

Discussion

A Well-Being Approach to Soil Health—Insights from Aotearoa New Zealand

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Abstract: This paper explores the concept of soil health from a human well-being perspective in Aotearoa New Zealand. Globally, soils play an integral role in wider society and the environment by maintaining a large range of ecosystem services and benefits. As populations and resource constraints increase and food production and food security become growing issues globally, there is a recognition of the importance of defining soil condition or soil health for sustaining all ecosystems, including services and benefits to humans, plants, animals, and micro-organisms. While the ecosystem services approach has helped to illuminate the varied services soils provide, an understanding of the complex human–soil relationships and values has been missing. Those seeking to understand and form concepts about soil health have concentrated on the more inherent biochemical, physical and economic (e.g., productivity) aspects of soils, but not on the human, social or cultural dimensions. It is argued in this paper that soils form an integral part of our social and cultural fabric and are fundamentally important to human and societal well-being. The way humans interact with, value and use soil is a critical part of determining the health and sustainability of soil ecosystems. We discuss how a well-being approach can improve understanding of soil health with respect to societal goals and needs. We believe this type of approach, which includes social and cultural dimensions, provides a more diverse and inclusive knowledge base and perspective to better inform the development of integrative policy. This would lead to improved management and decision-making of land resources and soils in Aotearoa New Zealand and globally.

Keywords: human well-being; soil health; Policy; decision-making; social; cultural; ecosystem services

1. Introduction

Soils provide critical functions for society [1–3], and throughout history they have been an integral resource base for human survival and advancement. Arguably, “for most of history, few things have mattered more to human communities than their relations with soil” [4] (p. 1627). Despite its critical role in sustaining civilisation [5], the importance of soil–human relations largely goes unrecognised [5–8].

The ecological function of soils and the degradation they suffer have increasingly become the focus of soil science [4,9,10], and more recently soil health has gained prominence as a way to frame this issue. There have been several recent reviews of soil quality and soil health that discuss its evolution (see for example [11,12]). Kibblewhite [12] discusses soil health from a “utilitarian” perspective, which has grown out of the fitness for agricultural production, stating that “Therefore, at least from a utilitarian perspective, soil health indicates how close the condition of a soil is to its optimal one for supporting specified services, that is, those that define its inherent quality. It focuses assessment towards the

quantity and quality of specified services that the soil is able to support; for example, if the specified service is to support agricultural production then the assessment of soil health will be directed towards measurement of agricultural yields and the soil properties that control these outputs" [12] (p. 2).

Bünemann et al. [11] consider soil quality and soil health to be equivalent, asserting that soil quality (and therefore soil health) is typically "considered to transcend the productivity of soils to explicitly include the interactions between humans and soil, and to encompass ecosystem sustainability as the basis for the benefits that humans derive from soils as well as the intrinsic values of soil as being irreplaceable and unique" [11] (p. 107).

These definitions frame soil health within the ecosystem services approach, which is widely advanced as a decision-making framework for identifying the benefits ecosystems provide to people [10,13–19]. Provisioning and regulating services are the primary focus of many ecosystem services research [15], and this is true of soils where the ecosystem services approach has largely focused on biochemical and physical aspects of the system, such as carbon sequestration and buffering and the filtering capacity of soils [20]. Consideration of social values and perspectives is largely lacking.

In general, soil health is still largely considered in the context of crop yield and food nutrition [12,21,22]. Aotearoa New Zealand has been monitoring soil health since the late 1990s. The origins of the programme were influenced by early work, such as the publication by the Soil Science Society of America (SSSA) *Defining Soil Quality for a Sustainable Environment* [23]. This document illustrated that the state of dynamic soil properties could be quantitatively described, thereby providing a foundation for land assessment where the quality or health of the soil system could be monitored. In Aotearoa New Zealand, there was a concerted effort to balance production versus environmental needs of the indicators selected (total C, total N, pH, Olsen P, mineralisable N, bulk density, and macroporosity) using target ranges that considered both [24]. Although the system attempts to balance agronomic and environmental concerns, the emphasis (as elsewhere in the world) is on the biochemical and physical aspects of soil [25,26] over the social dimensions.

However, the diversity and variability in soil types, properties and qualities (both spatially and temporally, see [27]) means that finding biochemical and physical indicators that can be used practically to provide meaningful information to support soil management decisions is difficult [12,28,29]. Current understanding of the soil system "is not sufficiently complete to confirm which components and processes are most critical to its functions and inform an unequivocal choice of biological parameters that are indicative of soil health status" [12] (p. 11). In fact, as Baveye et al. [30] (p. 37) point out, despite 50 years of research interest, there are, to date, "no direct quantitative measurements of the functions/services of soils".

There is a growing recognition in Aotearoa New Zealand that a broader approach is necessary to address the question of how to increase productivity and improve the sustainability of soils [25,26]. There is also increasing recognition of the importance of indigenous Māori perspectives on soil health [31] and the diversity of stakeholders who have an interest in soil. Further, it is realised that trade-offs will be required between interest groups, and that there needs to be an increased awareness by society in general of the importance of soils [25,26]. Soil is part of our social fabric [25], and at a recent workshop on soil management and policy in Aotearoa New Zealand involving representatives from regional and central government, science organisations and the agricultural sector, participants identified a need for a value shift in soil due to its fundamental importance to societal well-being [32]. People and nature are intimately connected, and the human dimensions that shape the ways ecosystem services are valued and used [33,34] are just as critical to the sustainability of soils as the services themselves. Reframing soil health to focus on the well-being benefits people obtain from nature rather than the ecosystem processes that give rise to them [15] could better inform soil health decision-making.

Soil policy and decision-making have shifted towards the sustainable use of soils [2], resulting in "the need for a broadening of the focus from natural science towards societal insights and a long-term vision of durable land use" [2] (p. 2). This, they argue, means that the value of ecosystem services provided by soils can be assessed by the gain in well-being of a population or society [2]. While the

ecosystem services concept “explicitly links ecosystems and well-being” [18] (p. 205), and the intangible values people derive from human–ecological relations are acknowledged as important in the ecosystem services approach [35], their incorporation into decision-making processes is often lacking [15].

In this paper we explore the concept of well-being as a means of informing soil health decision-making. Well-being, as Weeratunge et al. [36] (p. 257) note, “provides a comprehensive frame for understanding what is important to people, communities and society”. It is more than just a broad-based outcome; it is an analytical lens that can enhance policy development and improve the understanding and governance of issues [36]. The following section provides an overview of the well-being concept and its use as an analytical lens through which to view soil health. In Section 3, we use examples from Aotearoa New Zealand to demonstrate how soil health is being valued more holistically and finally we discuss how a well-being approach can better capture and express these diverse views than the current production-focused perspectives.

2. The Well-Being Concept

There is a long and rich history of well-being research within the social science disciplines [36,37]. Measuring well-being to improve decision-making has been developed by governments across the world [38,39], and societal well-being (i.e., living well together) is increasingly being used to define social progress [39]. This perspective defines well-being as “A state of being with others, where human needs are met, where one can act meaningfully to pursue one’s goals and where one enjoys a satisfactory quality of life” [40] (p. 1).

This definition incorporates three key dimensions: the material (objective), the relational, and the subjective [36,41,42]. These dimensions take account of the objective circumstances of the person, their own subjective evaluation, and “the ways in which both the objective and subjective dimensions of wellbeing are socially and culturally constructed through relationships in particular societal contexts” [41] (p. 5). This relational dimension acknowledges that people become who and what they are through their relations with others and the environment [15,42]. While well-being is a state that people experience, a well-being approach focuses on the conditions that have to be in place for people to achieve well-being [41].

From a decision-making perspective, Coulthard et al. [41] note four key observations arising from the well-being literature that are applicable to decisions concerning soil health. The first observation highlights the social and cultural aspects within which people’s lives are embedded. For example, in Aotearoa New Zealand, “soil has a strong ancestry for Māori connecting to Polynesian migration, knowledge, history, settlement, and gardening ... Belief systems and values provide a basis for explaining soil health from a traditional and historical perspective. These values still resonate strongly today, and Māori position themselves as being part of the soil ecosystem with strong links between soil health, human well-being, and healthy foods” [32].

A fundamental concept of indigenous knowledge systems is that people are an intrinsic part of the natural environment [43]. There is also the understanding that the benefits and values people derive from nature are blended and interwoven across all ecosystem services and are not confined to just the cultural ecosystem services category [43,44]. In Aotearoa New Zealand, the indigenous Māori perspective of soil ecosystems and soil health is derived largely from Te Ao Māori (the Māori world view). This includes traditional beliefs, values, and concepts, based on mātauranga Māori (ancient/traditional, historical, and contemporary Māori knowledge), elucidating the values, uses, and aspirations that Māori have regarding soils, and the practices they wish to follow aligned to their values (e.g., kaitiakitanga—guardianship of the natural environment; tikanga—values and customs) [45]. This Te Ao Māori perspective also encompasses the interests, particularly in modern society, that Māori have in the environment based on their values, indigenous rights and existing property rights. A Te Ao Māori view does not fit well within the western anthropocentric paradigm or economic production model, where nature is treated as just a resource or commodity to service humans. Rather it exists in parallel as a co-existing framework [44], where natural ecosystems are

integral and inter-related to human health and well-being. From a Māori perspective, the health and well-being of the environment equates to the health and well-being of people. Māori principles focus on environmental, social and cultural values, in addition to financial outcomes—and their long-term commitment is intergenerational [46]. Māori models of well-being emphasise that “wellbeing is affected not just by access to or quantity of natural resources but also by their state or condition” [44] (p. 278). A well-being perspective on soil health that focuses on the benefits people derive from nature rather than the ecosystem processes that give rise to them would be more inclusive of indigenous views [15,47].

The second key observation from Coulthard et al. [41] is that people are heterogeneous. Different people have diverse ideas about what is more or less important when it comes to their well-being [16,42,48]. Breure et al. [2], for example, describe how stakeholders rate the services provided by soils differently. What was considered important by some stakeholders was deemed unimportant by others, and vice versa. Furthermore, “gender, class, age and ethnicity systematically shape access to resources, rewards and life chances” [49] (p. 4) and inequalities within these categories are associated with reported subjective well-being [49]. As such, “wellbeing and contributors to wellbeing vary across the country, among individuals, [groups], and communities” [50] (p. 10) and well-being approaches need to appreciate these layers of diversity and inequality if they are to improve decision-making processes [50].

Thirdly, because societies are heterogeneous, conflicts can arise between individuals or groups who may have contrasting well-being goals [48]. This is evidenced in Aotearoa New Zealand (and globally) with the increasingly contested use of highly productive soil between urban expansion and rural lifestyle development and primary production [51,52]. In Aotearoa New Zealand, priority has been placed on issues such as urban expansion over production [51], resulting in unconsidered trade-offs in how high functioning soil resources are managed [52]. The social complexity surrounding soils and their health is politically charged and as a result could lead to one group or view benefiting more than another [53]. As Dawson and Martin [54] (p. 70) note, “differences in power relations between stakeholder groups influence which values are recognised in policies governing natural resources, in the negotiation of trade-offs and consequently in the contribution of ecosystem services and disservices to the wellbeing of local people”. A well-being approach would help to provide decisionmakers with an understanding of these conflicts and an insight into who wins and who loses when it comes to soil health policy implementation.

Finally, a well-being approach is important for policy analysis because people’s decisions and behaviours are driven by what they think well-being is and how they aspire to achieve it [41]. This approach elevates the importance of human agency in determining the benefits people derive from ecosystem services [48,55]. Having a more holistic understanding of the benefits people value from soil, who benefits and how, would help develop more equitable soil health policies and support better decision-making.

Using a Well-Being Approach to Inform Soil Health Policy

Globally, well-being is increasingly being viewed as an approach to measure social progress and address sustainability issues across nations [39]. However, well-being can equally be applied to obtain a better understanding of a particular sector or issue, and for the development of appropriate decisions and policies relating to that issue [36]. Applying a well-being lens to soil health (Figure 1) provides new ways of thinking about this issue, and how to bring it into the policy domain.

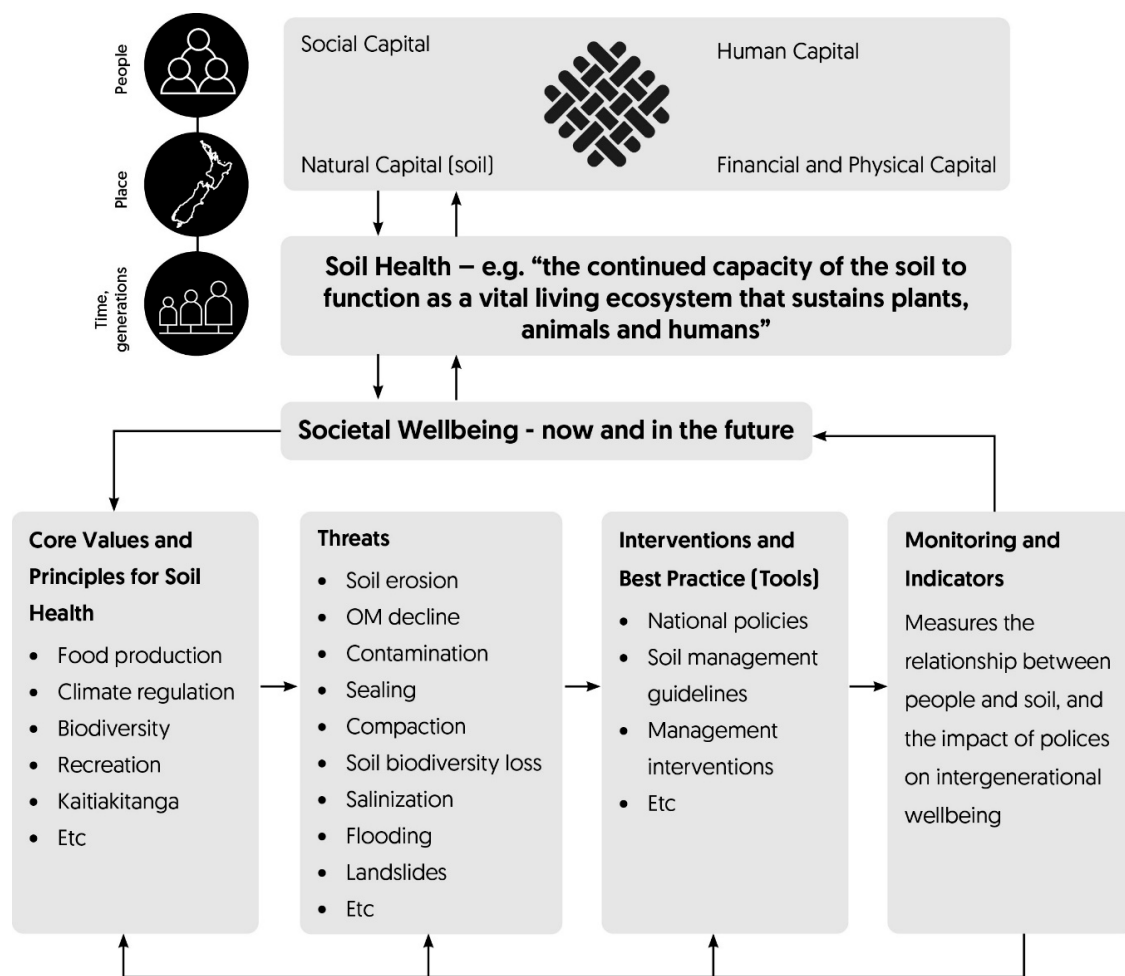


Figure 1. A well-being approach to soil health (adapted from [56,57]) (The soil health definition cited in the framework is from [58]. Kaitiakitanga is defined as guardianship of the natural environment.).

The top half of the framework presented in Figure 1 is drawn from the Aotearoa New Zealand Treasury's Living Standards Framework [56] and positions soil health within the well-being approach. This part of the framework recognises the interconnectedness and importance of all the capital assets in shaping the way ecosystem services are valued and used, reemphasising why a holistic approach to soil health is necessary. Furthermore, it acknowledges the heterogeneity of views people have with regard to soil and soil health, the need to address soil sustainability (i.e., that capital assets are not eroded by current generations at the expense of future generations), and the importance of taking a place-based approach to accommodate the wide variety and variability in soil types, properties and qualities (both spatially and temporally). The framework is outcome-focused, with the outcomes framed in terms of the well-being benefits that people derive from soils.

The bottom part of the framework draws on Holloway [57] and provides a strong intervention logic on which to make good policy and management decisions. Foremost, is the need to understand the core values people hold about soil and soil health (i.e., what benefit are you trying to protect/promote). Second, is the need to understand the threat(s) to that value/benefit. Third, what tools are available to manage the threat (tools can include the spectrum from national policy to on-farm management interventions), and finally, what monitoring (or indicators) will be put in place to show that the tools are managing the threat, and achieving or enhancing the core values/benefits.

Public policy is ultimately about helping people live better lives. Good policy achieves this by ensuring that the well-being generating capacity of capital assets (such as soil) is managed and maintained in a way that is:

- Sustainable—that capital assets are not eroded by current generations at the expense of future generations.
- Equitable—that access to capital assets is shared across all groups in society.
- Socially cohesive—that no particular social group(s) impose their concepts of well-being on others.
- Resilient—that capital assets are protected against major systematic risks.
- Supportive of economic growth—that the material well-being generating potential of capital assets is enhanced [59].

Reframing soil health to focus on the well-being benefits that people derive from soil could provide the needed value shift to conceptualise and articulate to a wider audience the requirements needed to ensure its sustainable use [32].

3. More than Just Production

As a multifunctional living system, soils support the interests, values and priorities of many different actors in society [12,21]. In Aotearoa New Zealand, there is a growing articulation of the value and benefits of soil beyond the production benefits and a more holistic view of soil health is warranted, as evidenced from the following examples.

3.1. Cultivate

Cultivate is a social enterprise operating two urban farms in the Aotearoa New Zealand city of Christchurch. The farms grow vegetables which are sold to local businesses. The land the farms occupy is leased by Cultivate on a 30-day rolling cycle and comprises vacant urban land cleared following the Christchurch earthquake. Cultivate works with at-risk youth who work on the farms as interns [60]. Ethnographic research conducted by Dombroski et al. [60] indicates that while the farms produce a significant amount of food, the benefits extend beyond urban food security to improved well-being of youth interns through the development of their capacity to care, work and maintain focus. Their research also highlights the challenges faced by Cultivate in their attempts to foster more holistic benefits. These include balancing care for farm production with the complex care needs of youth and volunteers and incorporating uncertain land tenure into planning processes [60]. Under current soil health indicators these challenges would largely go unrecognised.

3.2. Papatūānuku Kōkiri Marae

Papatūānuku Kōkiri Marae is an urban marae (Māori cultural and social centre) and whare wānanga (learning centre) in Auckland, Aotearoa New Zealand. The marae is the site of an extensive community garden that has been running for almost 30 years. The marae runs education programmes to teach organic food production (Kai Oranga) using traditional Māori values and ethics. In addition to learning how to produce healthy food, the programme has led to wider benefits beyond the classes. Participants are adopting and promoting healthier lifestyles and are participating in, and contributing to, marae community activities. Further outcomes of the programme have been the demand for te reo (Māori language) programmes to run alongside Kai Oranga and a strengthening of cultural capability. These additional benefits are significant as many who participate have become disconnected from their culture and ancestral lands [61]. Recovering those connections is a major additional outcome of the food production programme—one that would not be captured using contemporary soil health indicators.

3.3. Fit for a Better World

In July 2020, the Aotearoa New Zealand Prime Minister launched the Primary Sector Council's roadmap Fit for a Better World [62]. The roadmap outlines the Government's plan for accelerating the productivity, sustainability, and inclusiveness of the Aotearoa New Zealand's primary sector. A key underpinning principle of the roadmap is the concept of Te Taiao [63]. As outlined by Howard et al. [64] (p. 5), "Te Taiao is the natural world that contains and surrounds humanity in an interconnected

relationship of respect". It has, at its heart, the health and well-being of the natural world and people [63–65]. Practices including "enriching soil health, holistic management, balance, diversity, respect and connection with past and future generations" are at the centre of the Te Taiao approach [65] (p. 8). It is recognised that successful rollout and delivery of the roadmap will require the development of well-being outcome statements and indicators [64]. As such, a more holistic view of soil health than that which is currently held will be required.

4. Discussion

Considering the diverse interests, values and priorities of all the different actors is critical for the effective governance and management of soil. Tadaki et al. [66] (p. 1) argue that "human and ecological 'values' have become powerful concepts in environmental management", and that the incorporation of these into decision-making processes has become quintessential for achieving environmental outcomes [66,67].

Soil is part of the natural capital that underpins food, feed, fibre and fuel production [68], and is important to Aotearoa New Zealand's environment, economy, and well-being [69]. However, in Aotearoa New Zealand, the human perspectives of soil are largely lacking along with understanding, appreciation, and respect for soils [68]. There is a strong need for a wider perspective on the value of soil health to be investigated and to understand how people appreciate and care for soil. Understanding what value or values are important to society is a prerequisite for making sound policy and management decisions, and for developing appropriate indicators.

Current biochemical and physical soil health indicators only represent a portion of the full range of services and experiences provided by soils; subsequently, they do not address the needs and world views of all the different sectors and stakeholders. Therefore, relying solely on biochemical and physical soil health indicators disempowers collective action on soil health as some perspectives are marginalised. As Duncan et al. [70] (p. 11) illustrate using water quality as an example, "conversations about how "we used to fish here, versus this is the nitrate level" (or we want to fish here or see others fish here, versus you need to get to this nitrate level) can instigate quite different conversations and actions that are likely to deliver quite different outcomes".

And the same is true for soil. Conversations around the societal well-being benefits arising from urban farms, community gardens, or even the primary sector (as outlined in Section 3), encompass much broader issues of social cohesion, cultural identity, land availability and mental health, for example, than does the conversation solely on the biochemical and physical conditions needed to grow healthy produce.

The soil system, as with water, has "interconnecting ecological, social, cultural, economic, historical, institutional and political dimensions" [70] (p. 11). Reframing soil health to how it is enacted and experienced would better accommodate these various dimensions and improve the management and sustainable use of soil [45]. There are many diverse actors and stakeholders with a range of perspectives and experiences who hold an interest in soil and soil health (e.g., indigenous groups, private landowners, community groups, sector organisations, scientists, policy makers, etc.). People value soil for many different reasons. For some, it will be "motivated by economic concerns, but others are rooted in tradition or emotion, some reflect individual needs while others reflect collective needs and social relations, and arguably, many preferences are a complex combination of all of these" [67] (p. 367).

A well-being approach provides a way of navigating these diverse values by framing them in terms of the well-being benefits people derive from soil. Reframing the discussion in this way would create new policy approaches, decision-making, and management actions that may be more productive, and resonate with a much wider audience than is currently the case [47]. Additionally, conversations about well-being benefits would help to identify and develop appropriate indicators or measures that are based on the core soil health values and meet achievable and sustainable goals and objectives.

Soil health issues largely boil down to “societal negotiation in the face of unavoidable trade-offs between various soil uses” [11] (p. 120). There are synergies and tensions between people’s values and perspectives regarding soil and its use. Policy development is about managing these tensions and the resulting trade-offs [71]. A well-being approach does not eliminate these trade-offs [47,71], but it does provide a safe and structured approach for people to engage in meaningful conversations about the issue, articulate their values, allow a discussion/translation between different interest groups, and space to facilitate arbitration [53]. These conversations can then be transparently operationalised as policy and management interventions using the intervention logic process shown in Figure 1.

Understanding the well-being benefits society obtains from soil is therefore a key starting point for these negotiations. Aotearoa New Zealand has made a significant start in determining what the core soil values and principles are with respect to indigenous Māori [31,32,45] and for some sector groups [25]. However, further work is required to collate and weight the full range of values people derive from and place on soils to better inform and continue the discussion that has commenced. Au and Karacaoglu [72] (p. 7) note that “the current [Aotearoa New Zealand] government has clearly signalled that it wants to frame, design and implement public policy with an objective of increasing overall wellbeing”. Reframing soil health as a well-being issue would meet this objective.

5. Conclusions

This paper argues that soils form an integral part of our social and cultural fabric and are intrinsically important to human survival and well-being. The ways humans interact, value and use soil are critical factors in determining the health and sustainability of soil ecosystems. People value soils for many different reasons. This diversity of values from distinct social groupings (e.g., country, urban, rural, ethnicity, religion, sector) can help shape overall societal views and perspectives and subsequently improve our understanding of natural ecosystems and their importance in our everyday lives.

We have used a well-being approach from Aotearoa New Zealand to demonstrate a more holistic way of determining and understanding soil health, reflecting diverse societal and cultural values and framing these in terms of the well-being benefits people derive from soil ecosystems. This approach can improve our understanding of soil health with respect to greater societal needs and goals and inform soil health policy. Current soil policy and decision-making frameworks, such as the dominant ecosystems services approach, do not adequately account for this social dimension. The well-being approach to soil health would help create a more meaningful interpretation of soil [21] and enable soil to be managed in a more holistic and sustainable way.

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