. Aufbauend auf den Ergebnissen dieses Systembeschriebs wurde mit Hilfe einer angepassten «City Food-Flow Analysis» Methode (CFFA) die Anteile von biologischen und regionalen Produkten im Einkauf der Zürcher SVBs berechnet (Moschitz & Frick, 2020). Die Regionsdefinition basierte auf folgenden zwei Ebenen: (1) Produkte, welche im Kanton Zürich, Zug oder Aargau produziert wurden, (2) Produkte Schweizer Herkunft. Die Untersuchung beschränkte sich auf zwölf Produktgruppen. Als Datengrundlage dienten die Bestelldaten der koordinierten Beschaffung aus dem Jahr 2019 und sechs semi-strukturierte Interviews mit BetriebsleiterInnen von SVBs. Die COVID-19 Pandemie erschwerte eine breitere Befragung. Die Methodik der dritten Forschungsfrage basierte auf einer systematischen Literaturanalyse von 20 wissenschaftlichen und grauen

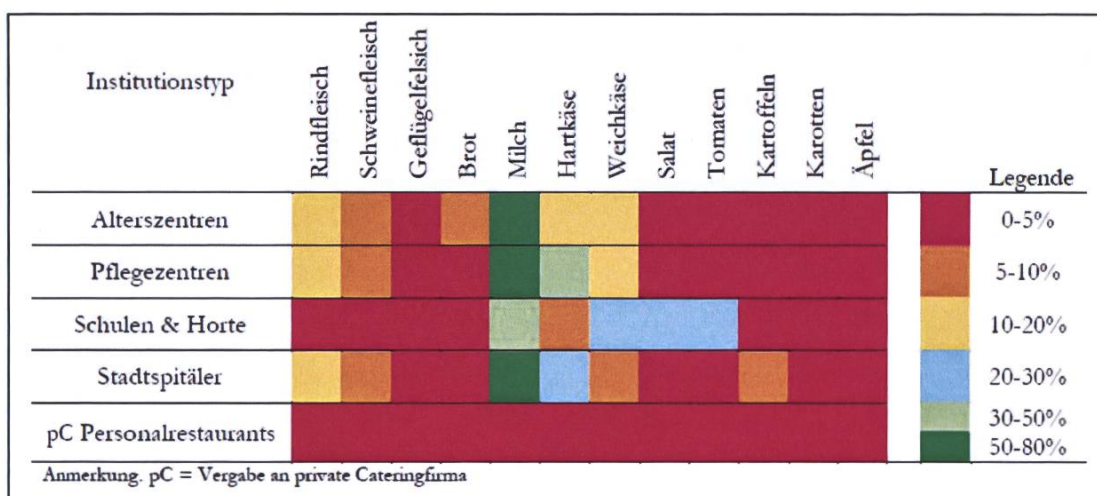
Literaturquellen über die regionale Beschaffungspraxis der öffentlichen Hand in der Schweiz und der Europäischen Union (EU). Die Literatur wurde mittels einer qualitativen Inhaltsanalyse auf Beschaffungskriterien, Hürden und Lösungsansätze für den regionalen Einkauf untersucht.

Resultate

Die Systemanalyse zeigt die strategisch wichtige Rolle der koordinierten Beschaffung des Gesundheits- und Umweltdepartements für den Betrieb der Zürcher SVBs. Die SVBs des Typs «EkB» sind für 70 % aller 7,1 Millionen Mahlzeiten, welche jährlich durch die Stadt produziert werden, verantwortlich. Die Beschaffungstypen pC und EdB produzieren lediglich 25 %, respektive 5 % der städtischen Mahlzeiten.

Weiterhin beleuchtet die Analyse der Lebensmittelflüsse die Beschaffungspraxis der EkB und pC SVBs in Zürich. EkB Betriebe kaufen durchschnittlich 11 % Bioprodukte, pC Betriebe 9 % Bioprodukte ein. Bei der Milch wird von beiden Beschaffungstypen über die Hälfte in Bioqualität eingekauft. Tabelle 1 verdeutlicht ausserdem, dass die SVBs primär tierische Produkte in Bioqualität einkaufen. Die Auswertung der Herkunft zeigt die hohe Priorität für Schweizer Produkte in der Beschaffungspraxis von Zürich. Durchschnittlich beschaffen die befragten SVBs 90 % der untersuchten Produkte aus der Schweiz. Auf der subnationalen Regionsebene kann auf Grund unzureichender Datenlage keine Aussage gemacht werden.

Tabelle 1: Relative Anteile an Bioprodukten im Einkauf der verschiedenen Institutionstypen.



Die Literaturanalyse zeigt, dass die Beschaffung von regionalen Lebensmitteln für die öffentliche Hand in der EU und der Schweiz trotz internationaler Handelsrichtlinien möglich ist. Mit Hilfe kreativer Beschaffungskriterien bezüglich Frische, Verpackung, Labels, Saisonalität, Transparenz oder durch die Abstimmung mit regionalen Anbietern können öffentliche Aufträge regionale Produkte bevorzugen.

Diskussion & Fazit

Die Arbeit quantifiziert erstmals den Stellenwert der drei Beschaffungstypen EkB, EdB und pC in der Stadt Zürich und unterstreicht die Relevanz der koordinierten Beschaffung für die Gesamtbeschaffung von Zürich. Die Datenlage und die Validität der Resultate werden als gut eingeschätzt. Bezüglich dem Bioanteil ist die Stadt Zürich im schweizerischen Vergleich eine Vorreiterin (Bänninger et al., 2020), kann aber von anderen europäischen Städten lernen (Smith et al., 2016). Die ungleiche Verteilung der Bioanteile über die Produktgruppen und Institutionstypen hinweg weist auf Handlungsoptionen hin. Beispielsweise könnten Vorgaben zu einem Mindestbioanteil auf Produktebene eine gleichmässige Nachfrage auf dem Biomarkt kreieren. Die Auswertung der Herkunft der Lebensmittel auf subnationaler Ebene wurde durch die Intransparenz im Handel erschwert. Diese Problematik tritt auch in anderen Studien auf (Arens-Azevedo, 2012; Moschitz & Frick, 2018). Allerdings ist zu betonen, dass sich die Kriterien biologisch und regional nicht gleich stark zur Beurteilung der Nachhaltigkeit eines Lebensmittels eignen. Biologische Produkte haben aus ökologischer und gesundheitlicher Sicht viele Vorteile gegenüber konventionellen Produkten (Reganold & Wachter, 2016). Hingegen kann die Nachhaltigkeit regionaler Produkte nur in Kombination mit anderen Indikatoren abgeschätzt werden (Galli & Brunori, 2013).

Die Ergebnisse der Literaturanalyse über regionale Beschaffungsinitiativen der öffentlichen Hand bieten einen Einblick in die rechtliche Grauzone der regionalen Beschaffung. Da das Vorgehen dieser Arbeit die Unterschiede im Beschaffungsrecht zwischen der Schweiz und der EU vernachlässigt, bleibt die Anwendbarkeit der EU-Beschaffungskriterien auf die Stadt Zürich offen. Jedoch sind für eine Umsetzung die

Intransparenz im Handel und die Organisation der öffentlichen Beschaffung relevante Hürden für die Stadt Zürich. Mögliche Lösungsansätze sind organisatorische Anpassungen und die Zusammenarbeit mit verschiedenen Akteuren entlang der Wertschöpfungskette.

Die vorliegende Masterarbeit erweitert die wissenschaftliche Diskussion zum politischen Handlungsspielraum der öffentlichen Beschaffung und bietet mit der angepassten CFFA Methodik einen gesamtstädtischen Ansatz um die Lebensmittelflüsse in der öffentlichen Beschaffung abzuschätzen. Zukünftige Studien könnten die Effektivität bestimmter Beschaffungspraktiken untersuchen und diese hinsichtlich deren Nachhaltigkeitswirkung beurteilen. Wissenschaftliche Untersuchungen wie diese zeigen den potentiellen Beitrag der öffentlichen Beschaffung zu einem nachhaltigen Ernährungssystem und können die strategische Beschaffung weiter legitimieren.

Literaturverzeichnis

- Arens-Azevedo, U. (2012). Regionale Produkte in der Gemeinschaftsverpflegung: aktuelle Situation, Hemmnisse und Förderndes bei der Verwendung. Vierteljahrshefte zur Wirtschaftsforschung, 81(4), 147-162. doi:10.3790/vjh.81.4.147
- Bänninger, A., Baume, C. d. L., Beelong Sàrl, Bolliger, U., Scherraus, T., & Culinarium Trägerverein. (2020). PHR-Projekt Nachhaltige, vermehrt regionale Versorgung der Gemeinschaftsgastronomie: Fachlicher Schlussbericht – Projektergebnisse und -empfehlungen. AGRIDEA. Lindau. Verfügbar unter: <https://www.agridea.ch/de/themen/maerkte-agrar-und-lebensmittelsektor/gemeinschaftsgastronomie/>
- Barling, D., Andersson, G., Bock, B., Canjels, A., Galli, F., Gourlay, R., Mikkelsen, B. (2013). Revaluing public sector food procurement in Europe: an action plan for sustainability. Verfügbar unter: <http://www.foodlinkscommunity.net/cop-public-procurement.html>
- Galli, F., & Brunori, G. (2013). Short food supply chains as drivers of sustainable development. Evidence document (No. 265287). Document developed in the framework of the FP7 project FOODLINKS. Verfügbar unter: <http://www.foodlinkscommunity.net/cop-short-food-supply-chains.html>

- McIntyre, B., Herren, H., Wakhungu, J., & Watson, R. (2009). Agriculture at a Crossroads: Synthesis Report. International Assessment of Agricultural Knowledge, Science and Technology for Development, Washington. Verfügbar unter: <https://www.weltagrарbericht.de/original-berichte.html>
- Mikkelsen, B. (2018). Organic AND local? – Caseinsights from a two-in-one approach to regional public food sourcing for the public in the city of Aalborg. Paper presented at the 2nd International Workshop “Organic farming and agroecology as a response to global challenges”, Capri.
- Moragues-Faus, A., & Morgan, K. (2015). Reframing the foodscape: the emergent world of urban food policy. *Environment and Planning*, 47(7), 1558-1573. doi:10.1177/0308518X15595754
- Morgan, K. (2015). Nourishing the city: The rise of the urban food question in the Global North. *Urban Studies*, 52(8), 1379-1394. doi:10.1177/0042098014534902
- Morgan, K., & Morley, A. (2014). The public plate: Harnessing the power of purchase. In T. K. Marsden & A. S. Morley (Eds.), *Sustainable Food Systems* (pp. 84-102). London: Routledge.
- Moschitz, H., & Frick, R. (2018). KERNiG-AP1. 1 Bestandsaufnahme der kommunalen Ernährungssysteme–Landwirtschaftliches Produktionspotenzial und Lebensmittelflüsse. Forschungsinstitut für biologischen Landbau. Frick. Verfügbar unter: <https://orgprints.org/32087/>
- Moschitz, H., & Frick, R. (2020). City food flow analysis. A new method to study local consumption.
- *Renewable Agriculture and Food Systems*, 1-13. doi:10.1017/S1742170520000150
- Reganold, J. P., & Wachter, J. M. (2016). Organic agriculture in the twenty-first century. *Nature Plants*, 2(2), 15221. doi:10.1038/nplants.2015.221
- Smith, J., Andersson, G., Gourlay, R., Karner, S., Mikkelsen, B. E., Sonnino, R., & Barling, D. (2016). Balancing competing policy demands: the case of sustainable public sector food procurement. *Journal of cleaner production*, 112(2016), 249-256. doi:10.1016/j.jclepro.2015.07.065

- Sonnino, R. (2009). Quality Food, Public Procurement, and Sustainable Development: The School Meal Revolution in Rome. *Environment and Planning A: Economy and Space*, 41(2), 425-440. doi:10.1068/a40112
- Sonnino, R. (2016). The new geography of food security: exploring the potential of urban food strategies. *The Geographical Journal*, 182(2), 190-200. doi:10.1111/geoj.12129
- Stadt Zürich. (2019). Strategie nachhaltige Ernährung Stadt Zürich. Zürich: Umwelt und Gesundheitsschutz. Verfügbar unter: https://www.stadt-zuerich.ch/gud/de/index/umwelt_energie/ernaehrung/ernaehrungsstrategie.html.
- Von Koerber, K. (2014). Fünf Dimensionen der Nachhaltigen Ernährung und weiterentwickelte Grundsätze—Ein Update. *Ernährung Fokus*, 14, 260-268.

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2nd rank

Effects of extreme weather on dairy production and on the respective sustainable performance in the Netherlands

Stéphanie Vuille

The agricultural sector is crucially dependent on weather and climate conditions. Climate change increases farmers exposure to extreme weather shocks affecting their production (e.g. Finger et al., 2018, Grillakis, 2019, Trnka et al., 2014). This holds for both crop and livestock production. At the same time, farms need to become more sustainable. In response to climate change and to increasing consumer interests, the dairy companies and agricultural policy in Europe now increasingly develop measures towards a sustainable dairy sector. It is possible that these sustainable goals are not only influenced by the farmer and his farm's management but also by external factors like climate change. Extreme weather, like high temperatures and drought, has direct effects on dairy cattle and their production but also indirect effects such as on the forage production (Mukherjee et al., 2013; Key and Sneeringer, 2014; Qi et al., 2015; Finger et al., 2018; Perez-Mendez et al., 2019)(ii). Weather extremes can undermine the sustainability performance of farms and thus reduces farm income. This could decrease incentives to invest in more sustainable farming practices.

This thesis explores the effects of extreme weather in the Netherlands on the following sustainable indicators; greenhouse gas emissions per ton milk, nitrogen balance and protein from own land (FrieslandCampina, 2018). It aims to understand how the sustainable performance of the dairy production is influenced by extreme weather and the mechanism behind them.

Several studies explore the effects of changing weather conditions on the dairy cattle. Above a certain threshold of temperature and humidity, the cows require more energy for their metabolism thus reducing their milk production (Nardone et al., 2010; Key and Sneeringer, 2014) the effects of global warming will not be adverse everywhere, a relevant increase of drought is expected across the world affecting forage and crop production. Hot environment impairs production (growth, meat and milk yield and

quality, egg yield, weight, and quality. But there are also indirect effects, like on the forage production which have been less explored. Perez-Mendez et al., (2019) found out that extreme weather, especially high temperatures can increase grass yields in Spain. Shrestha et al., (2014) found similar results but highlighted the significant effects of soil type and drainage. On the other hand, other papers point out the increasing difficulties of a pasture system, as grass growth is limited under drought and animals are more exposed to extreme climate conditions (Nardone et al., 2010; André et al., 2011). If we find out in this thesis that the sustainable scores are influenced by extreme weather, it will have another new indirect effect on dairy farmers' income. In our knowledge, this aspect has not yet been covered in the actual literature. With society's increasing awareness of sustainability, the score of such indicators will probably gain in significance in the future for the dairy companies and the farmers.

In Europe, some dairy companies develop different sustainable goals to stimulate farmers to produce in a more conscious way. Farmers are mostly paid for their performances according to these respective targets through an increased milk price. Only the ones who reach more than the average score will receive a pay-off (Njuki and Bravo-Ureta, 2015; FrieslandCampina, 2018). To illustrate this system, we consider the case of a large cooperative dairy company in the Netherlands, FrieslandCampina, who develop their own sustainable goals in three parts; animal health and welfare, climate and biodiversity (FrieslandCampina, 2018). In our case we focus on the two-last parts, namely climate, with the greenhouse gas emissions, and biodiversity, with the nitrogen soil balance and the share of protein from own land. These all three sustainability indicators are calculated by the Kringloopwijzer, a large data set on farm level, which is an online nutrient cycling assessment tool (Kringloopwijzer, 2020), managed by ZuivelNL, the Dutch dairy sector organisation.

We expect extreme weather to have significant effects on the greenhouse gas emissions, on nitrogen balance and on protein from own land and aim to understand the mechanism behind. For the greenhouse gas emissions per ton milk, several factors, like milk production, forage production, electricity consumption, etc., that could be affected by extreme weather are

include in the calculation, which make difficult to make any assumption on the global effects on this indicator. For the nitrogen balance, which is the difference between nitrogen inputs and outputs per hectare, we suggest that weather would have no effects on nitrogen input but only on output, respectively in the nitrogen yield on the field. The quality of the forage is expected to be negatively linked to drought despite that predicting the effects on yield dry matter is more ambiguous. Overall, we expect extreme weather to increase the nitrogen balance. Considering protein from own land, which is the percentage of protein produce on the farm on the whole protein quantity fed to the dairy, we also expect changes due to weather effects on forage production. We assume that the total protein yielded will be negatively affected by drought, as dry matter yield losses are often linked with drought (Shrestha et al., 2014; Perez-Mendez et al., 2019). Thus, we expected the yield losses to have a significant effect and to lead to a decreasing percent of protein from own land under extreme weather.

In the same way as other studies on this topic, the effects of weather on the sustainable score are empirically analysed. The anonymised dataset from the Kringloopwijzer is on farm level and represents approximately 11,000 dairy farms from FrieslandCampina for the years 2017 and 2018. Farmers have to fill input data (like number of animals, hectares, yields, forage quality, purchase of forage, etc.) on the Kringloopwijzer's platform every year. Then the tool calculates the sustainable scores. For our analysis, we used the input data from the farmers and the scores calculated by the tools. The data per farm are located within the three first postcode digits. We enrich this dataset with weather data like temperature load (Koninklijk Nedelands Meteorologisch Instituut, 2018a, 2018b), rainfall (Koninklijk Nedelands Meteorologisch Instituut, 2020) and surface soil moisture (Copernicus, 2020). Temperature load above 25°C, 28°C and 35°C represent heat waves and is the area between the daily temperature curve and the temperature threshold. The total rainfall during the vegetation period as well as the median of the surface soil moisture observed in the same period illustrate drought. From the first observations, we noticed some very large outliers, probably because input data are self-reported by the farmers and subjects to mistakes. We assume that the very large outliers disturb the

normal distribution of the variables and lead to noise in the Mahalanobis distance calculations. To handle this point, we create a subset of reliable dairy farms before cleaning and then applied the Mahalanobis distance. With this approach, we remove 15.36% of our farm level dataset, which is large, but in line with the expectations of the experts from the Kringloopwijzer (Kringloopwijzer, 2019). To estimate the impact of extreme weather, we use first differentiated and pooled regressions and we look for the effects of control and explanatory variables used in the calculation on sustainable indicators.

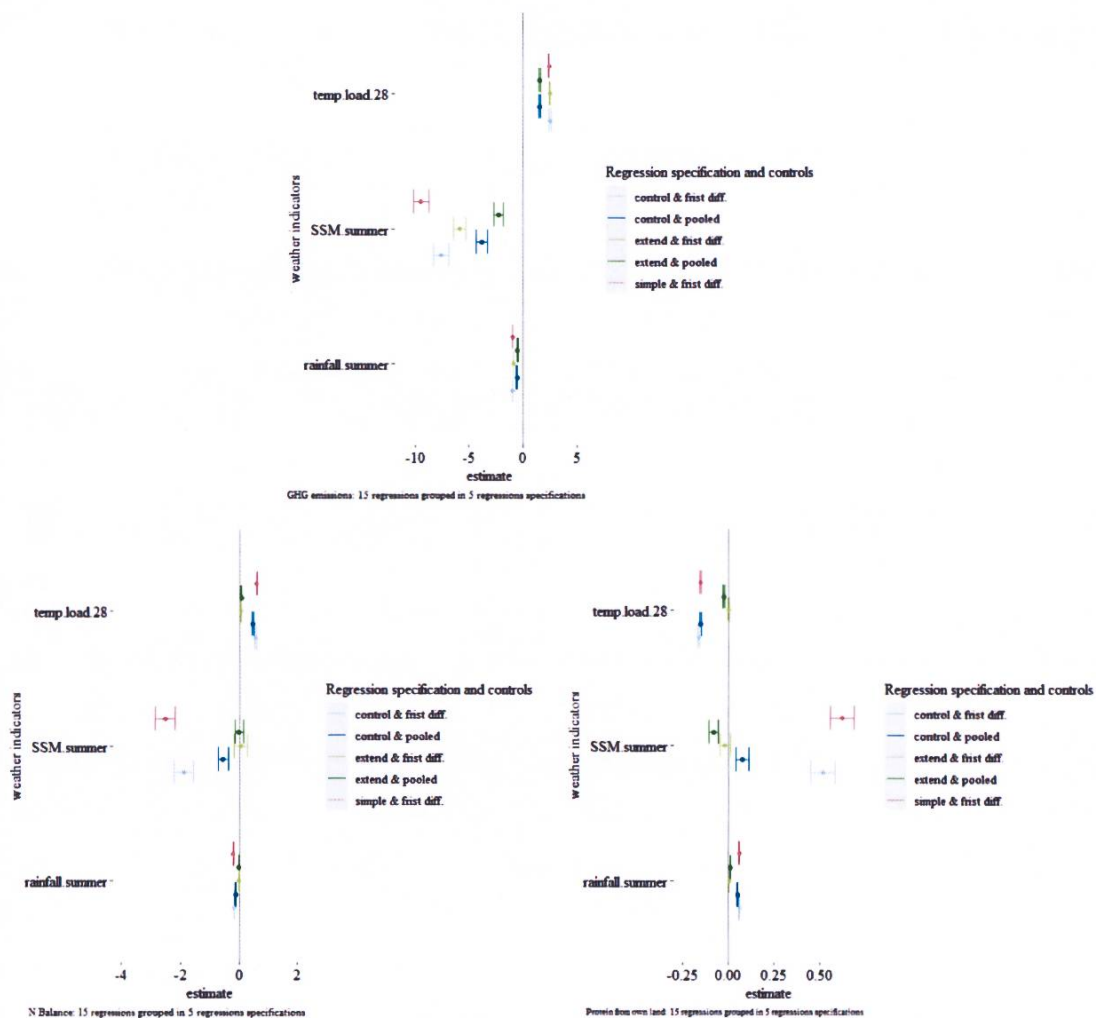


Figure 1: Coefficient plot for greenhouse gas emissions (top, Fig. 1A), nitrogen balance (left, Fig. 1B) and protein from own land (right, Fig. 1C). Each estimate illustrates on the plots come from a different regression.

Our results show that greenhouse gas emissions and nitrogen balance increase under drought or heat waves and that the percentage of protein produced on the farm decreases. On figure 1, we observe the results of estimates for different kind of regressions. There is 15 regressions in each plot. The two calculation methods are illustrated, namely first differentiated and pooled regressions and three regression's kinds; simple (the sustainable indicator on one weather indicator), control (the sustainable indicator on one weather indicator and control variables) and extend (the same regression as the control regression and with variables included in the calculation of the indicator). As observed on the Figure 1, the different kind of regressions lead to some differences. We notice that the estimates in the extend regressions for nitrogen balance and protein from own land lose their significance (Figure 1B and 1C). We assume that the variables included in the calculation of the respective sustainable indicator capture the extreme weather effects. For the greenhous gas emissions (Figure 1A), we can't observe this mechanism probably because the complex calculation makes it too difficult to empirically assess reasons for these changes. For the nitrogen balance, the losses from grass and corn yield seems to mostly explain these differences. This imply that yield losses linked to extreme weather should lead to a higher nitrogen balance in the soil. Finally, for the percent of protein produced on the farm, changes in the forages quality and yield explain the effects of extreme weather.

We find that extreme weather has negative impact on the sustainable goals, but further work is required to understand the mechanism behind. With our findings, we show that the sustainability performance is influence by natural factors. It may increase the financial risk exposure if the reward for environmentally friendly production gain in importance. To incentive farmers to produce in a more sustainable way, policy makers and industry need to require more attention on the extreme weather's effects and should better inform the farmers on these risks. By further exploring the mechanism of the effects of extreme weather on the sustainable performance, it may be possible to highlight good agricultural practices during such extreme event.

References

- André, G., Engel, B., Berentsen, P. B. M., Vellinga, T. V., and Oude Lansink, A. G. J. M. (2011). Quantifying the effect of heat stress on daily milk yield and monitoring dynamic changes using an adaptive dynamic model. *J. Dairy Sci.* 94, 4502–4513. doi:10.3168/jds.2010-4139.
- Copernicus (2020). Copernicus Global Land Service. Available at: <https://land.copernicus.eu/global/products/ssm> [Accessed March 9, 2020].
- Finger, R., Dalhaus, T., Allendorf, J., and Hirsch, S. (2018). Determinants of downside risk exposure of dairy farms. *Eur. Rev. Agric. Econ.* 45, 641–674. doi:10.1093/erae/jby012.
- FrieslandCampina (2018). Foqus planet Appendix B Netherlands.
- Grillakis, M. G. (2019). Increase in severe and extreme soil moisture droughts for Europe under climate change. *Science of The Total Environment*. 660, 1245-1255.
- Key, N., and Sneeringer, S. (2014). Potential effects of climate change on the productivity of U.S. dairies. *Am. J. Agric. Econ.* 96, 1136–1156. doi:10.1093/ajae/aau002.
- Koninklijk Nedelands Meteorologisch Instituut (2018a). Datacentre. Available at: <https://data.knmi.nl/datasets/Tn1/2?q=gridded> [Accessed March 4, 2020].
- Koninklijk Nedelands Meteorologisch Instituut (2018b). Datacentre. Available at: <https://data.knmi.nl/datasets/Tx1/2?q=gridded> [Accessed March 4, 2020].
- Koninklijk Nedelands Meteorologisch Instituut (2020). Datacentre. Available at: https://data.knmi.nl/datasets/rad_nl25_rac_mfbs_24h/2.0 [Accessed February 27, 2020].
- Kringloopwijzer (2019). Aandacht voor invoer KringloopWijzer neemt toe. Available at: <https://mijnkringloopwijzer.nl/actueel/nieuws/aandacht-voor-invoer-kringloopwijzer-neemt-toe/> [Accessed July 3, 2020].
- Kringloopwijzer (2020). Mijn Kringloopwijzer. Available at: <https://mijnkringloopwijzer.nl/> [Accessed March 26, 2020].
- Mukherjee, D., Bravo-Ureta, B. E., and De Vries, A. (2013). Dairy pro-

ductivity and climatic conditions: Econometric evidence from South-eastern United States. *Aust. J. Agric. Resour. Econ.* 57, 123–140. doi:10.1111/j.1467-8489.2012.00603.x.

- Nardone, A., Ronchi, B., Lacetera, N., Ranieri, M. S., and Bernabucci, U. (2010). Effects of climate changes on animal production and sustainability of livestock systems. *Livest. Sci.* 130, 57–69. doi:10.1016/j.livsci.2010.02.011.
- Njuki, E., and Bravo-Ureta, B. E. (2015). The economic costs of environmental regulation in U.S. Dairy farming: A directional distance function approach. *Am. J. Agric. Econ.* 97, 1087–1106. doi:10.1093/ajae/aav007.
- Perez-Mendez, J. A., Roibas, D., and Wall, A. (2019). The influence of weather conditions on dairy production. *Agric. Econ.* 50, 165–175. doi:10.1111/agec.12474.
- Qi, L., Bravo-Ureta, B. E., and Cabrera, V. E. (2015). From cold to hot: Climatic effects and productivity in Wisconsin dairy farms. *J. Dairy Sci.* 98, 8664–8677. doi:10.3168/jds.2015-9536.
- Shrestha, S., Hennessy, T., Abdalla, M., Forristal, D., and Jones, M. B. (2014). Determining short term responses of Irish dairy farms under climate change. *Ger. J. Agric. Econ.* 6, 143–155.
- Trnka, M., Rötter, R. P., Ruiz-Ramos, M., Kersebaum, K. C., Olesen, J. E., Žalud, Z., & Semenov, M. A. (2014). Adverse weather conditions for European wheat production will become more frequent with climate change. *Nature Climate Change*. 4(7), 637.
- ZuivelNL (2018). Dutch dairy in figures. 27.

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3rd rank

Assessing the Impact of Political and Economic Events on Firms' Economic Performance in the Plant Protection Sector

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In recent years there has been much controversy over the application of pesticides in the plant protection sector [Bonanno et al., 2017], more specifically on glyphosate [Benbrook, 2016]. As the issue of glyphosate use continues to grow in importance and awareness by means of increased media attention, the question arises as to whether the companies' share also reacts sensitive to the matter. This thesis aims to examine the estimates of various stock price reactions conditional on the influence of news announcements concerning glyphosate. Specifically, seven of the world's largest glyphosate manufacturers are being evaluated utilizing the Event Study methodology, originating in econometric theory. To assess the aforementioned responsivity of global players, the measure of examination ranges from an individual to an industry effect.

Consequently, this work contributes to a better understanding of the glyphosate subject from a manufacturer's perspective. In fact, the literature is short of studies in which the effects of events on agricultural economics are broadly examined. This paves the way for this thesis to assess the impact of public announcements on stock prices of the global leaders in glyphosate production.

Built on the market model and extensively formulated by [Binder, 1985a], a multivariate regression model was employed. This type of model is ideally suited for the use of multiple events [Lamdin, 2001], whereas the introduction of dummy variables allows for taking into consideration any periodic events or factors [De Jong et al., 1992]. A great advantage of this method lies in the coefficients, that can control for varying effect among companies [Binder, 1985a].

This study makes use of seven glyphosate manufacturers that are considered major players of the global market in terms of volume, but are also listed on the stock exchange (Adama Agriculture Solutions Ltd., Anhui Guangxin Agrochemical Ltd., BASF, Bayer AG, DuPont de Nemours Inc., Nantong Jiangshan Agrochem. Ltd., Nufarm Ltd.). The daily rate of stock returns for all individual securities were compiled over an estimation window of 120 trading days. Beyond that the event window was added, on which three trading days have been defined. Particular attention was paid to selecting announcements that could have a sensitive impact on the stock market, and might also exert an influence on the entire industry. To these ends, 24 events were selected in a period from the beginning of 2015 to the middle of 2020.

Given this framework, one null hypothesis assumes that the cross-sectional average abnormal returns are zero during the three days of event window. The results show, it is worth noting that the industry is likely receiving word of the upcoming announcement one day before its publication. On the other hand, the day after the announcement does not seem to have a major impact, suggesting that event-effects might already be incorporated on the day prior to the announcement.

Another null hypothesis implies that a certain event shows no effect on the cumulative abnormal returns over the entire event window of a single company. Based on the results, it can be generally stated that a majority of events have had a far-reaching impact on the share prices of individual glyphosate producers.

The third null hypothesis presumes no influence of the event across the event window and all firms. Where so far the difference was made in time, this hypothesis is about testing industrial effects. According to the results, the industry as a whole can be affected by a particular event, but this didn't apply to an event in general.

To observe an industry-wide response to an announcement, events must be considered individually. Consequently, the events were divided into regulatory and legal categories. This showed, that regulatory events have

an individual impact on glyphosate producers depending on their scope. Whereas legal events tend to induce a negative impact on stock prices of the glyphosate industry as a whole.

In order to investigate the robustness of the results, a sensitivity analysis was performed, where the estimation period and the event window were extended. As a general rule, it can be stated that announcements with high implications persist even over longer periods of estimation. Thereby it can be said that overall, the original results based on 120 days of estimation and a three-day event window still hold under longer estimation measures.

For a different way of testing robustness, a substitution group was included, consisting of a group of plant protection product manufacturers that do not produce glyphosate. On the day before the announcement the mean values of average abnormal returns between the glyphosate producers and the substitution group differed significantly from each other. No significant difference was shown on the day of the announcement nor on the day after. Either the substitution group experienced a spill-over effect, or other events were responsible for a greater deviation in their share prices. Ultimately, the substitution group was not able to confirm that they were equally or less unaffected by announcements regarding glyphosate.

Intuitively, it is assumed that announcements concerning their core business might try to move their share value. By means of the Event study methodology, it was shown that certain events do indeed cause price volatility. Upon closer examination of individual reactions to the announcements, the investigation of cumulative abnormal returns revealed that Chinese companies reacted less sharply to the events than European and American glyphosate producers for instance. In particular, both German firms appeared to have reacted similarly to certain events, which may be due to Bayer's strong involvement in U.S. litigations. In this respect, a company's portfolio diversity will be particularly important in determining its dependence on the announcement.

Through the application of the widely used Event Study methodology, this thesis expands the scarce literature in the food and agriculture sector in this

field. Supported by the results, this study opens avenues for future research: The widespread use of the market model might benefit from being supplemented by other parameters such as exchange rate fluctuations, additional benchmark indices and company-specific parameters in order to increase the robustness of the results. To make the comparison in the model not only with the national benchmark index, an additional comparison with an equally-weighted index would be a meaningful alternative to increase power. Another fundamental step would be to greatly expand the sample with additional companies to improve the assessment of the industry effect and to gain a better understanding of the behavior of certain subgroups.

The findings aim to indicate that stronger glyphosate policies will increase the pressure on companies disproportionately. However, the story of synthetic crop protection companies might come to a dramatic climax when, in 2022, the European Union decide on whether to continue its authorization.

References

- [Benbrook, 2016] Benbrook, C. M. (2016). Trends in glyphosate herbicide use in the united states and globally. *Environmental Sciences Europe*, 28(1):3.
- [Binder, 1985a] Binder, J. J. (1985a). Measuring the effects of regulation with stock price data. *The RAND Journal of Economics*, 167–183.
- [Bonanno et al., 2017] Bonanno, A., Materia, V. C., Venus, T., and Wes-seler, J. (2017). The plant protection products (ppp) sector in the euro-pean union: a special view on herbi- cides. *The European Journal of Development Research*, 29(3):575–595.
- [De Jong et al., 1992] De Jong, F., Kemna, A., and Kloek, T. (1992). A contribu- tion to event study methodology with an application to the dutch stock market. *Journal of Bank- ing & Finance*, 16(1):11–36.
- [Lamdin, 2001] Lamdin, D. J. (2001). Implementing and interpreting event studies of regulatory changes. *Journal of Economics and Business*, 53(2-3):171–183.

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