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How behavioural and experimental economics can contribute to agricultural policy with an application to agri-emissions pricing

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ABSTRACT

In this paper, I discuss the role that behavioural and experimental economics can play in improving agricultural policymaking. I do so by considering the development of an agri-emissions pricing policy in NZ. International literature shows that profit, as well as a range of other factors such as social norms and identity, drive farmer behaviour. This is particularly true for adoption of sustainable technologies and practices. A better understanding of farmer behaviour provides potential for: (1) an increased understanding of the uncertainty around policy modelling; (2) an increase in the accuracy of policy modelling, particularly when emission prices are low; (3) potential for new policy tools. Experimental economics provides a powerful methodology to build behavioural understanding and test policy tools. I argue that a behavioural economics perspective can contribute to agricultural policy, but add a note of caution that the gains to modelling accuracy and improved policy design are not guaranteed.

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Introduction

Behavioural and experimental economics have provided myriad new insights into individual decision making, helping to develop theory and enhance policy design (Chetty, 2015; Harrison & List, 2004). This statement is true for many different areas, including farmer behaviour. One area of increasing focus is sustainable practice adoption. For example, policymakers and researchers in Europe have recognised the untapped potential for behavioural interventions to enable a more sustainable agricultural sector (Dessart, Barreiro-Hurlé, & van Bavel, 2019). In this paper, I review the development of agri-emissions pricing policy in New Zealand and consider what insights behavioural and experimental economics could provide. From this example, I draw more general lessons.

At a high level, behavioural economics is a branch of economics that seeks to develop neoclassical economic models of human behaviour, using psychological insights and empirical evidence. In policy-making, behavioural economics can increase the accuracy of policy modelling, as well as increasing the available policy tools (Chetty, 2015).

Both building better models and utilising new policy tools is useful for agricultural policy. Indeed, farmer decision making is known to have a strong behavioural element. Farms tend to be small businesses dealing with high levels of production and market uncertainty, meaning profit maximisation is not always easy, nor is it the only goal of farming. Farmers may wish to be seen to be good farmers, productive farmers and/or sustainable farmers (Dessart et al., 2019).

Experimental economics is a methodological approach to testing theory and estimating empirical parameters, such as risk aversion or willingness to pay. The emphasis is on controlled experiments,

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whereby treatment assignment is exogenously randomised (Harrison & List, 2004). Thus, experimental economics is a key research method for behavioural economics, but it is also utilised within a neo-classical approach.

Experimental economics has been vital for understanding when behavioural factors are present and economically significant in a decision making context. An interesting contrast is the comparison between the potential predictability of behavioural elements of decisions making emphasised in papers like Chetty (2015), and the unpredictability of human behaviour, based on context, emphasised by many behaviour change experts (Dewies, Denktaş, Giel, Noordzij, & Merkelbach, 2022). Either way, field experiments in particular provide a means of credibly identifying whether a policy intervention will work as predicted (Dewies et al., 2022; Harrison & List, 2004).

There are many international examples where behavioural and experimental insights have contributed to agricultural policy. In highly subsidised agricultural sectors of Europe and North America, this contribution focuses on optimising how policy can achieve the desired outcomes. Indeed, there is increasing interest in how these methods can and do contribute to the design and evaluation of the Common Agriculture Policy (CAP) in Europe, from supporting productivity to sustainable practice adoption (Thoyer & Préget, 2019). Such evaluation can include everything from how subsidy schemes are designed, to low cost adjustments to communication strategies about policies. In the latter case, Czap, Czap, Banerjee, and Burbach (2019) shows in the United States of America the importance of both sending a letter to inform farmers about a conservation subsidy scheme, and how that letter is written. Chabé-Ferret, Le Coent, Reynaud, Subervie, and Lepercq (2019) find in a field experiment in France that information about other farmer's irrigation usage increases low users' irrigation usage, and decreases high users (convergence to a social norm).

In low- and middle-income countries, the methods have additionally been applied to areas such as the adoption of practices to increase yields and crop insurance. Duflo, Kremer and Robinson (2011) find in a field experiment that a nudge is the most efficient policy to increase fertiliser use in Kenya, compared with subsidy or liberalisation policies. Ali et al. (2021) show in a field experiment in Ghana how an understanding of risk preferences and liquidity constraints is helpful for increasing uptake of crop insurance.

Agri-emissions pricing policy development in New Zealand

In 2020, the government established a collaborative policy-making group to help them develop an emissions pricing scheme for agriculture. The group, known as He Waka Eke Noa (loosely translated as 'we're all in this together') consists of industry and Iwi/Māori representatives, as well as government. Their brief was to develop an agri-emissions pricing scheme that will come into force in 2025, alongside any required technical developments such as a farm-level emissions calculator. The government adopted the basic set up of He Waka Eke Noa's proposal and requested public feedback in October 2022 (Ministry for the Environment (MfE) & Ministry for Primary Industries (MPI), 2022).

The proposed scheme would see farmers charged a small levy on every kilogram of greenhouse gas (GHG) they emit (perhaps initially around 5% of the price of emissions for all other sectors under the Emissions Trading Scheme). The revenue for this levy would be earmarked for administering the scheme and funding discounts on the levy bill to incentivise uptake of specific on farm mitigation measures. The focus of the policy development process has been on creating a pricing scheme that would cost effectively achieve the policy goals. These include mitigating emissions, as well as equity and maintaining the sector's export competitiveness (MfE & MPI, 2022).

The potential role for behavioural insights

Let us consider modelling the first few years of the policy, 2025–2030. The government has a target for methane emissions of 10% below 2017 levels by 2030. Methane is the main GHG from agriculture and agriculture is the main source of methane in NZ (MfE & MPI, 2022).

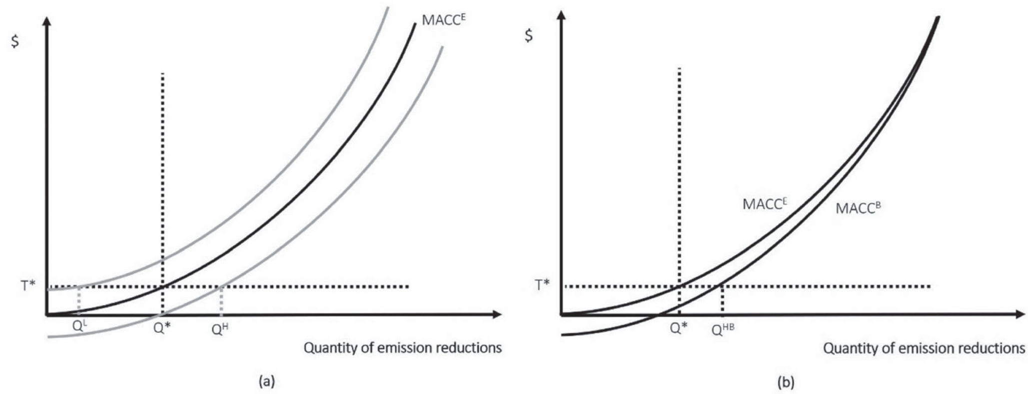

Figure 1. Estimating marginal abatement cost curves (MACCs) for agricultural emission reductions in 2030, considering constant uncertainty (a), and potential increased mitigation at each emission price, after accounting for behavioural interventions (b).

Suppose we wish to know the price of the emissions levy that will achieve the 2030 target for methane. To do so, we must model the marginal abatement costs for the agricultural sector. Of course, the government should also want to know the uncertainty around achieving the target at the estimated price.

I depict this in Figure 1(a). Let Q^* be the mitigation target, shown on the x-axis. Note that Q^* is relatively low in the following sense. Around half of the methane mitigation target will likely be achieved by mitigation in the waste sector (the other major source of methane emissions) and by policies such as the NZ Emissions Trading Scheme, which incentivises the planting of trees. These trees tend to displace sheep and beef farms, thus reducing some of the methane emissions from agriculture (He Waka Eke Noa, 2022).

Thus, price T^* in Figure 1(a) is also relatively low, and hence relatively low on the estimated marginal abatement cost curve ($MACC^E$). The $MACC^E$ is upward sloping at an increasing rate, as initial mitigation tends to be low cost relative to deep cuts in emissions.

Assuming roughly constant uncertainty around the $MACC^E$ in terms of absolute cost, we can see that predicted emissions reductions from a low price T^* has a higher level of uncertainty than it would at a higher T. Depicted in the figure is uncertainty around the $MACC^E$ meaning mitigation may be between Q^L and Q^H, a wide range. The lower-bound uncertainty curve is depicted as initially having negative cost; it is indeed possible that initial mitigation by 2030 will increase profitability (Cortés Acosta et al., 2019).

What light does behavioural economics shed on this uncertainty? Potentially, it increases the uncertainty, at least until we have better behavioural models of farmers. There are many behavioural reasons why farmers may not have yet adopted no cost or negative cost mitigation measures (Cortés Acosta et al., 2019). Hence, there is a lot of scope for initial 'behavioural' mitigation by 2030, but it is hard to predict to what extent this will be realised.

I depict this additional uncertainty in Figure 1(b) by adding a $MACC^B$ that may be available after implementing successful behavioural interventions. If we have a similar band of uncertainty around a $MACC^B$ as the $MACC^E$ has in Figure 1(a), then we can see there will be a larger zone of uncertainty around what mitigation will be achieved. Indeed, if we employ both behavioural and pricing interventions, the area of uncertainty may be even larger as we may not be sure if pricing interventions are complementary or could in fact crowd each other out (Knook, Dorner, & Stahlmann-Brown, 2022). Assuming the interventions are complementary, as depicted in Figure 1(b), now price T^* could provide level Q^{HB} of mitigation. Alternatively, target Q^* could be reached with a lower emission price.

Has the agri-emissions policy development process taken advantage of behavioural and experimental insights?

First, according to MfE and MPI (2022), He Waka Eke Noa is working on a wider behaviour-change framework. However, this piece of work is not mentioned in the major milestones, and an overall look at their work so far suggests insights from behavioural and experimental economics has not been a major focus. They did commission the report by Hungerford (2022), which is a literature review into farmer behavioural responses to prices. It recommends wider programme of support around a pricing policy, to enable heterogeneous farmers, including Māori, to adapt to the pricing policy.

From an outside perspective it is difficult to say how much traction behavioural perspectives have had within He Waka Eke Noa so far. But, a behavioural economics perspective does not seem to feature heavily in the current proposed policy. If there is some truth in Figure 1(b), it suggests there may have been a lost opportunity within the current policy. This is not to take away from the other perspectives that have and should be considered, such as a focus on extension (Hungerford, 2022) or a Mātauranga Māori view (eg. Hutchings et al., 2017).

In terms of policy modelling, there have been two main pieces of work supporting policy development. First, Denne (2022) estimated mitigation under different prices and policy scenarios to support the He Waka Eke Noa process. The modelling included behavioural factors such as adoption curves. Second, Greenhalgh and Djanibekov (2022) use the NZFARM model to support the government's policy development process, again by modelling different prices and policy scenarios.

Both these modelling exercises could potentially be enhanced by a deeper consideration of behavioural aspects of on farm behaviour change. An agent-based modelling approach could be one area for further exploration (eg. Huber, Xiong, Keller, & Finger, 2022), but there may be ways to tweak existing models too. An ultimate goal would be for the models to be more accurate after some investment in their development; however, it is unclear at this stage the extent to which such an investment would pay off in reduced modelling uncertainty. Either way, the additional uncertainty behavioural responses to a pricing policy pose, particularly at lower prices, could be more explicitly acknowledged and considered.

Indeed, there is the additional matter of complementary behavioural interventions, and their interaction with a pricing policy. There is evidence from lifestyle farmers (ie. non-commercial) that they could be susceptible to negative behavioural spillovers, where behavioural interventions undermine a price-based intervention (Knook et al., 2022). Indeed, it is an open question as to the extent to which behavioural interventions might result in meaningful emission reductions. But, if they do, they lower the price required to meet a emission reduction target, Q^*, as depicted in Figure 1(b).

Untapped potential?

There are behavioural policy tools that are somewhat developed and ready to be considered as part of a policy mix, and ones with potential but requiring further research. In either case, a detailed look at the literature is required. Such investigation is required in order to understand existing evidence on behavioural drivers, and to uncover what are essentially more novel, non-traditional policy options. I take just a brief look at what insights are on offer from a growing literature on behavioural factors in sustainable farming practice adoption.

Dessart et al. (2019) provide a comprehensive overview of behavioural factors influencing farmer adoption of sustainable farming practices. They summarise them (in order of proximal to distal) as cognitive (eg. perceived costs/benefits, perceived control), social (eg. social norms) and dispositional (eg. personality and moral environmental concern).

In terms targeting cognitive behavioural factors, there are some low risk and ostensibly sensible policy tools. It highlights the importance of good quality, user-friendly information about mitigation options, perhaps demonstrating the benefits beyond just the pricing policy incentives. The importance of famers being given the tools to measure and manage their own farm's emissions is highlighted by the perceived control aspect of cognitive factors. Towards the more potentially controversial end, something like loss aversion framing around incentivised mitigation technologies could be considered. This could take the form of highlighting to farmers the payments they are missing out on if they do not adopt the particular technology. Indeed, this idea of 'framing' of information in specific ways could be considered more generally within the communication strategy around policies.

Social norms have been shown many times to be a powerful driver of behaviour, including for sustainable farming practice adoption (Chabé-Ferret et al., 2019; Dessart et al., 2019). The role of farming leaders and networks should be considered. There is also potential for interventions such as social norm framing of information about new practices and technologies.

Dispositional factors may be getting more into the realm of risky policy tools, which require more research before they are ready even to be trialled in the field by policymakers. They include proposals such as having a mix of policy tools, targeting different segments within the natural heterogeneity of viewpoints, values and attitudes of farmers (Dessart et al., 2019). Such a policy mix is itself complicated to develop, and there may be a risk of backlash among farmers if this is perceived as particularly manipulative, which could undermine the tools themselves. Hence, a cautious approach is required.

As previously mentioned, experiments are an important means of empirically testing and verifying behavioural policy intervention. Examples of field experiments in agriculture in developed country contexts are relatively rare, presumably due at least in part to the cost of running such experiments and the need for willing partners in government and/or industry. Czap et al. (2019) and Chabé-Ferret et al. (2019) are two examples, where the interventions tested had mixed success (see introduction). However, they did provide lessons to take forward for future research and policy design.

There are risks involved in running experiments, both from policymaker and researcher perspectives. There is a risk of farmer backlash from poorly designed or communicated experiments. There is also the risk that the behavioural interventions being tested will not be well received, which I allude to in my discussion above. These risks from the point of view of policymakers creates a risk for researchers too. I am aware, anecdotally, of researchers overseas trying to partner with governments or government organisations, with such partners pulling out before research starts due to the perceived political and reputational risks of field experiments.

Nevertheless, there is appetite for behavioural sciences and experiments to be brought to bear on many areas of public policy. This is true in many countries, including New Zealand (Dewies et al., 2022).[1]

Conclusion

A behavioural understanding of farmers highlights the additional uncertainty in predicting their actions. However, this uncertainty exists regardless of whether we choose to include it in our models or not. Indeed, it adds an opportunity too; that of providing additional policy tools. Of particular importance, I would argue, is seeing these tools as a means of improving more traditional but effective policies, such as emission pricing policies. This holds particularly true when marginal prices are at the low end.

The challenge is the extent to which we can harness more realistic models of people to improve policy outcomes. Policy issues such as agriculture and climate change are large in terms of implications, both economically and environmentally, as well complex. Of course, there are many types of information and expertise available that policymakers should include in the policy development process. As I outline in this article, policymakers would be wise to leverage available expertise in behavioural and experimental economics, to their full potential. This could help optimise policy development in agriculture, as well as many other areas.

Indeed, as noted in the introduction, European policy makers are increasingly realising how behavioural and experimental economics can be used to improve the development and evaluation of the CAP. In New Zealand, agricultural policy is different, with a low subsidy and export focus. Climate change, freshwater quality and quantity, biodiversity and biosecurity policies are all areas where policymakers need all available tools and insights to develop high quality policies for complex challenges. I have covered environmental policy already in detail in this article. Biosecurity policies can benefit from behavioural and experimental insights by finding ways to improve farmer monitoring and reporting (see Wright et al., 20182019). Health and safety perhaps could benefit from a similar approach, given the dangerous nature of some farm work. Finally, industry bodies such as DairyNZ and Beef + Lamb tasked with increasing productivity and profitability of farms. They may find it useful to investigate whether their extension programmes and farmer support tools could be improved using experimental and behavioural insights (see for example Neal et al.,).

Note

1. See also https://dpmc.govt.nz/our-programmes/policy-project/policy-methods-toolbox/behavioural-insights.

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References

Ali, W., Abdulai, A., Goetz, R., & Owusu, V. (2021). Risk, ambiguity and willingness to participate in crop insurance programs: Evidence from a field experiment. *Australian Journal of Agricultural and Resource Economics*, *65*(3), 679–703. doi:10.1111/1467-8489.12434

Chabé-Ferret, S., Le Coent, P., Reynaud, A., Subervie, J., & Lepercq, D. (2019). Can we nudge farmers into saving water? *Evidence from a Randomised Experiment. European Review of Agricultural Economics*, *46*(3), 393–416. doi:10.1093/erae/jbz022

Chetty, R. (2015). Behavioral economics and public policy: A pragmatic perspective. *American Economic Review*, *105*(5), 1–33. doi:10.1257/aer.p20151108

Cortés Acosta, S., Fleming, D., Henry, L., Lou, E., Owen, S., & Small, B. (2019). Identifying barriers to adoption of 'no-cost' greenhouse gas mitigation practices in pastoral systems. *Motu Working Paper 19-10*. doi:10.2139/ssrn.3477066

Czap, N. V., Czap, H. J., Banerjee, S., & Burbach, M. E. (2019). Encouraging farmers' participation in the conservation stewardship program: A field experiment. *Ecological Economics*, *161*, 130–143. doi:10.1016/j.ecolecon.2019.03.010

Denne, T. (2022). Pricing agricultural GHG emissions: Sectoral impacts and cost benefit analysis [Report for He Waka Eke Noa]. Resource Economics.

Dessart, F. J., Barreiro-Hurlé, J., & van Bavel, R. (2019). Behavioural factors affecting the adoption of sustainable farming practices: A policy-oriented review. *European Review of Agricultural Economics*, *46*(3), 417–471. doi:10.1093/erae/jbz019

Dewies, M., Denktaş, S., Giel, L., Noordzij, G., & Merkelbach, I. (2022). Applying behavioural insights to public policy: An example from rotterdam. *Global Implementation Research and Applications*, *2*(1), 53–66. doi:10.1007/s43477-022-00036-5

Duflo, E., Kremer, M., & Robinson, J. (2011). Nudging Farmers to Use Fertilizer: Theory and Experimental Evidence from Kenya. *American Economic Review*, *101*(6), 2350–2390. doi:10.1257/aer.101.6.2350

Greenhalgh, S., & Djanibekov, U. (2022). *Impacts of climate change mitigation policy scenarios on the primary sector* (p. 105) [MPI Technical Paper No: 2022/20].

Harrison, G. W., & List, J. A. (2004). Field experiments. *Journal of Economic Literature*, *42*(4), 1009–1055.

He Waka Eke Noa. (2022). *Recommendations for pricing agricultural emissions*. He Waka Eke Noa. hewakaekenoa.nz.

Huber, R., Xiong, H., Keller, K., & Finger, R. (2022). Bridging behavioural factors and standard bio-economic modelling in an agent-based modelling framework. *Journal of Agricultural Economics*, *73*(1), 35–63. doi:10.1111/1477-9552.12447

Hungerford, R. (2022). *Insights into farmer behaviour responses to emissions pricing* (p. 39). Momentum Research and Evaluation Ltd.

Hutchings, J., Smith, J., Roskruge, N., Severne, C., Mika, J., & Panoho, J. (2017). Enhancing Māori agribusiness through kaitiakitanga tools (p. 20) [Technical Report]. *Our Land and Water, National Science Challenge*. ourlandandwater.nz

Knook, J., Dorner, Z., & Stahlmann-Brown, P. (2022). Priming for individual energy efficiency action crowds out support for national climate change policy. *Ecological Economics*, *191*, 107239. doi:10.1016/j.ecolecon.2021.107239

Ministry for the Environment & Ministry for Primary Industries. (2022). *Pricing agricultural emissions: Consultation document*. Wellington: Ministry for the Environment.

Neal, M. B., Woodward, S. J. R., Dela Rue, B. T. (2019). Identifying the pasture potential for New Zealand dairy farms. *Journal of New Zealand Grasslands*, *81*, 235–240. doi:10.33584/jnzg.2019.81.405

Thoyer, S., & Préget, R. (2019). Enriching the CAP evaluation toolbox with experimental approaches: Introduction to the special issue. *European Review of Agricultural Economics*, *46*(3), 347–366. doi:10.1093/erae/jbz024

Wright, B. K., Jorgensen, B. S., & Smith, L. D. G. (2018). Understanding the biosecurity monitoring and reporting intentions of livestock producers: Identifying opportunities for behaviour change. *Preventive Veterinary Medicine*, *157*, 142–151. doi:10.1016/j.prevetmed.2018.07.007