Which benefits would make farmers happier, and which would they choose?

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Abstract:

We presented six novel farming vignettes to UK farmers that describe trade-offs between pecuniary and non-pecuniary benefits. What farmers would choose corresponds with what they think would make them happier, which supports the use of subjective well-being as a proxy for decision utility in agricultural research. Where a disparity between choice and well-being does exist, farmers seem willing to trade happiness for pecuniary benefits. Our results also suggest that farmers often trade pecuniary gains for non-pecuniary benefits. The utility derived from non-pecuniary benefits may help to explain farmer behaviours such as unsubsidised environmental improvements, and reluctance to adopt efficiency-enhancing technologies.

Appendix materials can be accessed online at:
https://uwpress.wisc.edu/journals/pdfs/LE-99-3-Ocean-appA.pdf
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1. Introduction

Economists typically infer utility by observing actual behaviour under the assumption that individuals make choices based on utility maximisation (revealed preference). In recent years, there has been increasing interest in the use of subjective indicators of well-being as a proxy for individual utility. One justification put forward for this approach is that individuals often make choices that do not appear to improve overall subjective well-being, such as taking on stressful high-income occupations. In such situations, it has been argued that self-reported well-being (e.g. measures that ask how happy or how satisfied with one's life one is) is a more accurate representation than observed choice of the utility one will eventually experience (Stutzer & Frey, 2010; Hirschauer et al., 2015). A further argument for measuring subjective well-being is that it enhances the economist's toolkit by allowing for welfare evaluations to be conducted in situations where they are difficult to do credibly with revealed preference methods. Central to the appropriateness of using subjective well-being as a proxy for utility instead of revealed preference is the assumption that people make choices that they think would maximise their happiness (Benjamin et al., 2012).

The main question we ask in this study is: *do farmers make choices that exclusively maximise their happiness*? Although farmers are likely to behave in a similar way to people in general, there are a couple of reasons why we believe it is sensible to apply Benjamin et al. (2012)'s approach to a sample of farmers. First, farmers have a set of quite context-specific non-pecuniary goals that feed into their well-being. The literature has made significant progress in generalising the well-being objectives and motivations of farmers (e.g. Howley, 2015). However, we do not yet know which of these motivations farmers would prioritise when faced with a trade-off, or whether there are specific contextual tensions associated with the farming lifestyle that would lead to a discordance between choice and well-being

maximisation. Second, the behaviour of farmers is an important driver of the agricultural sector of the economy, and so is crucial to debates surrounding both food security and environmental sustainability. In contrast to a general population sample, farmers can be characterised as self-employed business owners with a different and perhaps richer set of competing objectives. Replicating Benjamin et al. (2012)'s findings within an agricultural context would also help to strengthen the case for the use of subjective well-being data as a suitable proxy for utility (and hence a predictor of actual choice behaviour) in different decision making domains.

To answer these questions, we studied six hypothetical trade-off scenarios designed to explore both what choices farmers would make when faced with competing benefits (e.g. more environmental conservation vs higher farm profits) and which they believe would make them happier if they were given the option. Our approach is close in spirit to previous studies comparing well-being and choice in the general population by Benjamin et al. (2012) and Adler et al. (2017). The main novelty of this study is that we combine the study design from this prior literature with insights from the agricultural literature in order to study trade-offs that are pertinent to farmers. By looking at response patterns across our scenarios, we first ascertain the extent to which stated choice and predicted well-being align. In other words, do farmers seek to maximise their happiness when making farm decisions?

A supplementary aim of this study is to use farmers' stated preferences from these trade-offs to explore whether non-pecuniary benefits form an important part of a farmer's utility function, as well as result in any associated consequences for farmer decision making. Given that utility is difficult to measure, models of farm behaviour have often treated farms as enterprises and made the simplifying assumption that farms, like firms, are profit maximisers. This is evident in many mathematical economic models of farm behaviour where money is

treated as an adequate substitute for utility (Edwards-Jones, 2006). We test to what degree non-pecuniary benefits are determinants of farmer utility (and therefore choice) by tailoring our scenarios to represent trade-offs that farmers might commonly face when it comes to competing pecuniary and non-pecuniary benefits. In essence, we are interested in exploring whether farmers are willing to sacrifice some pecuniary gain (e.g. farm profits) in return for some non-pecuniary benefit (e.g. preserving the environment).

In keeping with studies that use more general samples of the population, our results suggest that choice and well-being correspond closely to one another in farmers. In short, farmers appear to make choices that they believe will make them the happiest. Where there are disparities, they appear to arise from a tension between farm income maximisation and the preservation of specific non-pecuniary benefits associated with farming. This suggests that farmers do care about things other than their individual happiness. We also find across many scenarios (irrespective of whether we look at stated choice or predicted well-being) that many farmers are willing to sacrifice income or profitability for non-pecuniary benefits. The utility enhancing properties of non-pecuniary benefits can, we suggest, help explain some outcomes that appear puzzling if looked at from a purely profit-maximising perspective. For example, farmers often engage in unsubsidised (and even loss-making) environmental practices (Marr & Howley, 2019; Mills et al., 2018). Also, the uptake of efficiency-enhancing technologies and new farm practices is often much lower than a simple cost-benefit analysis based on financial returns would predict (Pannell et al., 2006). Such behaviours may not be profit-maximising, but are still consistent with utility maximisation once one takes into account the utility-enhancing properties of non-pecuniary benefits associated with many farm activities. While our findings suggest that non-pecuniary benefits are important, we also offer some preliminary evidence to suggest that the degree to which non-pecuniary benefits

influence farmer decision-making may vary across farmers, depending on characteristics such as age, education, and farm type.

Background and literature

Before proceeding, we present a brief overview of the background literature in choice vs well-being, as well as the literature on farmer well-being more generally. First, it is instructive to understand the distinction between choice and well-being. The distinction made by Kahneman et al. (1997) between *experienced utility* and *decision utility* is a useful starting point. Decision utility is closer to the notion of utility commonly used in an economic context, where the chosen option is the one with the greatest utility attached to it. This form of utility is abstract, difficult to measure, and usually inferred by means of revealed preference, i.e. for two real-valued goods x and y: if $\exists\ x \in X\ where\ x > 0$ such that $x \succcurlyeq y$ for all $y \in X$ where $y \neq x\ and\ y > 0$, then $u(x) \geq u(y)$. On the other hand, experienced utility is more indicative of one's subjective quality of experience. Experienced utility is commonly measured using self-response questions regarding an individual's level of subjective well-being. In recent years, principally using primary survey data on stated preferences, a number of studies have explored the degree to which choice (*decision utility)* and well-being (*experienced utility)* align for people in general (Benjamin et al., 2012; Adler, 2013; Benjamin, Heffetz, Kimball, & Rees-Jones, 2014; Benjamin, Heffetz, Kimball, & Szembrot, 2014; Fleurbaey & Schwandt, 2015; Adler et al., 2017). Though there is a separate philosophical debate on the precise interpretation of subjective well-being measures, the literature following Benjamin et al. (2012) has empirically investigated whether measures of experienced utility can be used as an adequate proxy for decision utility. The general conclusion from these studies is that stated choices and predicted well-being broadly align for general population samples (i.e. people make choices that would maximise their happiness).

More generally, this literature suggests that the concepts of happiness and well-being constitute the most important component of stated preference, adding weight to arguments that support the use of measures of subjective well-being as a proxy for utility.

Within the agricultural literature, there has been a wide array of work that has examined decision utility using revealed preference to explain behaviours related to technology adoption and conservation (e.g. Foltz, 2003; Lichtenberg, 2004). However, even Foltz (2003) highlighted the limitations of this indirect approach for explaining the reasons behind farmer behaviour compared with directly asking farmers about their preferences. Increasingly, stated preference methods such as contingent valuation and choice experiments have also been used to understand which choices farmers would make in hypothetical scenarios, such as which agricultural policy is preferred between two alternatives with different features (e.g. Ruto & Garrod, 2009; Kuhfuss et al., 2016). The main advantage of studying stated/hypothetical preferences is that this approach allows the researcher to consider behaviour in a wider array of scenarios than would otherwise be possible.

Aside from measuring stated or actual preferences, there is a nascent literature that uses measures of subjective well-being (i.e. experienced utility) as a means for measuring farmer utility and conducting welfare evaluations. For example, the degree of independence and autonomy associated with different farming practices have been shown to be a strong contributing factor to increased farmer self-reported well-being (Markussen et al., 2018). A further study has shown that organic farmers appear to be happier than non-organic farmers (Mzoughi, 2014), which may signify that conservation motivations feed directly into farmer well-being. O'Brien et al. (2012) point out the importance of community connectedness for self-reported farmer life satisfaction. Howley et al., (2017) reported that farm income was only weakly related to life satisfaction, suggesting that farmer life satisfaction can be distinct

from business success. To the best of our knowledge, existing studies in the farmer well-being literature have not assessed whether the two forms of utility (decision and experienced) correspond with each other (i.e. whether farmers make choices that maximise their subjective well-being).

The findings from more general samples (e.g. Benjamin et al., 2012) suggest that it is quite likely that the choices farmers make also maximise their subjective well-being. However, to what extent is this true? If farmers care about things other than their happiness, then the level of subjective well-being obtained from an action may not provide a very good approximation of the choices that farmers will make. Taking advantage of the specific trade-offs that farmers face, another question we pose is: do non-pecuniary benefits form an important argument in a farmer's utility function? Specifically, we aim to understand whether farmers would trade pecuniary gains in return for non-pecuniary benefits, and whether we can better understand farmer decision-making as a result.

2. Method

Conceptual framework

In standard economic theory, it is typically assumed that work is a source of disutility with individuals having to choose the amount of labour to supply in order to maximise utility (see Rätzel, 2012; Spencer, 2014 for a review). Increasing time allocated to labour generates utility from consumption via greater income, but also reduces utility by reducing leisure time. However, there is an emerging literature that suggests assuming a disutility of labour may be unrealistic for farm operators or other self-employed individuals (see Howley, 2015). Therefore, we refine the traditional labour vs leisure decision problem by positing that farmers have to make choices between competing pecuniary and non-pecuniary activities.

Pecuniary benefits generate utility from increasing one's consumption opportunities, though they may also feed directly into well-being in other ways (e.g. from relative comparison). Non-pecuniary activities directly contribute to utility. While they may be mutually compatible (e.g. one can derive utility from farm work and that can increase income), there are often situations where they are at odds with one another. As an illustration, we suggest that certain efficiency enhancing technologies or farm practices may increase pecuniary returns but lead to a reduction in non-pecuniary benefits by reducing the utility experienced from more "traditional" ways of working.

Following Benjamin et al. (2012), we assume that subjective well-being is a uniquely important argument of the utility function. This means that self-reported happiness data could serve as a proxy for decision utility. We test whether this assumption holds in the case of farm operators by developing a series of trade-offs, where we ask farmers which option they would choose and which option would make them happiest. We can then test for any discordance between responses to these two questions. Following this, we look at the emergent preferences to see if they can reveal anything about the motivations underpinning farmer behaviour. We are particularly interested in the degree to which farmers are willing to trade pecuniary returns for other non-pecuniary benefits.

Well-being and choice trade-off scenarios

In order to examine how farmers approach trade-offs between pecuniary and non-pecuniary benefits, as well as to examine whether there is a discordance between stated choice and anticipated well-being, we followed a similar approach to Benjamin et al. (2012) in developing a series of vignettes. For each vignette, we described two possible courses of action, labelled option A and option B. Immediately below this, participants were shown two questions. First, they were asked to consider which option they believed would provide them

with a *happier life as a whole*. Second, they were asked which option they would actually *choose* if they were limited to these two options. Respondents were asked the happiness question followed by the choice question immediately afterwards, allowing for the comparison of responses within-subjects (Figure 1). Responses were marked on a six-point ipsative scale. Our aim with this design was to answer two main questions: for each scenario, 1) *do well-being and choice preferences align when faced with trade-offs involving competing benefits*?; 2) *to what extent are farmers willing to trade pecuniary benefits for non-pecuniary benefits?* We were also interested in how farmers would behave when faced with trade-offs between different types of non-pecuniary benefits.

[[Insert Figure 1 here]]

In constructing the scenarios, we aimed to present options that were representative of important decisions that farmers make (e.g. maintain land for conservation or convert to growing crops for additional income). Based on the existing literature we identified four key and often competing benefits that would underpin these scenarios. These are (i) *pecuniary benefits*; (ii) *environmental conservation;* (iii) *social & lifestyle benefits*; and (iv) *farm labour*. Our selection of farmer motivators does not preclude the existence of many more. However, we present an argument in the following subsection to explain the rationale behind this selection and why we believe that these are applicable and key to most farmers.

Farming motivations

Broadly speaking, motivation is a multidimensional construct that aims to provide an explanation for why people are driven to take action at all, both in terms of what people choose to do and how much energy and effort they devote to an activity (Ryan & Deci, 2000). Economic explanations for behaviour often focus on *extrinsic* motivations such as

income maximisation, which drive behaviour through externally provided rewards or punishments. Indeed, pecuniary benefits are likely to be central to farmer behaviour. Farmers (to varying degrees) rely on income from their farm business to support themselves and their dependents. However, there is a rich literature also supporting the importance of non-pecuniary benefits to farmers, many of which are *intrinsic* motivations in the sense that behaviour is driven by personal interests and internal rewards (e.g. Ryan & Deci, 2019). Early work by Gasson (1973, 1974), for instance, reported that in addition to the desire to make money, farmers reported that social (e.g. farming tradition), expressive (creativity), and intrinsic (enjoyment of work tasks) aspects were important to them. Following on from this literature, a wide array of studies across the social sciences have pointed out that farming is a vocation that is often valued in and of itself, and that farmers often seek to balance the need to maximise incomes with familial and lifestyle objectives (Beedell & Rehman, 1999; Willock et al., 1999; Beedell & Rehman, 2000; Vanclay, 2004; Maybery et al., 2005; Howley, 2015).

In further support of the idea that non-pecuniary benefits can influence farmer decision-making, previous research has highlighted a number of instances where farmers exhibit behaviour that would be against their financial self-interest. Examples include engagement in loss-making production activities (O'Donoghue & Howley, 2012), disinvestment reluctance even when land prices are significantly higher than the annualized returns (Musshoff et al., 2013), and working more on the farm even if the off-farm labour market provided greater income gains (Key & Roberts, 2009). These behaviours appear to contradict a solely profit-maximisation focus but can be explained by the non-pecuniary returns associated with various farm practices. In further support of the importance of non-pecuniary factors, a number of studies have shown that non-economic motivations can be significant predictors of

farmer behaviour across a variety of domains (e.g. Darnhofer et al., 2005; Läpple & Rensburg, 2011; Mills et al., 2018; Cullen et al., 2020).

When it comes to the types of non-pecuniary benefits that may be relevant for farmers, *environmental conservation* has been highlighted as being valuable not just because the deterioration of environmental capital threatens long-term production, but also simply due to a general pro-environmental attitude or concern with environmental issues (Marr & Howley, 2019). In support of this idea, Mills et al. (2018) found that 25% of environmental activity on arable farms in England are unsubsidised. However, we note that pro-environmental behaviour may provide benefits that are not just non-pecuniary. Certain environmental behaviours may enhance the long-run sustainability and financial viability of the farm (e.g. by preserving the quality of soil and fresh waterways which may boost future yields).

A variety of additional non-pecuniary benefits associated with the farming lifestyle have also been highlighted as potentially important for farmers. Howley (2015) classified these motivators into two distinct categories, labelled as "farm labour" and "social and lifestyle", and we adopt this classification in the design of our scenarios. *Farm labour* is reflective of the intrinsic rewards that farmers derive from farm work independently of any material benefits that may arise from it. *Social & lifestyle* benefits are derived from farming as a choice of lifestyle more generally (e.g. the "rural idyll", social interaction, benefits for raising children).

Scenario development

We suggest that farmers may commonly be faced with trade-offs between the four key farmer benefits that we identified from the existing literature discussed above: (i) *pecuniary benefits*, (ii) *environmental conservation*, (iii) *social & lifestyle benefits*, (iv) *farm labour*. We

designed six hypothetical vignettes that each describe a particular trade-off scenario to farmers. For each scenario, we were interested in which option farmers predict would maximise their happiness and which option they would actually choose. Each vignette traded two of the four farmer benefits with each other, resulting in $\binom{4}{2} = 6$ scenarios in total. The first three scenarios offer a trade-off between pecuniary benefits and one of the non-pecuniary benefits. The remaining three scenarios offer trade-offs between the different categories of non-pecuniary benefits to identify which (if any) is valued most highly on aggregate. Each vignette was also kept intentionally generic in order to apply to as wide a range of farmers as possible.

Scenario 1 offers respondents a trade-off between (i) and (ii): either using land for *environmental conservation* or growing crops on it for additional *pecuniary benefits*. Farmers are commonly faced with decisions to undertake activities that would boost farm output, but have adverse environmental consequences (Maybery et al., 2005). While agri-environment schemes (AESs) such as Countryside Stewardship have continued to operate at least in the short term in the UK post-Brexit, anecdotal comments from an environmental farmer group meeting that one of the authors attended in 2019 suggested that there may be a host of smaller environmental practices that farms incorporate into their operation that are not acknowledged or compensated for. They are undertaken for reasons such as personal pride or a sense of responsibility towards the natural environment. This is supported by existing research which suggests that, while certain cohorts of farmers appear unwilling to participate in an AES even when they can set the price themselves (Vanslembrouck et al., 2002), many others appear willing to engage in unsubsidised pro-environmental behaviours (Lokhorst et al., 2011).

Scenario 2 offers a trade-off between (i) *pecuniary benefits* and (iii) *social & lifestyle benefits* by offering a choice between a machine that replaces farm hands but generates more

profits, or to retain human workers (reflecting traditional farming culture) but with less profit. Scenario 3 trades (i) *pecuniary benefits* with (iv) *farm labour* by offering a choice whether or not to adopt a hypothetical technology that would require indoor computer control and yield extra profit, versus continuing to work outdoors (*farm labour*) without extra profit. Scenarios 2 and 3 are designed to be representative of the types of trade-offs or pressures that farmers face when it comes to "sustainable intensification" wherein some aspects of farming may have to evolve to incorporate new technologies and farm practices (Wezel et al., 2014). While changes such as the adoption of new technologies and farm practices may enhance profitability or long-run sustainability, it may also affect (positively or negatively) other non-pecuniary aspects of farming life with associated consequences for overall utility.

Scenario 4 trades (iii) *social & lifestyle benefits* with (iv) *farm labour*. This vignette offers a choice between adopting a hypothetical technology that would save one hour of farm labour to use for leisure (providing *social & lifestyle benefits*); or continuing to work on the farm without adopting this technology (providing *farm labour* benefits that stem from an intrinsic motivation to undertake farm work). The final two scenarios deal with the trade-off between wider environmental benefits (which can be seen as a public good), and the more private non-pecuniary benefits that apply only to the farmer in question. Scenario 5 trades (ii) *environmental conservation* with (iii) *social & lifestyle benefits* by offering a choice between spending time to maintain agri-environment measures that are no longer being compensated for, or using this time instead to spend with family or in the local community. Scenario 6 trades (ii) *environmental conservation* with (iv) *farm labour* by offering a choice whether or not to adopt a new technology that has the potential to benefit the environment at the expense of removing a portion of time required to work on-farm. The full text for all six vignettes used in the survey can be found in Appendix A.

Data

We collected data from two surveys (in Summer 2019 and Summer 2020 respectively) that were sent to a random sample of UK farmers selected from a 1999-2013 database of CAP subsidy recipients from farmsubsidy.org as part of a wider project on agricultural policy and the environment (Howley & Ocean, 2021a, 2021b; Ocean & Howley, 2021). Physical invitation letters containing a link to an online survey were sent to each selected farm address. 12,000 farmers were invited in the first survey, and 30,000 were invited in the second survey. The overall response rate of survey 1 was approximately 7.6% and the overall response rate of survey 2 was approximately 8.5%. Because the surveys contained a large number of questions overall, we minimised survey burden by displaying only two trade-off scenarios to each participant. We obtained 344 responses for Scenario 1, 335 responses each for Scenarios 2 and 3, and 338 responses for Scenario 4. These responses were collected from the first survey. Scenarios 5 and 6 were presented only in the second survey and received 807 and 810 responses respectively due to the larger overall sample size.

For those farmers that completed the demographic questions at the end of the survey, their demographic and farm characteristics appear to correspond broadly to UK data (though we do not claim that they are representative of all UK farmers and farms). According to the 2016 Farm Structure Survey (our first survey; our second survey), 29% (26%; 21%) of UK farms were cropping farms, whilst 64% (44%; 49%) were livestock (including dairy).[1] There was a higher proportion of mixed farms in our sample than in the UK (24% in each survey vs 6% nationally). In terms of income (standard output), 61% of UK farms in 2016 were below 50,000 EUR and 14% were 250,000 EUR or above. This corresponds reasonably well to our data, where 49% were below 45,000 GBP in both samples, and 16% were above 190,000 GBP in the first survey while 19.2% were above 180,000 GBP in the second survey.

However, our sample does represent a higher proportion of large farms. UK government farm size data from June 2017 shows that 19% of holdings were 100ha and over, compared with 55% and 57% in each of our survey samples.[2] On the other hand, the individual demographic characteristics of the farmers themselves were virtually identical to national level data. We had an identical median age band (50-59) and proportion of females to males (15% in the first survey and 17% in the second survey) in our samples when compared to UK data.

3. Results

Aggregate happiness and choice preferences for each scenario

For each of our six scenarios, we first look at the proportion of farmers preferring option A to option B, both in terms of what they feel would make them happier and in terms of what they would choose. Here, the goal is to establish whether farmers as a whole show a clear preference between option A and B in each scenario, as well as to show whether mean preferences are the same between happiness and choice. Table 1 shows that predicted happiness seems to be a good predictor of choice at the aggregate level because the mean responses for Scenarios 3-6 generate the same aggregate preference relationship in terms of both well-being and choice. That is, for these four scenarios, the option that on aggregate farmers thought would make them happier is also the option that the majority of farmers would choose. In addition, the percentage of farmers who feel would be happier with option A and the percentage who state that they would choose option A are very similar for Scenarios 4, 5, and 6, which trade non-pecuniary factors against each other. It may also be worth noting that a clear majority prefers the *social & lifestyle* option to both the *farm labour* option in Scenario 4, and the *environmental conservation* option in Scenario 5. This suggests that *social & lifestyle* benefits seem to be particularly valuable for farmers on aggregate.

[[Insert Table 1 here]]

In contrast, we observe an aggregate disparity between choice and well-being preferences for Scenarios 1 and 2. Looking at Scenario 1 in Table 1, we can see that the majority of farmers (52%) believe that maintaining additional environmental features at the cost of additional farm income would make them happier, but a minority (44%) of farmers report that they would choose this option. For Scenario 2, less than half (45%) report that they would feel happier purchasing a new technology that would save labour effort and boost farm income over continuing to work with other farmers on the farm, but 51% would choose the pecuniary option. In Scenario 3, which also trades a pecuniary option with a non-pecuniary option, we do not observe an aggregate happiness-choice discordance as we do with Scenarios 1 and 2. 44% of farmers would be happier to adopt a profit-enhancing technology that would require indoor computer control as opposed to continuing to work outdoors (*farm labour*) and 48% would choose this option. As in Scenarios 1 and 2 however, a higher percentage of farmers indicate that they would choose the pecuniary option as compared to the percentage that said that this is the option that would make them happiest.

Considering the scenarios as a whole, we can see that choice and predicted happiness broadly align. In other words, what farmers choose on aggregate broadly corresponds with what they feel would make them happiest. However, a t-test for the difference between the proportion of farmers that would be happier with option A and the proportion of farmers that would choose option A finds significant differences for Scenarios 1-3 (Table 1). Specifically, there appears to be a systematic tendency among respondents to favour the pecuniary option more in the choice question than in the happiness question. This suggests that income or profit maximisation may be acting at odds with well-being maximisation in farmers.

Do choice and well-being preferences align *within farmers*?

Table 1 outlined that choice and well-being broadly align at the aggregate level, but that there may be systematic happiness-choice discordances in trade-offs involving pecuniary benefits. To further scrutinise the relationship between choice and well-being, we now examine whether preferences align within each farmer by examining the congruence of response pairs per individual. First, we plot heat-maps that provide a visual representation of the pairwise response distribution, in terms of responses to both the happiness and choice questions for each scenario. Figure 2 illustrates that happiness and choice preferences align within farmers in the majority of cases. This is evident given the concentration of responses along the diagonal. That choice and well-being coincide closely within farmers is supported by high correlations between what a farmer said would make them happier and what they said they would choose. These correlations range from a minimum of 0.85 for Scenario 1 to a maximum of 0.95 for Scenario 4. Therefore, in keeping with analyses on more general population samples (Benjamin et al., 2012), well-being is likely to form a very large portion of the choice utility function for farmers.

[[Insert Figure 2 here]]

Notwithstanding the close correlation between choice and well-being, we still observe a number of cases where there is an incongruence between choice and happiness. This is mostly evident in Scenarios 1-3, which involve a trade-off between a pecuniary and a non-pecuniary option. For example, looking at Scenario 1 in Figure 2, we see that 11.9% of responses are in the top-left or bottom-right quadrants. This means that 11.9% of respondents preferred a different option depending on whether they were predicting their choice or whether they were predicting their happiness. The fact that 10.1% of this total of 11.9% are concentrated in the top-left quadrant suggests that when there is a preference disparity, it is

heavily weighted in favour of farmers who felt the environmental option would make them happiest but would actually choose the pecuniary option. Table 2 summarises this information numerically by specifically outlining the proportion of respondents that demonstrated a disparity between their chosen option and their happiness-maximising option. The first row presents the same information as discussed for Scenario 1 in the first heatmap. 10% of farmers in Scenario 1 were happier with option A (environment) but would choose option B (farm income), whereas only 2% of respondents were happier with option B but would choose option A.

Table 2 echoes Table 1 in that it suggests little disparity between predicted well-being and choice for Scenarios 4-6, and slightly more for Scenarios 1-3. We can formally test whether the happiness question is statistically equivalent to the choice question by comparing the direction of disparity between the cases where choice and happiness diverge using the Liddell test (Liddell, 1983). The Liddell test is an exact version of McNemar's test, which measures the degree of disagreement between matched pairs in terms of two binary outcome variables. The null hypothesis is: $P(choose\ A\ \cap\ happier\ with\ B)\ =\ P(choose\ B\ \cap\ happier\ with\ A)$, which is a test of whether the top-left and bottom-right quadrants in Figure 2 contain the same proportions of respondents. Table 2 shows that the null hypothesis is rejected for Scenarios 1-3, which trade pecuniary benefits for non-pecuniary benefits. This means that when preferences diverge, there is an asymmetry in *how* they diverge. For farmers who would choose differently to what makes them happier, they appear to be willing to trade reduced happiness for higher income.

[[Insert Table 2 here]]

Heterogeneity in choice-happiness concordance

We next estimated separate probit regressions (Table B1 in Appendix B) in order to determine whether individual and farm characteristics could predict the likelihood of a disparity between choice and well-being preferences.[3] The included covariates are: *gender, age band, income, farm type, education, marital status, whether they had children, health, and life satisfaction*. The dependent variable is a dummy that is equal to 1 if the *option selected* by an individual for a particular scenario differed between the happiness and choice questions and 0 otherwise. More specifically, an individual expressing different degrees of preference for the same option would be given the value 0 (e.g. possibly choosing A but probably being happier with A is coded as 0). Because relatively few people expressed such a preference disparity overall, to maximise explanatory power, we pooled Scenarios 1-3 into a single dependant variable that is 1 if there was a preference discordance shown for at least one of these three scenarios. This allows us to estimate a single regression to model the characteristics that make it more likely that there will be a conflict between pecuniary and non-pecuniary benefits.

Table B1 shows that individual and farm characteristics do not seem to predict the likelihood of a farmer having a happiness-choice discordance very well. Although the first three scenarios involve a pecuniary benefit as part of the trade-off, farm income itself is not a strong predictor of happiness-choice discordance. This suggests that although scenarios involving income are most likely to generate a difference between happiness and choice, this appears to be down to an individual farmer's utility function rather than their objective level of farm income. The strongest predictor of a happiness-choice discordance in the pecuniary vs non-pecuniary scenarios appears to be farm type. In particular, dairy farmers appear significantly *less* likely to exhibit a happiness-choice discordance than other kinds of farmers.

For example, the predicted probability of having a discordance in responses is approximately 14 percentage points higher for cereal or cropping farms relative to dairy farms. Of the individual characteristics, age appears to have the largest influence on discordance. In the pooled regression for Scenarios 1-3, farmers in higher age bands were less likely to express a happiness-choice discordance, which is likely to indicate that there is less of a dilemma for older farmers when it comes to having to choose between pecuniary and other quality-of-life benefits. Farmers below 50 years of age were approximately 11 percentage points more likely than farmers aged 70 or above to express a happiness-choice discordance when they face a trade-off between pecuniary and non-pecuniary benefits. This age pattern becomes stronger if we change the dependent variable in the regression to only capture cases where pecuniary benefits were chosen, but where participants felt that non-pecuniary benefits would make them happier; this is supplemented by a significantly positive relationship between having children and having this particular type of discordance (these results are not shown, but are available on request). Age is also a predictor of discordance in Scenarios 5 and 6, which trade the environment against different types of non-pecuniary benefits. Again, the youngest farmers (those below 50) are more likely to exhibit a happiness-choice discordance in these scenarios, though the pattern does not appear to be monotonic because the probability of discordance begins to increase again in older age.

The importance of non-pecuniary benefits

Having looked at the *consistency* of preferences in terms of predicted choice and happiness, we now more closely scrutinise the *actual* preferences expressed in the scenarios involving pecuniary vs non-pecuniary trade-offs. First, let us consider Scenario 1. Here, farmers were faced with a scenario involving a trade-off between maintaining environmental features on

the farm once an agri-environment scheme ends (option A), versus converting the land back to growing crops for an additional 10% increase in farm income (option B).

The preferences expressed here are pertinent in a UK context where many AES contracts are ending and may not be renewed in their original form now that the UK no longer falls under the EU's Common Agricultural Policy (CAP). At present, the main financial incentive for environmental practices in the UK agricultural sector are AESs, which form part of the CAP. They were originally introduced in the EU in the 1980s and have been mandatory for member states since 1992, though voluntary for farmers (Hodge & Reader, 2010). By paying farmers for providing environmental services, AESs incentivise farmers to engage in more pro-environment farm practices than would otherwise be the case (McGurk et al., 2020). Some examples of the types of behaviour AESs look to encourage include crop rotation, reducing fertiliser use, enhancing wildlife habitats, and maintaining buffer strips. Farmers commit to these practices for a set contract length (typically around five years) but are free to return their land to previous uses once the scheme ends (European Commission Directorate-General for Environment, 2017). To illustrate the scale of these schemes, in 2020 the total area of land in AESs in England came to 3.6 million hectares, which represents approximately 40% of the utilisable agricultural area (Joint Nature Conservation Committee, 2021). However, despite their wide coverage, AESs (in combination with other rural development initiatives that fall under Pillar II of the CAP) represent less than 20% of the total CAP budget.

While the role of AESs in the EU has grown since their inception, quantifying the environmental benefits has proven challenging, and significant doubts about their environmental effectiveness have been raised. This is because requirements and payments are generally uniform across all farmers which means the potential for adverse selection remain

high (Chabé-Ferret & Subervie, 2013). The difficulty is that farmers whose usual farming practices already satisfy a portion of the scheme's requirements are the farmers who are most likely to participate. Notwithstanding this problem, some studies have employed quasi-experimental methodologies and found that AESs have provided significant environmental benefits (Pufahl & Weiss, 2009; Kuhfuss & Subervie, 2018).

The environmental cost of removing AESs will depend on the degree to which farmers would voluntarily maintain environmental features once the scheme contracts end. Scenario 1 suggests that a significant proportion of farmers seem to be willing to sacrifice a degree of pecuniary gain in favour of environmental preservation through intrinsic motivation alone. Just under half of all farmers reported that when faced with this specific trade-off, they would choose the environmental option, whereas just over half indicate that this option is the one that would make them happiest. Of course, if option B were to provide a 20% increase in farm income, we would expect to see a much larger proportion of farmers in favour of the pecuniary option. However, it is still informative to observe that a significant proportion of farmers appear willing to sacrifice some profitability for environmental conservation. This is consistent with other research which suggests that many farmers plan to maintain pro-environmental farm practices even after the end of an AES contract (Kuhfuss et al. 2016; Howley and Ocean 2021).

Moving to the other non-pecuniary factors, 49% of farmers in Scenario 2 indicated that they would choose to continue to work with other workers on the farm (*social and lifestyle benefits*) in favour of a machine that replaces the workers with a subsequent 10% increase in profitability (*pecuniary benefits*). In Scenario 3, we can see that despite the profitability gains, a small majority of farmers (52%) would actually choose to continue working outdoors (option B) as opposed to adopting a labour saving and profitability enhancing technology that

requires indoor control. This response pattern illustrates the difficulty in encouraging uptake of new technologies and farm practices more generally. Policymakers often lament the fact that farmers often fail to adopt profit-enhancing technologies or new farm practices despite it being financially optimal to do so (Pannell et al., 2006; Howley, 2015). Our results highlight one possible explanation for this: adopting certain technologies may result in the loss of highly valued non-pecuniary benefits.

Overall, we suggest that farmers are commonly faced with difficult trade-offs where they have to weigh up utility gains arising from increased farm income associated with new farm practices against the disutility stemming from losses in other non-pecuniary benefits. The fact that many farmers would still prefer non-pecuniary options to pecuniary ones highlights the fact that farm owners cannot be treated as solely profit-maximising entities. This is supported by observed behaviour (Pannell et al., 2006; Mills et al., 2018; Marr & Howley, 2019), where there has been a tendency for some farmers to engage in unsubsidized or even loss-making environmental practices, reluctance to adopt new efficiency-enhancing technologies or farm practices, as well as the allocation of more time to farm labour even when faced with higher returns in the off-farm labour market. A further contraindication for the use of neoclassical models in agriculture is the apparent intrinsic motivation towards farm work in itself. In Scenario 4, although a clear majority of farmers report that they would be happier and would choose extra leisure time instead of extra farm labour, over a third of farmers still preferred extra outdoor farm work to extra leisure time. This contradicts standard economic models of labour supply, which treat labour as only a means to generate income.

Heterogeneity in preferences across farmer subgroups

The analysis above illustrates that non-pecuniary benefits form an important part of the utility function for many farmers. In order to add further richness to our understanding of which

types of farmers might be more likely to prefer one of the two options in general, we split each scenario into subgroups based on the following covariates: farm type, education, gender, age, and whether they had children. Our aim with this analysis is to offer a preliminary descriptive examination of whether the behaviour of farmers with specific characteristics are more likely to be affected by the presence of non-pecuniary benefits.

Table B2 in Appendix B shows the proportion that preferred option A for both happiness and choice across the subgroup categories for each scenario. Looking first at Scenarios 1-3, we can see that across the major farm classifications, dairy and crop farmers appear to value pecuniary benefits relatively more than livestock farmers. One possible explanation for this result is that dairy and crop farms in the UK tend to be much more intensive, less subsidy reliant, and more business orientated than livestock farms. Additionally, Scenarios 4 and 6 suggest that *farm labour* may be relatively less important to crop and dairy farmers than to livestock farmers. This could be a result of the differences in what constitutes "farm work" across different types of farm. It may suggest that the cases in which farmers might paradoxically prefer to spend more time labouring on the farm are likely only when the type of farm work involved has sufficient intrinsic rewards, and these rewarding types of work may only be available on certain types of farms.

In terms of individual characteristics, Table B2 suggests that first, less educated farmers may have more of an attachment to the non-pecuniary benefits associated with farm labour itself than more educated farmers. For example, the proportion of farmers preferring the pecuniary option over the farm labour option (Scenario 3) is 19 percentage points higher in those with a degree relative to those without a degree. The other two scenarios involving *farm labour* (Scenarios 4 and 6) also see a significantly higher proportion of farmers with a degree preferring the alternative non-pecuniary option over *farm labour*. In Scenario 4, the

proportion of farmers preferring the social & lifestyle over the farm labour option is 13 percentage points higher for those with a degree, whereas in Scenario 6 the proportion preferring the *environmental benefits* option to the *farm labour* option is 18 percentage points higher in farmers with a degree.

Second, it appears as though female farmers may place a lower value on pecuniary benefits than male farmers. Scenarios 1-3 show that a relatively higher proportion of male farmers would be both happier and would choose the pecuniary option over the non-pecuniary option, though the relatively low proportion of female farmers in our samples does reduce the reliability of any gender comparison. In relation to age, we observe in Scenarios 1-3 that older farmers are more likely to choose the non-pecuniary as opposed to pecuniary option than comparatively younger farmers. For example, in Scenarios 2 and 3, 62% of farmers under 50 choose the pecuniary in favour of the social and lifestyle and farm labour option, but this compares to 45% and 44% respectively for farmers over 60 years of age. A similar picture is evident in Scenario 1 where 49% of farmers over 60 would choose the environmental as opposed to pecuniary option but this falls to 32% for those under 50. While we cannot distinguish between life-cycle effects and generational effects from these data, it is perhaps intuitive that older farmers are less concerned with income. For example, they may already have previously accumulated wealth, or have reduced family expenditure requirements, which would lead to a comparatively lower marginal utility of income.

Finally, one might expect farmers with children to be more interested in income maximisation due to a bequest motive. However, our results suggest that this is unlikely to be the case. The differences between preferences in farmers with children and farmers without children top out at a maximum of 4 percentage points across Scenarios 1-3. In Scenario 5, there is a 12-percentage point difference: relatively more farmers without children would be

happier with *environmental benefits* to *social & lifestyle benefits* than those with children. However, this pattern is not repeated in Scenario 6, where a similar proportion of farmers with and without children prefer *environmental benefits* to *farm labour*.

4. Discussion

In summary, this study has made two main contributions to the literature. First, we have confirmed that choice and well-being align strongly in farmers, as it appears to do so in a wider population sample more generally (Benjamin et al., 2012). In what we believe is the first study to analyse farmer-specific trade-off scenarios within a farming population, we find that farmers would generally choose what they also believe would make them happier (if they were to be given the option). This supports the theoretical idea that subjective well-being (i.e. experienced utility) corresponds closely to the more traditional economic concept of decision utility. It also lends some credibility to the use of subjective well-being measures as a proxy for farmer decision utility.

While our results support the finding that happiness is a uniquely important argument of the utility function (Benjamin et al., 2012), we do identify situations where farmer choices do not appear to maximise their happiness. This is apparent in the scenarios that trade pecuniary gains against non-pecuniary gains. Such a disparity between happiness and choice appears to be more likely to occur in younger farmers. One possible explanation may be due to responsibility utility (Comerford & Lades, 2021). Farmers may feel a responsibility to seek an income maximising choice but may not desire this option overall from the perspective of their own individual happiness (e.g. because of family). Instead, it may only be possible to maximise their well-being when an exogenous third-party is able to choose on their behalf (Comerford & Lades, 2021). Another explanation for the disparity could be that farmers feel as though they will become happier in future from choosing to maximise income today, i.e.

maximising lifetime happiness rather than short-run happiness. However, they may be overestimating the future well-being impact of more income today because of the "impact bias" (Wilson & Gilbert, 2005). Specifically, people are poor at predicting the intensity and duration of feelings caused by future events. Therefore, it is possible that any perceived future increases to happiness from extra income today may be less impactful than anticipated.

Second, our findings also suggest that non-pecuniary attributes, such as environmental conservation and intrinsic rewards from farm work, are important arguments in a farmer's utility function. Therefore, they are likely to influence decision-making in an agricultural context. Our scenarios were designed to illustrate how farmers are commonly faced with difficult trade-offs, where they have to weigh up increases in farm income associated with new farm practices against losses in other non-pecuniary benefits. The fact that many farmers appear willing to sacrifice a pecuniary gain in return for non-pecuniary benefits demonstrates that farm owners cannot be treated solely as profit-maximising entities. In turn, the omission of non-pecuniary benefits for farmer behaviour from economic models of agriculture may lead to an inaccurate assessment of the impact of a change in agricultural or environmental policy. Our subgroup analysis also points to differences across farmers with regards to the extent to which non-pecuniary benefits matter. For example, relatively older farmers, those with comparatively less education, and livestock farmers all appear to be relatively more likely to be impacted by the presence of non-pecuniary benefits in their decision-making.

The presence of non-pecuniary benefits makes the challenge of predicting how farmers will react to new interventions such as new policies (e.g. payments for ecosystems services, PES) or the development of new technologies challenging, especially because traditional models may not accurately capture farmer motivations. To illustrate this point, consider the recently proposed UK Agriculture Bill, which promises to change how agricultural subsidies

are distributed following the UK's withdrawal from the EU (and subsequently the CAP).[4] The CAP is designed to provide financial support to farmers in EU member states. Payments under CAP account for over half of all farm incomes in the UK and so have been central to the financial sustainability of farm businesses. AESs co-funded by EU member states by the CAP have been the main mechanism used to deliver environmental benefits on agricultural land in Europe. Notwithstanding the support for AESs, the CAP has been criticised as contributing to widespread biodiversity loss (Pe'er et al., 2020). This is because the majority of CAP support consists of direct payments to farmers with limited requirements to meet environmental objectives (so called cross-compliance). The proposed Bill plans to move towards paying farmers to produce public goods and services, as opposed to payments based on how much land is farmed or historical production levels (the basis of current CAP payments). One implication of such a policy change is that there will be more scope for farmers to obtain payments for environmental practices, and possibly fewer situations where they have to make a choice between environmental conservation and pecuniary benefits. However, this would require a significant change in farming practice, and the consequences of such changes on farmer behaviour and welfare are unclear.

It is an open question, for instance, as to whether farmers will derive the same utility from producing environmental public goods and services as they do from traditional farm work such as producing food. This is not to say that farmers do not care greatly about environmental issues. Indeed, Scenario 1 in this study suggests quite the opposite. Rather, we suggest that the success of new policy initiatives will not only depend on farm income but will also greatly depend on the degree to which participation engenders losses in other utility enhancing non-pecuniary benefits. For example, participation in a new subsidy scheme (such as PES) might maximise farm profits, but not necessarily be the preferred option for each individual farmer when it comes to maximising their utility. A similar argument follows for

the adoption of a new agricultural technology. There is a rich literature exploring the determinants of technology adoption, which has pointed out the importance of economic considerations such as usability and profitability (see Pannell et al., 2006). The responses we collected suggest that even if technologies are profit enhancing, this may not maximise the utility of some farmers if it results in the loss of other key non-pecuniary benefits.

We note that, as with other vignette-based studies, the present study has the limitation of not being able to measure actual choices in practice, as well as presenting scenarios that are quite scant in terms of the information provided relative to the details that would be accessible in a real decision setting. However, insofar as the broad conclusions of this paper match similar previous work that was replicated with high-stakes choices (Benjamin, Heffetz, Kimball, & Rees-Jones, 2014), this is unlikely to be of particular concern. The use of vignettes has the advantage of allowing us to address a much wider variety of relevant real-world choice scenarios than would otherwise be the case. We also acknowledge that due to our recruitment method, we cannot generalise the results to all farmers, particularly to those that may not have been able to respond because of limited internet connectivity. To supplement the approach followed in the present study, future studies may also wish to adopt a reflective approach that asks farmers about their satisfaction with previous choices already made, though this is also problematic in that there are well-documented biases in terms of remembered utility, where experiences are evaluated predominantly by the peak and end of the memory (e.g. Redelmeier & Kahneman, 1996).

5. Conclusion

Using tailored scenarios which address important trade-offs for farmers, our study has shown that farmers choose in a way *that broadly but not exclusively* maximises their well-being. This suggests that using subjective indicators of well-being as a proxy for decision utility

may be a useful tool for studying farmer decision-making, as well as conducting welfare evaluations more broadly. In cases where a disparity between choice and well-being preference was observed, choices favoured greater pecuniary benefits (i.e. income or profits) at the expense of happiness. This means that using subjective well-being measures alone may understate the importance of income in farmer choice. The finding highlights the ongoing struggle between seeking out the lifestyle benefits that farmers seem to value highly in well-being terms and generating enough profit to thrive. Finally, our scenarios highlight the importance of non-pecuniary benefits for farmer utility, particularly those associated with the farming lifestyle. Farmers may decline an opportunity to increase farm income such as adopt a new technology or practice if it diminishes other sources of non-pecuniary utility. Failing to account for the presence of these non-pecuniary benefits can lead policymakers to draw incorrect conclusions when it comes to predicting farmer responses to policy changes.

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Tables

Table 1: Aggregate preferences for each scenario

Scenario	% happier with A	% would choose A	Implied aggregate preference	p-value (% happier A = % choose A)	*n*
1. Environment (A) vs pecuniary benefits (B)	52%	44%	ambiguous	<0.00005*	344
2. Pecuniary benefits (A) vs social & lifestyle (B)	45%	51%	ambiguous	0.0011*	335
3. Pecuniary benefits (A) vs farm labour (B)	44%	48%	$A \preccurlyeq B$	0.0045*	335
4. Social & lifestyle (A) vs farm labour (B)	63%	62%	$A \succ B$	0.3465	338
5. Environment (A) vs social & lifestyle (B)	31%	32%	$A \prec B$	0.6509	807
6. Environment (A) vs farm labour (B)	58%	58%	$A \succ B$	0.5997	810

Note: The first two columns show aggregate proportions preferring option A for the happiness and for the choice questions. The 'implied preference relation' column shows which of the two options for each scenario was preferred on average for both happiness and choice (i.e. between subjects). A weak preference relation is applied to scenario 3, where the aggregate split between options A and B was not found to be significantly different from 50-50 at the 5% level. Responses for scenarios 1-4 were collected from the first survey in 2019, and responses for scenarios 5-6 were collected from the second survey conducted in 2020. * indicates $p < 0.05$ for the null that the proportion happier with option A = the proportion that would choose option A.

Table 2: Proportion of farmers that would choose differently to what would make them happier

Scenario	Happier with (A); chose (B)	Happier with (B); chose (A)	Liddell's exact test statistic	*p*-value (two-sided)	*n*
1. Environment (A) vs pecuniary benefits (B)	34 (10%)	6 (2%)	4.857	0.002*	344
2. Pecuniary benefits (A) vs social & lifestyle (B)	12 (4%)	34 (10%)	2.615	0.008*	335
3. Pecuniary benefits (A) vs farm labour (B)	8 (2%)	24 (7%)	2.667	0.026*	335
4. Social & lifestyle (A) vs farm labour (B)	11 (3%)	7 (2%)	1.375	0.519	338
5. Environment (A) vs social & lifestyle (B)	37 (5%)	41 (5%)	1.079	0.739	807
6. Environment (A) vs farm labour (B)	27 (3%)	31 (4%)	1.107	0.701	810

Note: These are within-person disparities in preference for each scenario. They correspond to observations in the upper-left and bottom-right quadrants of Figure 2. * denotes $p < 0.05$.

Figure Captions

Figure 1: A happiness and choice trade-off question.

Figure 1 notes: The descriptive text and options shown in this screenshot correspond to Scenario 1. The two questions in italics and the response scales are identical across all six scenarios.

Figure 2: Heat-maps of within-person responses to the six trade-off scenarios.

Figure 2 notes: Each cell contains the *proportion* that responded with the corresponding response pairing. For example, the bottom-left cell in Scenario 1 indicates that 16.6% of respondents replied "Definitely option A" to both the happiness and choice questions. Observations on the main diagonal show responses where choice and happiness correspond exactly. Observations in the top-left and bottom-right quadrants represent farmers for whom choice and well-being were maximised with different options.

Endnotes

[1] See https://www.gov.uk/government/statistics/farm-labour-profiles-from-the-england-and-uk-farm-structure-survey

[2] https://www.gov.uk/government/statistical-data-sets/agriculture-in-the-united-kingdom

[3] We note that this analysis is exploratory in the sense that we had no prior expectations for the direction of specific subgroup differences.

[4] https://services.parliament.uk/bills/2019-20/agriculture.html

Suppose 25% of your land was previously in an agri-environment scheme (like the Countryside Stewardship). However, the scheme has now ended. You have two options:

Option A: Continue to develop the land for environmental conservation purposes.
Option B: Convert the land back to growing crops in order to generate 10% more farm income.

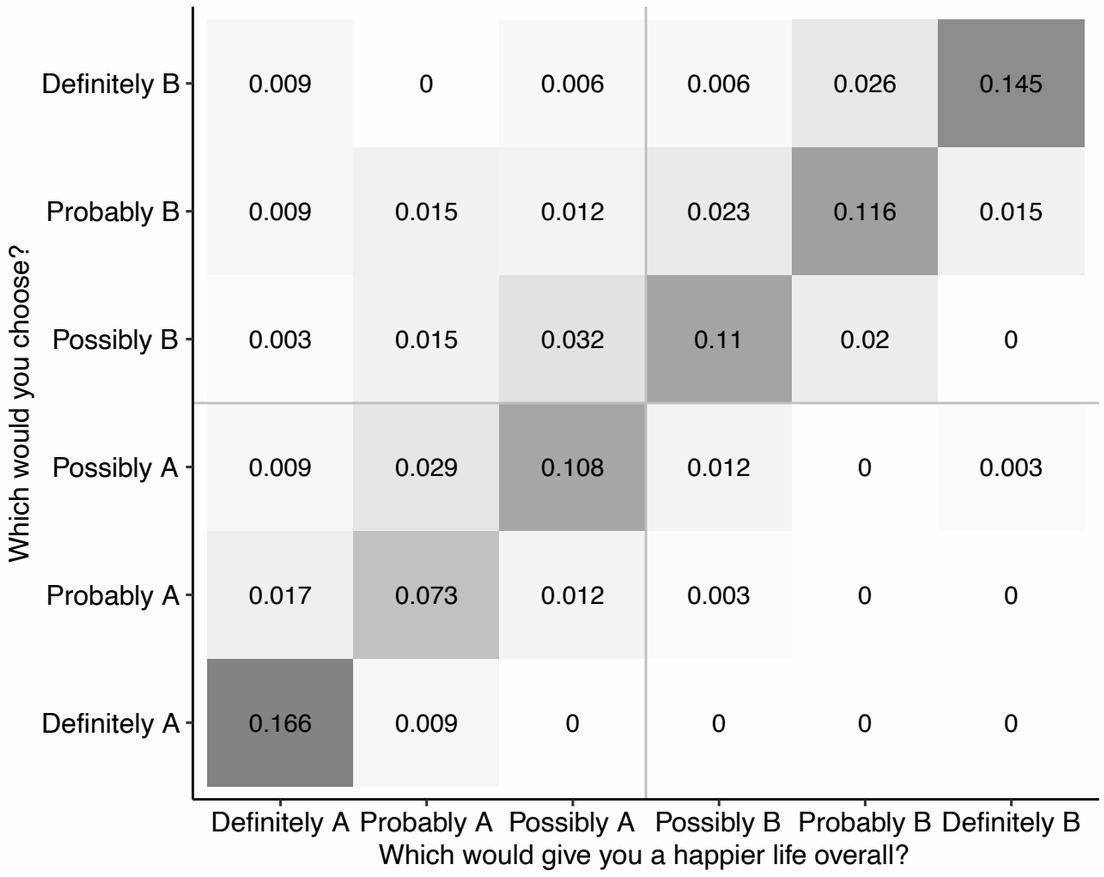
Between these two options, taking all things together, which do you think would give you a happier life as a whole?

Definitely happier with **Option A**	*Probably happier* with **Option A**	*Possibly happier* with **Option A**	*Possibly happier* with **Option B**	*Probably happier* with **Option B**	*Definitely happier* with **Option B**

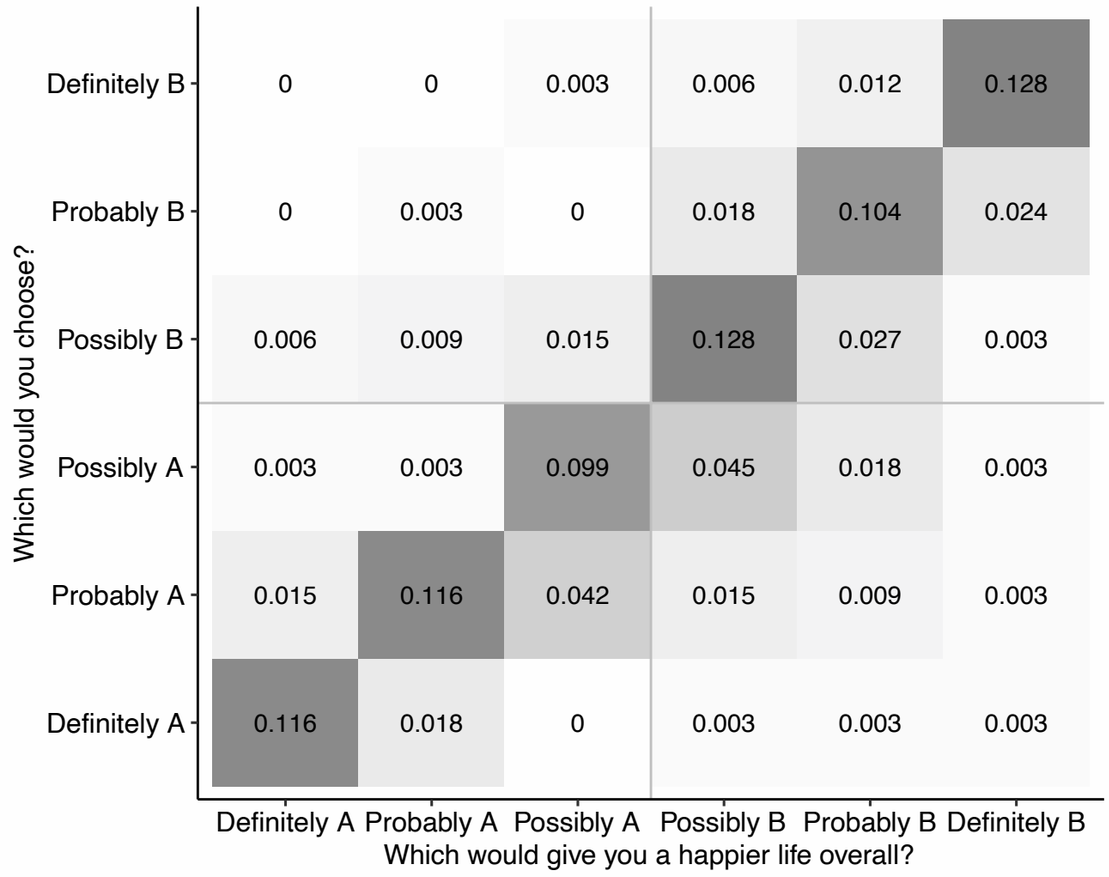
If you were limited to these two options, which do you think you would choose?

Definitely choose **Option A**	*Probably choose* **Option A**	*Possibly choose* **Option A**	*Possibly choose* **Option B**	*Probably choose* **Option B**	*Definitely choose* **Option B**

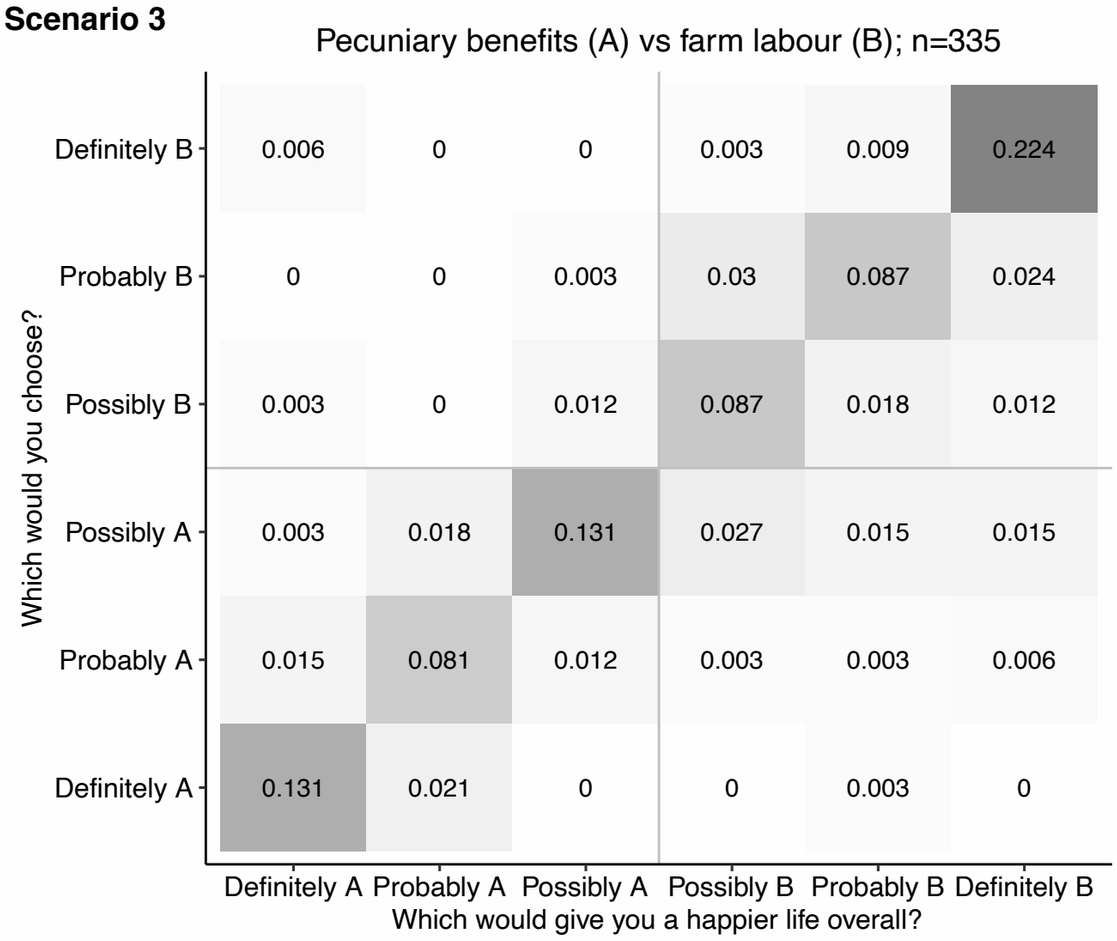
Scenario 1



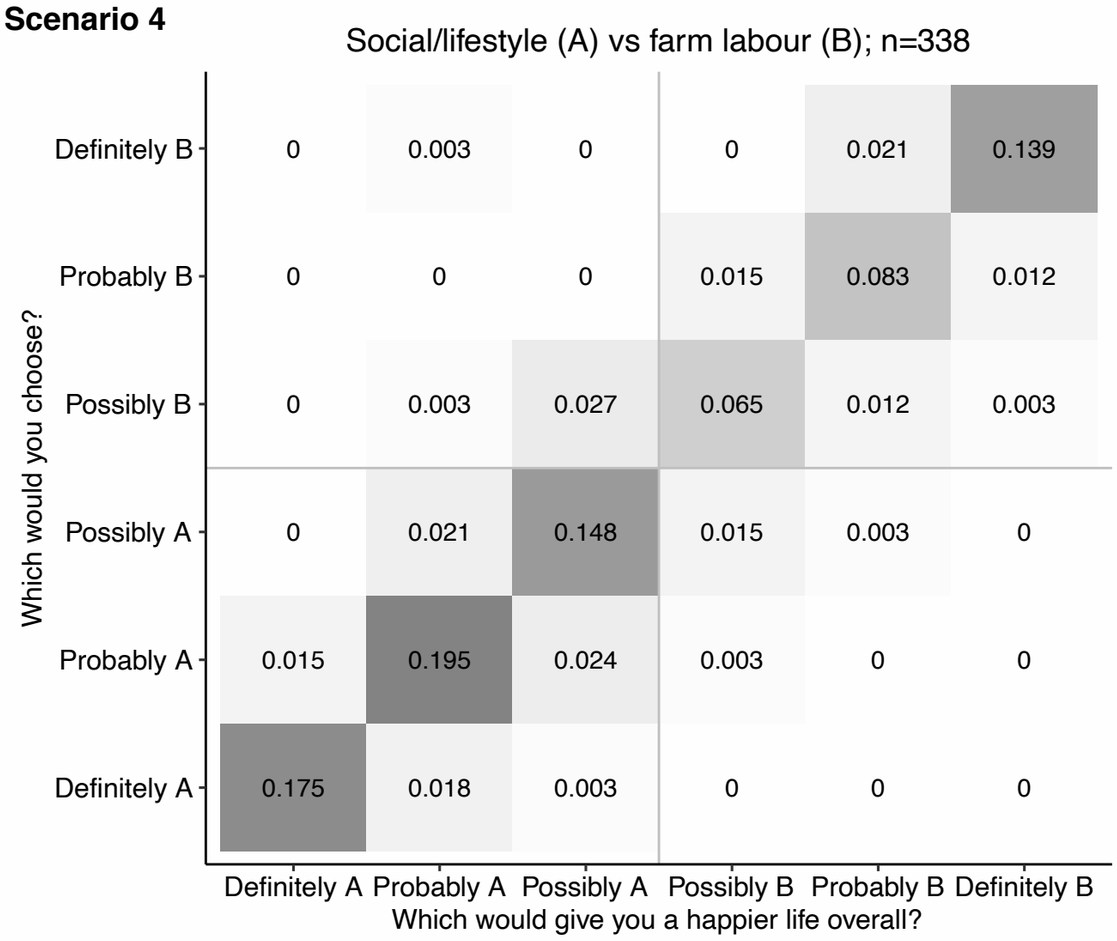
Scenario 2



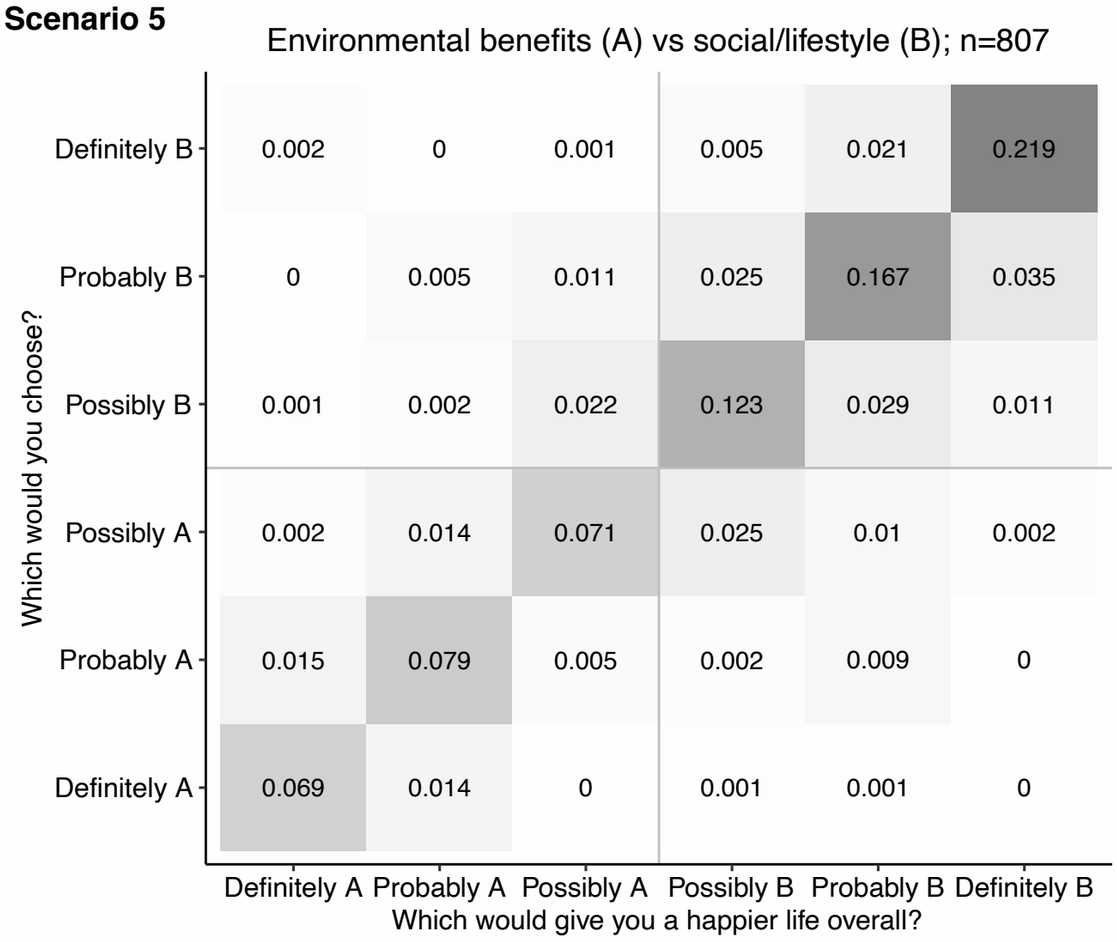
Scenario 3



Scenario 4



Scenario 5



Scenario 6