Exploring the Relationship between Regenerative Grazing and Ranchers' Wellbeing

1. Introduction

Livestock production is facing significant challenges due to declining ecosystem health and increasing reliance on external inputs, which compromises the resilience of farms (i.e., against the market and extreme weather uncertainties) and impacts the wellbeing of producers (Jackson, 2022; Spratt et al., 2021). Saliman & Petersen-Rockney (2022) highlight the adverse effects of climate change and financial and emotional hardships on ranchers in the western United States, resulting in increased distress, anxiety, interpersonal tension, and alcohol consumption which have contributed to a decline in psychological wellbeing among this population. The shift towards conservation paradigms in recent decades has created opportunities for adaptive grazing practices, which offer a promising approach for building and regenerating farms' ecosystem health while also delivering societal benefits (Spratt et al., 2021).

Regenerative grazing, also known as adaptive grazing, is an approach that prioritizes soil health and adaptive livestock management principles to improve both human and ecosystem health in livestock production systems (Newton et al., 2020; Spratt et al., 2021). This approach commonly involves maintaining short periods of intense grazing followed by long rest periods to support the paddock's recovery and build on the relationship between livestock and grassland (Teague & Kreuter, 2020). The literature on regenerative grazing has mainly focused on providing empirical evidence of the ecological benefits. Research has shown that regenerative practices can generate significant ecosystem services on and off the farm (Franzluebbers et al., 2012), providing opportunities for greater plant and insect species richness and birds (Goosey et al., 2019; Lwiwski et al., 2015; Lyons et al., 2017); improving soil structure and microbial communities (Glover et al., 2010; Teague & Kreuter, 2020); increasing water retention, water infiltration, improving soil fertility and preventing soil erosion (J. Y. Park et al., 2017; J.-Y. Park et al., 2017). Furthermore, regenerative grazing may significantly reduce a livestock grazing system's carbon footprint when compared with conventional grazing systems (Becker et al., 2022; Gosnell, Charnley, et al., 2020; Stanley et al., 2018; Thompson & Rowntree, 2020) while providing sufficient feed for cattle weight gain (Fruet et al., 2019; Rowntree et al., 2020).

While the ecological benefits have been extensively studied, the societal ones received much less attention (Gosnell, Grimm, et al., 2020; Spratt et al., 2021). The socio-economic benefits

have been mainly financial, linked to biophysical benefits that diversified farming operations provide – i.e., the literature suggests that improvement in herd health is likely to reduce veterinary costs (Dumont et al., 2022; Gosnell, Charnley, et al., 2020) and that multi-paddock grazing systems outperform continuous grazing systems in ecological function, which is predicted to feedback positively in ranching profitability (Gosnell, Charnley, et al., 2020; LaCanne & Lundgren, 2018; Teague & Dowhower, 2022). However, the empirical evidence from regenerative farms is mixed. Alfaro-Arguello et al., (2010) show that holistic management (a decision-making framework that includes adaptive grazing management) can improve farms' sustainability but suggest it can be compromised by government assistance, and Franke & Kotzé, (2022); Hawkins et al., (2022); Windh et al., (2020) discussed that high-density grazing systems did not affect productivity and profitability. The contested results call for research that can further the understanding of the benefits of regenerative grazing.

Despite farmers' wellbeing being a concern and motivation for promoting or assessing the effectiveness of regenerative practices, the discussion of the benefits of regenerative grazing has mainly focused on productivity and profitability. Research has shown that farmers adopt climate mitigation management practices, which overlap with regenerative practices, to pursue multiple benefits, such as reducing animal stress, enhancing their farm resilience to financial shocks and environmental conditions, reducing working time, and inheriting a healthy farm for the next generations, reflecting farmers' holistic thinking and how success is defined (Gosnell, Charnley, et al., 2020; Mann & Sherren, 2018). As highlighted by (Gosnell, Grimm, et al., 2020), for regenerative farmers, success is not just about financial gains, but also about improving their overall quality of life. Then, it is imperative to broaden the discourse on regenerative grazing to include its potential impact on the wellbeing of farmers.

The concept of human wellbeing has evolved during the last decades to encompass multiple factors, such as health, relationships, meaning, positive emotion, and the absence of anxiety, depression, and fear, which are viewed as important for optimal human functioning (Adler & Seligman, 2016). Within the regenerative grazing literature, there are some examples that link such factors that can influence farmers' wellbeing with the adoption of these practices. Mann & Sherren (2018) describe that ranchers in the USA, Australia, and Canada report benefits such as quality of life, resilience, and social capital and identified managing crisis and desperation as factors why people were interested in training in adaptive grazing management. Barton et al., (2020) found that

holistic management practices improved ranchers' communication with stakeholders and their confidence in handling difficult situations (e.g., droughts). Carien De Villiers et al., (2014) described that adaptive grazing practices enhanced social engagement and learning networks among ranchers in South Africa, and Derner et al., (2021) suggests that the value of adopting adaptive grazing management practices is how it changes the way ranchers manage the complexities of operating a ranch and rethinking their relationship with it. Interestingly, Gosnell et al., (2019) found that mechanisms such as social isolation, a sense of community, public recognition, and enthusiasm among others were influencing long-term commitment to regenerative or holistic management practices in Australian ranchers.

The growing recognition of including aspects of farmers' life in the assessment of regenerative grazing has emphasized the need to examine or identify the wellbeing outcomes associated with the adoption of regenerative practices. As previously mentioned, the literature has hinted at how regenerative grazing may impact farmers' wellbeing, however, few studies have explicitly measured the impact of regenerative grazing systems on wellbeing outcomes. In a study with those practicing extensive livestock grazing in Australia (and thus assumed to include those using regenerative practices), Brown et al., (2021) found that extensive practices were significantly correlated with subjective wellbeing measures such as life satisfaction, worthwhileness, the standard of living, personal health, achieving in life, personal safety, and community connectedness. Using the same 'Regional Wellbeing Survey' but from the following year, Brown et al., (2022) found evidence that managing extensive cattle and/or sheep grazing properties can increase farmers' self-efficacy and enhance their wellbeing and thus farmers' self-perception of how they manage their land can also lower their wellbeing. In a comparative study of Adaptive Multi-Paddock (AMP, a type of regenerative grazing), rotational, and conventional Canadian beef producers, Sherren et al., (2022) found that AMP grazers have significantly higher levels of physical (health) wellbeing, while levels of financial, relational and psychological wellbeing were strong for all sub-groups. These studies certainly provide important insight into the positive relationship between regenerative grazing and wellbeing and suggest that understanding farmers' wellbeing outcomes is crucial to promote the adoption of regenerative practices.

This study aims to contribute to this emerging body of literature assessing the perceived benefits of wellbeing for regenerative grazers in the US, where no similar study has been conducted. We highlight social wellbeing as a holistic concept to integrate the multiple societal

benefits that may originate – e.g., pleasure, self-determination, relationships, and improvements in financial and health outcomes.

We argue that understanding the social wellbeing outcomes of regenerative agriculture techniques is as crucial as understanding the ecological impacts, as we need to ensure these methods don't create social harm before scaling up adoption. Therefore, this paper aims to address these concerns through a twofold approach: proposing and testing a holistic framework for capturing farmers wellbeing complexity (or multidimensionality), and measuring the wellbeing outcomes across different grazing management practices for beef producers in Michigan, USA. Once we know that regenerative agriculture doesn't erode social wellbeing, we can use insights from livestock producers on this topic to further justify the transition to regenerative farming systems that withstand environmental stressors while supporting the wellbeing of the farmers (Brown et al., 2021).

2. Materials and Methods

In this study, we first propose a novel framework for assessing social wellbeing and second, we use the framework to measure the social wellbeing outcomes of beef producers in Michigan, also exploring potential variations among different grazing management practices. Cattle operations in Michigan are relatively small compared to other regions in the United States. According to the Michigan Beef Industry Commission (2023), there were approximately 12,000 farms with beef (and dairy) operations that met 33% of the local meat demand and were valued at $541 million in 2022. While all Michigan cattle start life on pasture, the majority are finished in feedlot systems (>97%, Stanley et al., 2018) which requires large proportions of agricultural land to be used for the cultivation of feed ingredients such as corn or alfalfa, with considerable use of chemical inputs that can lead to soil erosion and reduced productivity in the long term. Interventions to improve the system could include the adoption of regenerative grazing practices and finishing on grass, which can reduce the need for chemical inputs and enhance soil organic matter content and soil health (Teague and Kreuter, 2020).

2.1 Study design

The study design was adopted from an interdisciplinary longitudinal research project on regenerative grazing of beef cattle in Michigan, USA [redacted for review]. The methodological approach followed two main stages (1) The recruitment criteria and farmers' selection process and

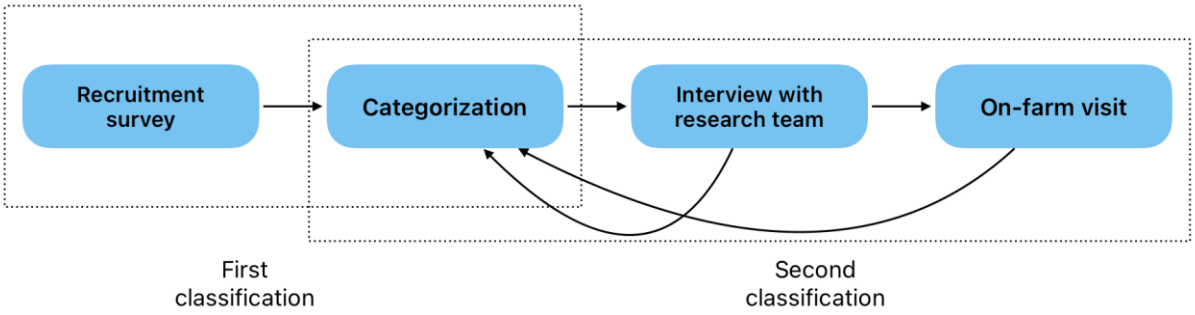
(2) the wellbeing survey design and implementation. This research was approved by the [Redacted for review] IRB Board through the Non-Committee Review procedure (STUDY00005404) on December 16th 2020 and all participants provided informed consent before participating.

2.1.1 Recruitment and categorization

The recruitment and categorization by grazing system were iterative processes based on information from an online recruitment survey, in-person interviews, and on-farm observation as shown in Figure 1. An initial categorization as adaptive or non-adaptive (commonly slow rotation-continuous) was performed after an online recruitment survey was distributed widely to pasture-based beef producers during the winter of 2021 and spring of 2022 through the Michigan State University Extension, Michigan Cattleman's Association, and related networks. We received 98 responses, and 61 farmers were invited to participate representing a spectrum of grazing management practices, based on how often their cattle moved during a grazing season in an average rainy year, how long the cattle were in a paddock, and whether the farmer considered their practices to be regenerative/adaptive. A final sample of 37 farms remained active participants.

The initial categorization was revised after an in-person interview that took place in the spring of 2022. During the interview, farmers were asked for more details about the initial classification questions collected in the recruitment survey. A final adjustment to the categories was made after in-situ observation of farmers' grazing practices in the summer of 2022.

Figure A.1. Farmers categorization process



After the second classification, we categorized 45 farmers from the 37 farms (that were either the sole or joint primary decision makers) into three groups: first, the adaptive group (n=16) which includes those farmers who were practicing regenerative grazing with their beef cattle at the time of the recruitment; second, farmers in a transition process towards regenerative grazing (n=19), and finally a group of non-adaptive farmers (n=10).

2.2 Survey design

2.2.1 Theoretical considerations for the subjective wellbeing survey

The wellbeing survey offers a holistic operationalization of social wellbeing as subjective wellbeing (SWB). In psychology, SWB refers to people's self-evaluation of the optimal human experience and functioning (Deci & Ryan, 2008) and is considered to be an adequate measure of human wellbeing (Frey & Stutzer, 2014). The research on operationalizing SWB has evolved over the years from a perspective beyond positive and negative affect to one that considers thriving across multiple domains in life. Therefore, we assume that social wellbeing is a latent variable, which could be measured through the outputs in multiple domains of subjective wellbeing. We propose a novel measure for social wellbeing which integrates five existing different domains or constructs: (1) Life Satisfaction, (2) Hedonic wellbeing, (3) Eudaimonic wellbeing, (4) Relational wellbeing, and (5) Physical wellbeing. From this perspective, maximizing one's human experience – social wellbeing – is viewed as maximizing one's experience in all of the five domains mentioned above.

A central assumption in our framework is that although all domains are intrinsically related, they are understood as independent constructs that influence the optimal human experience. Hedonic wellbeing (HWB) was originally described as the affective evaluation of people's lives as positive or negative (Bradburn, 1969) and the cognitive components of one's life conditions (Cantril, 1965). However, empirical evidence has shown that the affective (hedonic wellbeing) and cognitive components (life satisfaction) are separable (Davern et al., 2007; Deci & Ryan, 2008). The process of achieving the optimal human experience goes beyond happiness or positive and negative affect or emotion (Butler & Kern, 2016) and includes living as one was inherently intended to live, which is best known as eudaimonic wellbeing (EWB) (Deci & Ryan, 2008). Relational wellbeing rests on the premise that the presence or absence of interpersonal relationships, such as socializing, giving, or receiving social support, has a positive or negative effect on human wellbeing (Adler & Seligman, 2016; Biddle et al., 2019). Hence, what is often evaluated in relational wellbeing is the social network or availability of social interactions (helpful contact) and the satisfaction with received support and giving support to others (Butler & Kern, 2016; Winefield et al., 1992).

Within the wellbeing literature, and particularly in economics, there has been an interest in objective indicators of wellbeing. These indicators, often called social welfare indicators, are based on the resources and opportunities people may access and precisely how well people meet their needs (Breslow et al., 2016; de Maya Matallana et al., 2022; Gilbert et al., 2016; Loveridge et al., 2020). Our interpretation of physical factors follows Costanza et al., (2007), in which objective indicators are viewed as a means to potential improvement in subjective wellbeing. In our framework, we frame them as physical wellbeing and include two sub-categories - an evaluation of the physical and mental health and financial conditions of farmers. The literature suggests that poor physical and health conditions diminish the subjective wellbeing of an individual (Gilbert et al., 2016; Tang et al., 2021); on the other hand, a better financial condition affects the level of subjective wellbeing since it increments the consumption level and increases the capacity to deal with illness or unemployment (Easterlin et al., 2010; Fernández Domínguez & Hernández, 2019; Frey & Stutzer, 2014; Mahendru, 2021; Voukelatou et al., 2021).

Although connected, the uniqueness of the domains calls for a holistic measure of wellbeing. Therefore, our novel framework makes a distinction between each of those components and the survey asks about four subjective wellbeing domains and for a subjective evaluation of those often called "objective" measures, or physical wellbeing.

2.2.2 Scales/instrument selection

The literature on wellbeing provides a substantial number of well-developed scales that each measure a particular construct of wellbeing, such as the Satisfaction with Life Scales (Diener et al., 1985), Positive and Negative Affect Schedule (Watson et al., 1988), or the Ryff Scale for eudaimonic wellbeing (Ryff, 1989). There are also a few that integrate multiple constructs, for instance, the PERMA-Profiler (Butler & Kern, 2016), the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS, (Stewart-Brown et al., 2009), the Flourishing Scale (Diener et al., 2010), or The Stanford WELL for Life Scale (Heaney et al., 2017). A major limitation of these scales is that they focus on either two or three domains of wellbeing or are of considerable length, as is the case for the Stanford WELL for Life Scale which is about 160 questions long and therefore requires significant time which can lead to participant fatigue. However, these scales offer two main advantages: they are grounded in theory and have been widely validated.

Three validated scales were selected to represent the five elements of social wellbeing in our framework in the survey. The main criteria for selecting the instruments or scales are theoretical validity, statistical reliability, validity, and the time required to complete the instrument. They are described below.

Life satisfaction - Satisfaction with Life Scales (SWLS)

To measure life satisfaction, this survey relies on the Satisfaction with Life Scale (SWLS; (Diener et al., 1985). This 5-item scale measures the individual cognitive components of subjective wellbeing, such as global life satisfaction, rather than positive or negative emotions. Responses are based on a 7-point Likert scale with scores ranging from 0 (strongly disagree) to 6 (strongly agree), where higher scores indicate higher levels of life satisfaction; and has been found to be correlated with socio-economic and health variables and has high reliability and validity (Adler & Seligman, 2016; Cheung & Lucas, 2014; Frey & Stutzer, 2014; Tang et al., 2021). SWLS is preferred over single-question instruments for life satisfaction since the internal consistency of a single-item scale cannot be calculated in cross-sectional data (Cheung & Lucas, 2014).

Hedonic and Eudaimonic Wellbeing – the PERMA-Profiler

Proposed by (Butler & Kern, 2016), the PERMA-Profiler is a multidimensional measure of wellbeing. This scale includes 15 questions that measure five subdomains: Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment. Moreover, the scale includes eight additional questions that assess negative emotions and a subjective evaluation of physical health. The questions are evaluated on an 11-point Likert scale from 0 (low level) to 10 (high level). The subdomain or scale items have shown cross-time stability, high internal consistency, and a high correlation with other wellbeing scales such as the Ryff scales, which suggest the transtheoretical characteristic of PERMA-profiler and its capability to measure hedonic and eudaimonic constructs of wellbeing (Cobo-Rendón et al., 2020; Giangrasso, 2021). Choosing the PERMA-Profiler allows us to measure three of the domains of wellbeing in our framework in a more streamlined way compared to choosing an individual instrument for hedonic (positive and negative emotions), eudaimonic (engagement, meaning, and accomplishment), and relational (relationships) wellbeing.

Physical WB

To assess the physical health domain of physical wellbeing, we use the PERMA-Profiler as described above. The scale also includes a set of questions for self-evaluation of physical health,

which is consistent with our aim to evaluate such an "objective" domain from a subjective standpoint. To assess the subjective evaluation of financial conditions, we include a set of four questions inspired by the work of (Sherren et al., 2022).

2.2.3 Social Wellbeing Index

One of the important steps in analyzing social wellbeing is determining how to communicate the results of different scales. Constructing an index could serve as a practical approach to presenting the collected data. We combine the scores of the five social wellbeing constructs into a single index, with each construct having equal importance. The construction of the social wellbeing index required normalizing (rescaling) the data, as the instruments in our survey used different response scales. Normalizing the data attempts to give all constructs equal weight. Min-max normalization, also known as min-max scaling, involves linearly transforming the data to fit within a smaller range, such as the [0, 1] range. Following (’Han, 2022) min-max normalization rescales x_i, of construct Z to x_i', in the range of $[new\_max_z , new\_min_Z]$ by computing:

$$x_i' = \frac{x_i - min_Z}{max_z - min_Z}(new\_max_z - new\_min_Z) + new\_min_z$$

Where x_i' is the normalized value and x_i is the original value for the Z construct. It is important to note that to preserve the scale's original nature, the min and max values correspond to the min and max values of the scale rather than the data recorded for each item in any scale. We then calculate the average of the normalized scores x_i' of each construct to obtain a final index with range [0, 1], values closer to 1 indicate higher scores in each of the 5 constructs of social wellbeing and thus indicate that one’s human experience is being maximized.

2.2.4 Additional Survey Sections

Understanding which factors may accelerate (or block) the adoption of new agricultural practices is extremely important. Previous research on the adoption of regenerative grazing has indicated that aligning agricultural practices with farmers' values and motivations is a crucial aspect of decision-making (Gosnell and Grim, 2019). Given this but also a framing of wellbeing as living within one’s values, we felt it important to assess values. Additionally, understanding and managing fundamental systems processes play a critical role in enabling effective management to address uncertainty and complexity, especially in practices like regenerative grazing (Gosnell et al., 2020, Mann et al 2019).

Human Values

Values can be understood as guiding principles that shape the lives of individuals or groups, influencing their decision-making, attitudes, and behavior (Schwartz et al 2012), and thus they are important to understand the adoption of agricultural practices. Farmers' values were assessed using the Short Schwartz Value Survey (SSVS). The SSVS is a shortened version of the Schwartz Value Survey (SVS), which consists of 57 items and has demonstrated internal consistency and temporal reliability (Lindeman & Verkasalo, 2005). The SSVS assesses the 10 motivationally distinct values that are theoretically derived from Schwartz's value theory: Power, Achievement, Hedonism, Stimulation, Self-Direction, Universalism, Benevolence, Tradition, Conformity, and Security. These values can be grouped into two categories based on the relationship between them: openness to change versus conservation and self-enhancement versus self-transcendence. Participants were provided with a brief description of each value and asked to rate their importance on a 7-point scale ranging from 1 (against my principles) to 7 (of supreme importance).

System Thinking

System thinking is often recognized as a crucial competence for understanding how systems work and change. We built upon the work of (Sherren et al., 2022) and included a 9-item System Thinking and Traditional Thinking Scale. Each item was scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The survey also included questions we created on information support and networking (to supplement PERMA's relationships section), as well as standard demographic questions such as age, educational level, and income (given their influence on wellbeing (Costanza et al., 2007; de Maya Matallana et al., 2022; Gilbert et al., 2016; Jivraj et al., 2014; Kristoffersen, 2018; Tang et al., 2021)). Data cleaning and statistical analysis were conducted in the software R version 4.2.1. (R Core Team, 2022).

3. Results and Discussion

This section discusses the results of the exploratory analysis of the wellbeing survey. The survey was served online and sent to 45 farmers in Michigan, identified as the main (or joint) decision-makers during the recruitment process, during the spring and summer of 2022. The survey

took approximately 25 minutes to complete, and all responses were collected in approximately 8 weeks.

The socioeconomic data collected shows that the farmers' groups are comparable in certain characteristics, such as age, education, race, and marital status. The age of farmers was within the 35-44-year-old range for all groups, with a bachelor's or professional (MA, MS, MBA, PhD, JD, MD, DDS, etc.) degree, mostly Caucasian, and 87% of farmers were married. In terms of yearly income, the adaptive group reported the lowest levels but has a bimodal distribution ($25,000-$49,999 and $75,000-$99,999), the non-adaptive and adopting groups reported considerably higher levels of income, $75,000-$99,999 and $150,000 or more, respectively. However, differences in proportions between groups were not statistically significant.

3.1. Wellbeing outcomes

Table 1 shows the five domains considered in our multidimensional measure of social wellbeing, along with the estimated internal consistency measure for each domain. The life satisfaction, hedonic, eudaimonic, and relational wellbeing domains shown acceptable Cronbach's alpha scores, however, the score for physical wellbeing is questionable. Tavakol & Dennick, (2011) describe that low alpha scores can be due to a limited number of questions, weak connections among items, or heterogenous constructs. When computed independently, Cronbach's alpha scores for physical health and finances questions were 0.89 and 0.70, respectively, which suggest that poor inter-relatedness may be the reason for the low score for physical wellbeing. Since conducting an alternative reliability analysis (such as confirmatory factor analysis) was not possible due to our small sample size we decided to keep both sub-dimensions as part of the physical wellbeing construct and flag this as an areas for further study. Moreover, we did modify the relational wellbeing construct. Originally the PERMA scale measures relational wellbeing using three questions: *to what extent do you receive help and support from others when you need it? How satisfied are you with your personal relationships?* and *to what extent do you feel loved?*. However, we found poor inter-relatedness between the first and the other two questions and thus we only kept the last two questions to build the relational wellbeing construct. This suggests that for farmers in this study, relational wellbeing was more about the support received from their family relationships and less about social networks, hence we did not integrate social network data from that survey section.

Table 1. Wellbeing constructs and overall index

Wellbeing constructs	Mean	Sd	Cronbach's Alpha
Life Satisfaction	0.76	0.14	0.79
Hedonic Wellbeing	0.71	0.13	0.82
Eudaimonic Wellbeing	0.80	0.11	0.75
Relational Wellbeing	0.86	0.14	0.79
Physical Wellbeing	0.77	0.11	0.15
Social WB Index	0.78	0.10	0.84

As observed in Table 1 overall farmers scored higher in relational wellbeing, followed by eudaimonic wellbeing and physical wellbeing as the three highest categories. This suggests that farmers are highly satisfied with their accomplishments, social support, health, and finances. When farmers were asked in a follow-up question which domains of wellbeing were most important to them, all groups consistently ranked relationships and purpose and meaning (eudaimonic wellbeing) as the first and second most important domains.

Table 2. Correlation matrix

	Life Satisfaction	Hedonic Wellbeing	Eudaimonic Wellbeing	Relational Wellbeing	Physical Wellbeing	Social WB Index
Life Satisfaction	1.00					
Hedonic Wellbeing	0.64	1.00				
Eudaimonic Wellbeing	0.58	0.50	1.00			
Relational Wellbeing	0.54	0.46	0.39	1.00		
Physical Wellbeing	0.60	0.52	0.50	0.38	1.00	
Social WB Index	0.87	0.81	0.74	0.73	0.75	1.00

We then computed a correlation matrix to observe the strength of the relationship between constructs to assess divergent validity. In general, we observe that the strength of the correlation between the constructs is low to moderate and in the expected direction considering our theoretical expectations. Surprisingly, relational, eudaimonic, and physical wellbeing showed the lowest correlation with the social wellbeing index. Despite having similar levels of variability in their scores, life satisfaction and hedonic wellbeing had the strongest relationship with the index. In other words, farmers with a high social wellbeing index were more likely to score high in life satisfaction and hedonic measures, even though the farmers self-identify relational, eudaimonic, and physical constructs as the main contributors to their wellbeing (see Table 1). Our initial thought was the effect of the support received from their interpersonal relationships was expressed as the

absence of negative motions (anxiety, sadness, and anger) and the presence of positive ones (joy, contentment, and positivity) captured through hedonic wellbeing. However, the correlation matrix does not indicate a strong relationship between the scales used to measure these domains. A more plausible explanation is that the relationship between relational wellbeing and the social wellbeing index is not fully captured by our estimation approach, in other words assigning equal weights to each category to create the index does not reflect the farmer's understanding of "relationships". Further research with larger sample sizes and alternative reliability analyses could provide additional insights into the multidimensional nature of social wellbeing.

Table 3. Wellbeing and farmers' groups

	Life Satisfaction	Hedonic Wellbeing	Eudaimonic Wellbeing	Relational Wellbeing	Physical Wellbeing	Social WB Index
Non-adaptive	0.82	0.74	0.83	0.89	0.83	0.82
Adaptive	0.75	0.69	0.78	0.79	0.76	0.75
Adopting	0.73	0.71	0.79	0.82	0.75	0.77
Pairwise-comparison (p-value -adjusted)						
Adaptive - Adopting	0.44	1.00	0.63	0.79	0.85	0.44
Adaptive - Non	0.51	1.00	0.22	0.14	0.25	**0.11**
Adopting - Non	0.20	0.73	0.38	0.13	0.23	0.33

there is no evidence that differences in mean between groups are statistically significant.

Table 3 displays the scores for the five constructs and the social wellbeing index, along with the results of multiple pairwise comparisons. Our objective was to determine whether any of the groups scored significantly different from the others for any of the wellbeing constructs, including the social wellbeing index. Considering the limitation of our sample size, we compare the differences among the three groups of farmers using the post-hoc non-parametric Dunn test since it is an appropriate option when the ANOVA assumptions of equal variance or normal distribution are not fulfilled (Dinno, 2015). Moreover, p-values were adjusted to control for the family-wise error rate (FWER, rejecting the null hypothesis when it is true) using Holm's correction.

It can be seen from the data that all groups score strongly, indicating high levels of wellbeing across beef produces in Michigan. Non-adaptive farmers generally scored higher in all constructs compared to the adapting and adopting groups, with the largest differences observed in

life satisfaction between non-adaptive and adopting (-0.09), relational wellbeing between non-adaptive and adaptive (-0.1), and overall social wellbeing index (-0.07), similar results were observed in Brown et al., (2021) and Sherren et al., (2022). However, despite these differences, none of them were found to be statistically significant, except for the difference in social wellbeing index between the adaptive and non-adaptive groups was borderline significant at 90% level ($p\text{-adj} = 0.11 < 0.10$). Despite there being no statistically significant difference, it is interesting to observe the variation in the ranges of min and max values for each group and discuss this in the view of the theory of subjective wellbeing homeostasis. (Cummins et al., 2003; Cummins & Wooden, 2014) suggests "homeostasis" as an analogy to explain why the mean values for subjective wellbeing metrics in the western world are about 75% of the scale score, arguing that subjective wellbeing is "actively controlled and maintained" with a form of steady-state affective set-point. Thus, this implies that we would observe little variation if people's homeostatic systems are normally functioning.

Considering Cummins' theory, we could ask what is the "set-point" around which social wellbeing variations are interesting to interpret despite their non-statistical significance. Looking at the prior cited literature, we observe that subjective wellbeing scores for farmers in Brown et al., (2021, 2022); Sherren et al., (2022) were in a range of 70 to 80% of the scale's maximum scores used on those studies. Such values are consistent with what we observed for the adaptive and adopting groups but not for the non-adaptive ones. There could be two possible scenarios, the first one is that the non-adaptive farmers' higher scores in all constructs reflect their current homeostatic state, where they have adapted to their existing circumstances and have found a way to maintain their overall social wellbeing, presumably linked to a long-term consistency in grazing technique, given they are using 'traditional' practices and have not or are not adopting new agricultural practices. Conversely, an alternative scenario may suggest that the adaptive and adopting groups may be going through a period of adjustment due to the adoption of new practices. We assigned farmers to the adaptive group if they had been using such practices for at least 5 years, but realistically this is a short period to adopt new practices in agriculture. Therefore, participants in these groups may well still be undergoing temporary disruption of their homeostatic equilibrium. This suggests that there may be some differences in social wellbeing between the adaptive and non-adaptive groups relate to the adoption of regenerative grazing, but more data would be needed to confirm this.

Given the purpose of this study, it is important to highlight that our results indicate that the social wellbeing of all groups of farmers falls within a range typically associated with a healthy state of wellbeing. Moreover, while adoption of new practices may be influencing social WB, it is not significantly eroding it and thus we encourage the continued scaling up of regenerative grazing practices in Michigan's beef sector.

3.1. Values and System Thinking results.

Previous research has described how farmers who embrace regenerative approaches often exhibit distinct values and perspectives towards farming, and the importance of systems thinking in the adoption of regenerative grazing practices (Sherren et al., 2022; Gosnell et al 2019). The results of Schwartz's value scale in Table 4 show that across the sample, farmers rated more highly for the values of benevolence, self-direction, universalism, and conformity, while the lowest ratings were for power and hedonism. These findings are consistent with what (Sherren et al., 2022) observed in Canada. The high scores in benevolence and universalism, which belong to the self-transcendence dimension, suggest that farmers show a high concern for others' wellbeing. This can be linked to the results of relational wellbeing discussed earlier. When we asked farmers what they considered to be the main measure of success on their farms, family ranked first, while participating in the community ranked last. Consistent with the high self-transcendence scores, the low scores in power and hedonism values, which are part of self-enhancement, indicate that farmers focus less on themselves. Simultaneously, self-direction scores suggest that farmers generally trust their own abilities, while conformity scores indicate that traditional values (e.g., honoring parents) are highly regarded among farmers. These results highlight the importance of family relationships in the lives of farmers and how their values are connected to their wellbeing, particularly relational wellbeing.

Table 4. Values and system thinking

Scales	Mean	SD
Schwartz's Values		
Social power, authority, wealth - Power	3.044	1.313
Success, capability, ambition, influence on people and events - Achievement	4.933	1.136
Enjoyment in life, self-indulgence, gratification of desires - Hedonism	4.067	1.615

Daring, a varied and challenging life, an exciting life - Stimulation	4.778	1.259
Creativity, freedom, curiosity, independence, choosing one's own goals - Self-direction	5.889	0.859
Broad-mindedness, beauty of nature and arts, social justice, a world at peace, equality, wisdom, unity with nature, environmental protection - Universalism	5.711	1.121
Helpfulness, honesty, forgiveness, loyalty, responsibility - Benevolence	6.267	0.58
Respect for tradition, humbleness, accepting one's portion in life, devotion, modesty - Tradition	4.956	1.381
Obedience, honoring parents and elders, self-discipline, politeness - Conformity	5.267	1.009
National security, family security, social order, cleanliness, reciprocation of favors - Security	4.956	1.147
System Thinking		
I like to have a well-defined goal for my operation, and make decisions that bring me closer to it	4.24	0.68
I try to make management decisions so that my operation can mimic nature as much as possible	4.36	0.88
A healthy farm is self-sustaining and needs few inputs to be profitable	3.89	0.98
My management decisions have a big impact on the local ecosystem and community	3.86	1
Everything on my operation is connected, and even small decisions can have cascading effects in unpredictable way	4.29	0.76
Traditional Thinking		
A successful farmer concentrates on production and is not sidetracked by outside interests or activities	2.36	1.17
At a landscape level, decisions are made elsewhere, so my choices don't have a huge effect	1.78	0.77
Economic viability overrides all other farming considerations	2.42	0.99
We may not be able to solve every problem yet, but science and technology will eventually offer a solution for every problem	2.44	0.97

Human values can be grouped in four categories: (1) Self-enhancement: Power, Achievement, Hedonism; (2) Openness to change: Hedonism, Stimulation, Self-direction; (3) Self-transcendence: Universalism , Benevolence ; (4) Conservation: Tradition , Conformity, Security. (See (Schwartz et al., 2012))

Table 5 shows the Cronbach's alpha results for values and system thinking constructs. The results indicate that only the self-enhancement category had an acceptable Cronbach alpha. The lower score for the other construct may be attributed to the small sample size rather than the items in the scales. Therefore, further examination with a larger sample size may be necessary to assess the issues with the reliability of the other constructs for the Michigan beef population. Nevertheless, the results in Table 5 support the previous discussion and underscore the significance of values such as benevolence, which emphasizes the importance of closer relationships to farmers.

Table 5. Values and system thinking constructs.

	Cronbach alpha
Group of Values	
Self- enhancement (group 1)	0.63
Openness to change (group 2)	0.47
Self-transcendence (group 3)	0.43
Conservation (group 4)	0.54
Thinking framework	
System thinking	0.53
Traditional thinking	0.47

The result in Table 6 shows that, as expected, the adaptive and adopting group of farmers score lower in self-enhancement and conservation values at the aggregated level, suggesting farmers' motivation to challenge traditional practices (Schwartz & Cieciuch, 2021*)*. The pairwise comparison for the self-enhancement reveals that only the difference between the adopting and non-adaptive groups was statistically significant (P-adj =0.05). These results imply that farmers transitioning to regenerative grazing are less motivated than non-adaptive farmers by the desire to gain wealth, social power, or personal success.

The results of the pairwise comparison of system thinking and traditional thinking scales were also expected (given similar results in Sherren et al. (2022) and reflect regenerative grazing's philosophy of holistic management (Gosnell et al 2019, Mann et al 2019) or natural resource management (Brown et al. 2022) and of managing 'the system'. As seen in Table 6, the average scores for system thinking were higher for the adaptive and adopting group although only the difference between adaptive and non-adaptive groups was found to be statistically significant (p-adj = 0.09 < 0.1, applying Holm's adjustment). On the other hand, the non-adaptive farmers scored statistically significantly higher than the adaptive (p-adj 0.03 < 0.05) and adopting groups (p-adj = 0.01 < 0.05) for traditional thinking. Given, how those questions were framed (see Sherren et al. 2022), these results suggest that non-adaptive farmers may focus on individuals or segmented components of their operations, while farmers that adopt or are using adaptive or regenerative grazing practices are more likely to consider the complex interrelationship between various components of their farming systems when making management decisions.

Table 6. Comparison of values and system thinking among groups of farmers.

	Self-enhancement	Openness to change	Self-transcendence	Conservation	System Thinking	Traditional Thinking
Non-adaptive	4.77	4.97	6.00	5.53	3.76	2.75
Adaptive	3.98	4.81	5.97	4.96	4.29	2.19
Adopting	3.65	4.96	6.00	4.89	4.20	2.04
Pairwise comparison (p-value adjusted)						
Adaptive - Adopting	0.33	1.00	1.00	0.91	0.50	0.53
Adaptive - Non	0.26	0.91	1.00	0.21	**0.09**	**0.03**
Adopting - Non	**0.05**	1.00	0.96	0.16	0.21	**0.01**

As suggested by Sherren et al., (2022) in order to understand farmers' management choices, it is important to understand how they interact with their farms. The results of our exploratory analysis suggest that adopting regenerative grazing practices may encourage farmers to rethink their relationship with their farms (also discussed by Sherren et al., (2022) for instance, the statement "*I like to have a well-defined goal for my operation and make decisions that bring me closer to it*" was the highest rated among adopting farmers. These changes in farmers' thinking may ultimately lead to better management decisions that can positively impact their wellbeing. However, further research is needed to determine whether adopting regenerative grazing practices leads to a shift in farmers' thinking or whether farmers who are already inclined to think more holistically are more likely to adopt regenerative grazing practices in the first place. A further investigation of farmers wellbeing over time could shed light on the complex relationship of regenerative grazing and social wellbeing outcomes.

4. Conclusions

Regenerative grazing practices offer a promising approach to enhancing the ecological health of farms while also providing societal benefits. This study contributes to the literature by emphasizing the significance of examining the social wellbeing outcomes among regenerative pasture-raised beef producers in the United States. By adopting a holistic approach to social wellbeing, we developed and tested a novel framework to investigate the differences between regenerative and non-regenerative farmers in Michigan, USA. Our findings reveal high levels of wellbeing among all beef producers in our sample, with relational wellbeing and eudaimonic domains playing a

pivotal role in farmers' overall wellbeing. Although we didn't find differences between groups of farmers, we argue that even small differences observed in social wellbeing are important and further research should delve deeper into these differences, considering the homeostatic state of wellbeing in Western countries, particularly within farmer populations.

Additionally, we examined the link between values and wellbeing and found that adopters of regenerative grazing scored higher in values that prioritize caring for the family as a guiding principle influencing decision-making. Moreover, consistent with previous research and regenerative grazing philosophy, regenerative farmers demonstrated a strong inclination towards system thinking, this seems to indicate that managing regeneratively by understanding 'the whole', requires certain values. However, to uncover the causal relationship between values, system thinking, and the decision to adopt regenerative grazing, future studies should consider longitudinal approaches. The insights derived from this research support the transition towards regenerative practices, which contribute to the resilience of farming systems and support the overall wellbeing of farmers.

5. References

Adler, A., & Seligman, M. E. P. (2016). Using wellbeing for public policy: Theory, measurement, and recommendations. *International Journal of Wellbeing, 6*(1), 1–35. https://doi.org/10.5502/ijw.v6i1.429

Alfaro-Arguello, R., Diemont, S. A. W., Ferguson, B. G., Martin, J. F., Nahed-Toral, J., David Álvarez-Solís, J., & Ruíz, R. P. (2010). Steps toward sustainable ranching: An emergy evaluation of conventional and holistic management in Chiapas, Mexico. *Agricultural Systems, 103*(9), 639–646. https://doi.org/10.1016/j.agsy.2010.08.002

Barton, E., Bennett, D. E., & Burnidge, W. (2020). Holistic perspectives—Understanding rancher experiences with holistic resource management to bridge the gap between rancher and researcher perspectives. *Rangelands, 42*(5), 143–150. https://doi.org/10.1016/j.rala.2020.05.003

Becker, A. E., Horowitz, L. S., Ruark, M. D., & Jackson, R. D. (2022). Surface-soil carbon stocks greater under well-managed grazed pasture than row crops. *Soil Science Society of America Journal, 86*(3), 758–768. https://doi.org/10.1002/saj2.20388

Biddle, N., Swee, H., Manolom, T., Promphakping, B., Sorted, Q. L., Easterlin, R. A., McVey, L. A., Switek, M., Sawangfa, O., Zweig, J. S., Di Tella, R., MacCulloch, R., Deci, E. L., Ryan, R. M., Costanza, R., Fisher, B., Ali, S., Beer, C., Bond, L., … Gao, S. (2019). Understanding where we are well: Neighborhood-level social and environmental correlates of well-being in the stanfordwell for life study. *Social Indicators Research, 11*(1), 1052–1057. https://doi.org/10.1080/13607863.2016.1191058

Bradburn, N. M. (1969). The structure of psychological well-being. *Aldine.*

Breslow, S. J., Sojka, B., Barnea, R., Basurto, X., Carothers, C., Charnley, S., Coulthard, S., Dolšak, N., Donatuto, J., García-Quijano, C., Hicks, C. C., Levine, A., Mascia, M. B., Norman, K., Poe, M., Satterfield, T., Martin, K. S., & Levin, P. S. (2016). Conceptualizing and operationalizing human wellbeing for ecosystem assessment and management. *Environmental Science and Policy*, *66*, 250–259. https://doi.org/10.1016/j.envsci.2016.06.023

Brown, K., Schirmer, J., & Upton, P. (2021). Regenerative farming and human wellbeing: Are subjective wellbeing measures useful indicators for sustainable farming systems? *Environmental and Sustainability Indicators*, *11*. https://doi.org/10.1016/j.indic.2021.100132

Brown, K., Schirmer, J., & Upton, P. (2022). Can regenerative agriculture support successful adaptation to climate change and improved landscape health through building farmer self-efficacy and wellbeing? *Current Research in Environmental Sustainability*, *4*. https://doi.org/10.1016/j.crsust.2022.100170

Butler, J., & Kern, M. L. (2016). The PERMA-Profiler: A brief multidimensional measure of flourishing. *International Journal of Wellbeing*, *6*(3), 1–48. https://doi.org/10.5502/ijw.v6i3.526

Cantril, H. (1965). Pattern of human concerns. *Rutgers University Press*.

Carien De Villiers, A., Esler, K. J., & Knight, A. T. (2014). Social processes promoting the adaptive capacity of rangeland managers to achieve resilience in the karoo, South Africa. *Journal of Environmental Management*, *146*, 276–283. https://doi.org/10.1016/j.jenvman.2014.08.005

Cheung, F., & Lucas, R. E. (2014). Assessing the validity of single-item life satisfaction measures: Results from three large samples. *Quality of Life Research*, *23*(10), 2809–2818. https://doi.org/10.1007/s11136-014-0726-4

Cobo-Rendón, R., López-Angulo, Y., Pérez-Villalobos, M. V., & Díaz-Mujica, A. (2020). Perceived Social Support and Its Effects on Changes in the Affective and Eudaimonic Well-Being of Chilean University Students. *Frontiers in Psychology*, *11*(December). https://doi.org/10.3389/fpsyg.2020.590513

Costanza, R., Fisher, B., Ali, S., Beer, C., Bond, L., Boumans, R., Danigelis, N. L., Dickinson, J., Elliott, C., Farley, J., Gayer, D. E., Glenn, L. M. D., Hudspeth, T., Mahoney, D., McCahill, L., McIntosh, B., Reed, B., Rizvi, S. A. T., Rizzo, D. M., … Snapp, R. (2007). Quality of life: An approach integrating opportunities, human needs, and subjective well-being. *Ecological Economics*, *61*(2–3), 267–276. https://doi.org/10.1016/j.ecolecon.2006.02.023

Cummins, R. A., Eckersley, R., Pallant, J., Van Vugt, J., & Misajon, R. (2003). Developing a national index of subjective wellbeing: The Australian Unity Wellbeing Index. *Social Indicators Research*, *64*(2), 159–190. https://doi.org/10.1023/A:1024704320683

Cummins, R. A., & Wooden, M. (2014). Personal Resilience in Times of Crisis: The Implications of SWB Homeostasis and Set-Points. *Journal of Happiness Studies*, *15*(1), 223–235. https://doi.org/10.1007/s10902-013-9481-4

Davern, M. T., Cummins, R. A., & Stokes, M. A. (2007). Subjective wellbeing as an affective-cognitive construct. *Journal of Happiness Studies*, *8*(4), 429–449. https://doi.org/10.1007/s10902-007-9066-1

de Maya Matallana, M., López-Martínez, M., & Riquelme-Perea, P. J. (2022). Measurement of Quality of Life in Spanish Regions. *Applied Research in Quality of Life*, *17*(1). https://doi.org/10.1007/s11482-020-09870-x

Deci, E. L., & Ryan, R. M. (2008). Hedonia, eudaimonia, and well-being: An introduction. *Journal of Happiness Studies*, *9*(1), 1–11. https://doi.org/10.1007/s10902-006-9018-1

Derner, J. D., Augustine, D. J., Briske, D. D., Wilmer, H., Porensky, L. M., Fernández-Giménez, M. E., Peck, D. E., & Ritten, J. P. (2021). Can Collaborative Adaptive Management Improve Cattle Production in Multipaddock Grazing Systems? *Rangeland Ecology and Management*, *75*, 1–8. https://doi.org/10.1016/j.rama.2020.11.002

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, *49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D. won, Oishi, S., & Biswas-Diener, R. (2010). New well-being measures: Short scales to assess flourishing and positive and negative feelings. *Social Indicators Research*, *97*(2), 143–156. https://doi.org/10.1007/s11205-009-9493-y

Dinno, A. (2015). Nonparametric pairwise multiple comparisons in independent groups using Dunn's test. *Stata Journal*, *15*(1), 292–300. https://doi.org/10.1177/1536867x1501500117

Dumont, B., Franca, A., López-i-Gelats, F., Mosnier, C., & Pauler, C. M. (2022). Diversification increases the resilience of European grassland-based systems but is not a one-size-fits-all strategy. *Grass and Forage Science*, *77*(4), 247–256. https://doi.org/10.1111/gfs.12587

Easterlin, R. A., McVey, L. A., Switek, M., Sawangfa, O., & Zweig, J. S. (2010). The happiness—Income paradox revisited. *Proceedings of the National Academy of Sciences of the United States of America*, *107*(52), 22463–22468. https://doi.org/10.1073/pnas.1015962107

Fernández Domínguez, A. O., & Hernández, D. G. (2019). A multidimensional approach to the well-being of the population of the states of mexico. *Cepal Review*, *2019*(128), 169–189. https://doi.org/10.18356/F3044899-EN

Franke, A. C., & Kotzé, E. (2022). High-density grazing in southern Africa: Inspiration by nature leads to conservation? *Outlook on Agriculture*, *51*(1), 67–74. https://doi.org/10.1177/00307270221075060

Franzluebbers, A. J., Paine, L. K., Winsten, J. R., Krome, M., Sanderson, M. A., Ogles, K., & Thompson, D. (2012). Well-managed grazing systems: A forgotten hero of conservation. *Journal of Soil and Water Conservation*, *67*(4), 100–104. https://doi.org/10.2489/jswc.67.4.100A

Frey, B. S., & Stutzer, A. (2014). What from Learn Economists Can Happiness. *Journal of Economic Literature*, *40*(2), 402–435.

Fruet, A. P. B., Stefanello, F. S., Trombetta, F., De Souza, A. N. M., Rosado Júnior, A. G., Tonetto, C. J., Flores, J. L. C., Scheibler, R. B., Bianchi, R. M., Pacheco, P. S., De Mello, A., & Nörnberg, J. L. (2019). Growth performance and carcass traits of steers finished on three different systems including legume-grass pasture and grain diets. *Animal*, *13*(7), 1552–1562. https://doi.org/10.1017/S1751731118003142

Giangrasso, B. (2021). Psychometric properties of the PERMA-Profiler as hedonic and eudaimonic well-being measure in an Italian context. *Current Psychology*, *40*(3), 1175–1184. https://doi.org/10.1007/s12144-018-0040-3

Gilbert, A., Colley, K., & Roberts, D. (2016). Are rural residents happier? A quantitative analysis of subjective wellbeing in Scotland. *Journal of Rural Studies*, *44*, 37–45. https://doi.org/10.1016/j.jrurstud.2016.01.002

Glover, J. D., Culman, S. W., DuPont, S. T., Broussard, W., Young, L., Mangan, M. E., Mai, J. G., Crews, T. E., DeHaan, L. R., Buckley, D. H., Ferris, H., Turner, R. E., Reynolds, H. L., & Wyse, D. L. (2010). Harvested perennial grasslands provide ecological benchmarks for agricultural sustainability. *Agriculture, Ecosystems and Environment*, *137*(1–2), 3–12. https://doi.org/10.1016/j.agee.2009.11.001

Goosey, H. B., Smith, J. T., O'Neill, K. M., & Naugle, D. E. (2019). Ground-Dwelling Arthropod Community Response to Livestock Grazing: Implications for Avian Conservation. *Environmental Entomology*, *48*(4), 856–866. https://doi.org/10.1093/ee/nvz074

Gosnell, H., Charnley, S., & Stanley, P. (2020). Climate change mitigation as a co-benefit of regenerative ranching: Insights from Australia and the United States: CC Mitigation and Regenerative Ranching. *Interface Focus*, *10*(5). https://doi.org/10.1098/rsfs.2020.0027

Gosnell, H., Gill, N., & Voyer, M. (2019). Transformational adaptation on the farm: Processes of change and persistence in transitions to 'climate-smart' regenerative agriculture. *Global Environmental Change*, *59*. https://doi.org/10.1016/j.gloenvcha.2019.101965

Gosnell, H., Grimm, K., & Goldstein, B. E. (2020). A half century of Holistic Management: What does the evidence reveal? *Agriculture and Human Values*, *37*(3), 849–867. https://doi.org/10.1007/s10460-020-10016-w

'Han, J. 'Pei, Jian' "Tong, Hanghang." (2022). *Data mining: Concepts and techniques*. Morgan kaufmann.

Hawkins, H. J., Venter, Z. S., & Cramer, M. D. (2022). A holistic view of Holistic Management: What do farm-scale, carbon, and social studies tell us? *Agriculture, Ecosystems and Environment*, *323*, 107702. https://doi.org/10.1016/j.agee.2021.107702

Heaney, C. A., Avery, E. C., Rich, T., Ahuja, N. J., & Winter, S. J. (2017). Stanford WELL for Life: Learning What It Means to Be Well. *American Journal of Health Promotion*, *31*(5), 449–450. https://doi.org/10.1177/0890117117725842

Jackson, R. D. (2022). Grazed perennial grasslands can match current beef production while contributing to climate mitigation and adaptation. *Agricultural and Environmental Letters*, *7*(1). https://doi.org/10.1002/ael2.20059

Jivraj, S., Nazroo, J., Vanhoutte, B., & Chandola, T. (2014). Aging and subjective well-being in later life. *Journals of Gerontology - Series B Psychological Sciences and Social Sciences*, *69*(6), 930–941. https://doi.org/10.1093/geronb/gbu006

Kristoffersen, I. (2018). Great expectations: Education and subjective wellbeing. *Journal of Economic Psychology*, *66*(April), 64–78. https://doi.org/10.1016/j.joep.2018.04.005

LaCanne, C. E., & Lundgren, J. G. (2018). Regenerative agriculture: Merging farming and natural resource conservation profitably. *PeerJ*, *2018*(2), 1–12. https://doi.org/10.7717/peerj.4428

Lindeman, M., & Verkasalo, M. (2005). Measuring Values With the Short Schwartz's Value Survey. *Journal of Personality Assessment*, *85*(2), 170–178. https://doi.org/10.1207/s15327752jpa8502_09

Loveridge, R., Sallu, S. M., Pesha, I. J., & R Marshall, A. (2020). Measuring human wellbeing: A protocol for selecting local indicators. *Environmental Science and Policy*, *114*(January), 461–469. https://doi.org/10.1016/j.envsci.2020.09.002

Lwiwski, T. C., Koper, N., & Henderson, D. C. (2015). Stocking Rates and Vegetation Structure, Heterogeneity, and Community in a Northern Mixed-Grass Prairie. *Rangeland Ecology and Management*, *68*(4), 322–331. https://doi.org/10.1016/j.rama.2015.05.002

Lyons, A., Ashton, P. A., Powell, I., & Oxbrough, A. (2017). Impacts of contrasting conservation grazing management on plants and carabid beetles in upland calcareous grasslands. *Agriculture, Ecosystems and Environment*, *244*, 22–31. https://doi.org/10.1016/j.agee.2017.04.020

Mahendru, M. (2021). Financial well-being for a sustainable society: A road less travelled. *Qualitative Research in Organizations and Management: An International Journal*, *16*(3–4), 572–593. https://doi.org/10.1108/QROM-03-2020-1910

Mann, C., & Sherren, K. (2018). Holistic Management and adaptive grazing: A trainers' view. *Sustainability (Switzerland)*, *10*(6). https://doi.org/10.3390/su10061848

Newton, P., Civita, N., Frankel-Goldwater, L., Bartel, K., & Johns, C. (2020). What Is Regenerative Agriculture? A Review of Scholar and Practitioner Definitions Based on Processes and Outcomes. *Frontiers in Sustainable Food Systems*, *4*(October), 1–11. https://doi.org/10.3389/fsufs.2020.577723

Park, J. Y., Ale, S., Teague, W. R., & Dowhower, S. L. (2017). Simulating hydrologic responses to alternate grazing management practices at the ranch and watershed scales. *Journal of Soil and Water Conservation*, *72*(2), 102–121. https://doi.org/10.2489/jswc.72.2.102

Park, J.-Y., Ale, S., Teague, W. R., & Jeong, J. (2017). Evaluating the ranch and watershed scale impacts of using traditional and adaptive multi-paddock grazing on runoff, sediment and nutrient losses in North Texas, USA. *Agriculture, Ecosystems & Environment*, *240*, 32–44. https://doi.org/10.1016/j.agee.2017.02.004

R Core Team. (2022). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing. https://www.R-project.org/

Rowntree, J. E., Stanley, P. L., Maciel, I. C. F., Thorbecke, M., Rosenzweig, S. T., Hancock, D. W., Guzman, A., & Raven, M. R. (2020). Ecosystem Impacts and Productive Capacity of a Multi-Species Pastured Livestock System. *Frontiers in Sustainable Food Systems*, *4*. https://doi.org/10.3389/fsufs.2020.544984

Ryff, C. D. (1989). Scales of Psychological Well-Being. *Happiness Is Everything, or Is It? Explorations on the Meaning of Psychological Well-Being*, *57*(6), 1069–1081.

Saliman, A., & Petersen-Rockney, M. (2022). Rancher Experiences and Perceptions of Climate Change in the Western United States. *Rangeland Ecology and Management*, *84*, 75–85. https://doi.org/10.1016/j.rama.2022.06.001

Schwartz, S. H., Cieciuch, J., Vecchione, M., Davidov, E., Fischer, R., Beierlein, C., Ramos, A., Verkasalo, M., Lönnqvist, J.-E., Demirutku, K., Dirilen-Gumus, O., & Konty, M. (2012). Refining the theory of basic individual values. *Journal of Personality and Social Psychology*, *103*(4), 663–688. https://doi.org/10.1037/a0029393

Sherren, K., Hodbod, J., MathisonSlee, M., Chappell, E., & King, M. (2022). Adaptive multi-paddock grazing and wellbeing: Uptake, management practices and mindset among Canadian beef producers. *Agroecology and Sustainable Food Systems*, *46*(9), 1304–1329. https://doi.org/10.1080/21683565.2022.2107597

Spratt, E., Jordan, J., Winsten, J., Huff, P., van Schaik, C., Jewett, J. G., Filbert, M., Luhman, J., Meier, E., & Paine, L. (2021). Accelerating regenerative grazing to tackle farm, environmental, and societal challenges in the upper Midwest. *Journal of Soil and Water Conservation*, *76*(1), 15A-23A. https://doi.org/10.2489/jswc.2021.1209A

Stanley, P. L., Rowntree, J. E., Beede, D. K., DeLonge, M. S., & Hamm, M. W. (2018). Impacts of soil carbon sequestration on life cycle greenhouse gas emissions in Midwestern USA beef finishing systems. *Agricultural Systems*, *162*, 249–258. https://doi.org/10.1016/j.agsy.2018.02.003

Stewart-Brown, S., Tennant, A., Tennant, R., Platt, S., Parkinson, J., & Weich, S. (2009). Internal construct validity of the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS): A Rasch analysis using data from the Scottish Health Education Population Survey. *Health and Quality of Life Outcomes*, *7*, 1–8. https://doi.org/10.1186/1477-7525-7-15

Tang, J., Xu, Y., Ma, W., & Gao, S. (2021). Does participation in poverty alleviation programmes increase subjective well-being? Results from a survey of rural residents in Shanxi, China. *Habitat International*, *118*(October), 102455. https://doi.org/10.1016/j.habitatint.2021.102455

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

Teague, R., & Dowhower, S. (2022). Links of microbial and vegetation communities with soil physical and chemical factors for a broad range of management of tallgrass prairie. *Ecological Indicators*, *142*(January), 109280. https://doi.org/10.1016/j.ecolind.2022.109280

Teague, R., & Kreuter, U. (2020). Managing Grazing to Restore Soil Health, Ecosystem Function, and Ecosystem Services. *Frontiers in Sustainable Food Systems*, *4*. https://doi.org/10.3389/fsufs.2020.534187

Thompson, L. R., & Rowntree, J. E. (2020). INVITED REVIEW: Methane sources, quantification, and mitigation in grazing beef systems. *Applied Animal Science*, *36*(4), 556–573. https://doi.org/10.15232/aas.2019-01951

Voukelatou, V., Gabrielli, L., Miliou, I., Cresci, S., Sharma, R., Tesconi, M., & Pappalardo, L. (2021). Measuring objective and subjective well-being: Dimensions and data sources. In *International Journal of Data Science and Analytics* (Vol. 11, Issue 4). Springer International Publishing. https://doi.org/10.1007/s41060-020-00224-2

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

Windh, J. L., Ritten, J. P., Derner, J. D., Paisley, S., & Lee, B. (2020). Effects of long-term cattle market conditions on continuous season-long and rotational grazing system revenues. *Rangeland Journal*, *42*(3), 227–231. https://doi.org/10.1071/RJ20067

Winefield, H. R., Winefield, A. H., & Tiggemann, M. (1992). Social Support and Psychological Well-Being in Young Adults: The Multi-Dimensional Support Scale. *Journal of Personality Assessment*, *58*(1), 198–210. https://doi.org/10.1207/s15327752jpa5801_17