**Rural well-being: The push and pull and the diversity in-between**

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**Abstract**

This article proposes an analytical framework for developing indicators of agriculture and rural community sustainability, including the symbiotic relationship between sustainable agriculture and rural well-being. Rural well-being offers a sustainable approach to healthy lifestyles that are based on a balance of many complex components including social, economic, and environmental issues. The United States (US) and the United Kingdom (UK) have taken positions on these issues. The United States Department of Agriculture is ‘com- mitted to helping improve the economy and quality of life in rural America’ through loans and subsidies (USDA 2015). The USDA Sustainable Agriculture Research and Education (SARE) program vision is to sustain ‘an enduring American agriculture of the highest quality that is profitable, protects the nation’s land and water and is a force, providing a healthy and rewarding way of life for farmers and ranchers whose quality products and operations sustain their communities and society’ (SARE 2016; Smart, Sandt and Chris Zdorovtsov 2016). UK government and non-government agencies have taken a more holistic approach to rural well- being in their efforts to achieve a more balanced social–economic–environmental state of rural well-being. The UK interpretation of Community Supported Agriculture is a tested example of this sustainable approach to fostering rural well-being (Saltmarsh et al. 2011).

# **Introduction**

It is generally accepted that rural areas of the world provide urban areas of the world with the majority of food products, although rural areas are often assumed to be less well off. Rural well-being is measured in many ways. Degrees of rural well-being are tradition- ally determined by the measuring stick of economic, social, and environmental values. These evaluation instrument metrics are generally accepted. However, from time to time questions arise as to how accurate the ‘measuring sticks’ are. The question is, what defines the conditions necessary to achieve sustain- able rural well-being? Assumptions that rural poverty levels are higher than urban poverty levels are some- times incorrect. In reality there are many approaches to supporting healthy rural and urban well-being. All of these approaches contribute to levels of well-being in different ways depending on the contexts they are addressing. This article delves into these issues and questions, investigating diverse permutations of sustainable rural well-being. This article is based on our investigation of these macro-level models since 2015, focusing on the symbiotic relationship between sustainable agriculture and rural well-being as a factor in strengthening rural well-being.

This article compares and contrasts approaches to models of rural well-being in the United Kingdom (UK) and United States (US). Issues including social/minorities, and elderly are the most significant sector of the population impacted by these issues. Local and regional environmental factors range from seasonal weather, snow, rainfall and drought, to soil contamination, deforestation, and flooding. Statistics show that women, minorities, and elderly rural dwellers are especially impacted by these natural occurrences (UN Inter-Agency Task Force on Rural Women [2012](#_bookmark52)).

## Historical perspective on the agri-environment schemes in the US

There is significant evidence that sustainable agriculture practices (also referred to as ‘alternative agriculture’) date back to the mid-19th century. Sustainable agriculture and rural community resilience may effectively address todays rural well-being issues if we learn from the past. In the early 20th century agriculture in the US was beginning to transform from small rural farms to industrial agriculture. Rural populations were stable and confident that their livelihoods were secure. In the early 1920s, farmers saw several opportunities for increasing their production and prosperity. New technology and crop varieties were reducing the time and costs-per-acre of farming, which provided a great incentive for agricultural expansion. This expansion was also necessary to pay for expensive, newly developed equipment (such as fencing and ploughs) that was often purchased on credit, and to offset low crop prices after World War I (National Drought Mitigation Center [2016](#_bookmark44)).

In October 1929, the stock market collapsed leaving farmers with significant debt and fewer buyers of the products of their hard labor. Following the1929 stock market crash, the Great Depression began in 1930 and continued through the decade until shortly before World War II. During the 1930s, The Dust Bowl event covered the entire west and mid-western Plains. ‘The Dust Bowl drought of the 1930s was one of the worst environmental disasters of the Twentieth Century any- where in the world' Three million people left their farms on the Great Plains during the drought, and half a million migrated to other states, almost all to the West (Cook et al. [2009](#_bookmark35)). The Dust Bowl was caused by deficient rainfall, high temperatures and high winds, in combination with the predominant farming system. Additional insect infestations and dust storms further complicated this crisis. ‘The agriculture depression contributed to the Great Depression’s bank closures, business losses, increased unemployment, and other physical and emotional hardships' (National Drought Mitigation Center [2016](#_bookmark44)). During the 1930s, the combined occurrences of the 1929 stock market crash, the Great Recession, and the Dust Bowl had shocking and highly significant impacts on rural well-being and rural communities across the United States.

Regardless of the pains and trials, some rural communities played a key role in supporting agriculture in the 1930s, and continue to support sustainable agriculture in the 21st century. Sadly, during the Great Depression and the Dust Bowl many once thriving rural communities were lost forever. During the 1930s, catastrophic environmental damage occurred. Large numbers of farmers and their families had to sell their farms at historically low prices, resulting in homeless- ness for many. The devastating impacts of these events were felt throughout the country. However, a surprising number of rural communities struggled through and survived the 1930s era, and are still resilient and thriving in the 21st century. These communities currently play a key role in supporting sustainable agriculture and rural well-being even in the darkest times. For example, resilient rural communities provide supporting local services including access to churches, rural schools, and venues selling local agriculture products.

##  20th century rural well-being in the US and UK

In the late 1980s, Europeans recognized that there was insufficient support for a production-oriented agriculture to maintain biodiversity and rural well-being in many areas. Consequently, there has been growing support for measures that encourage the maintenance of a resilient and biodiverse environment, which will maintain ecosystem services. These measures are applied on a voluntary basis by farmers who wish to enhance biodiversity on their farm and contribute to wider societal efforts to positively facilitate environmental enhancement that could be achieved through farming and rural development. The measures include intensification of farming, low-intensity grazing systems, integrated systems management and organic farming, preservation of hedgerows, ditches, and woodlands, and conservation of high value habitats and their associated biodiversity. The application of these measures can lead to very significant benefits for the environment and sustainable rural livelihoods (see, Pagella et al. [2013](#_bookmark46)). Agri-environmental and specifically agri-ecosystem schemes have been applied with a considerable degree of variation and flexibility within different EU countries. The UK is no exception, with significant variations occurring between England, Scotland, Wales, and Northern Ireland. However, there has been little formal monitoring and evaluation of the effectiveness of agri-environmental schemes until recently (Dwyer and Kambites [2005](#_bookmark36)). This review anticipated the increasing importance of agri-environmental measures as part of the revised CAP reforms between 2014 and 2020 that are discussed below.

## 21st century rural well-being in the US and UK

Not surprisingly, 21st century sustainable agriculture practices have drawn significantly on lessons learned from the catastrophic Great Depression. The agri- environmental movement in the US commenced with the Agricultural Adjustment Act of 1933 and the Soils Conservation Act of 1935. In the US, the first Farm Bill, the 1933 Agricultural Adjustment Act (PL 73–10), addressed environmental issues of significant relevance to agriculture in America during the Great Depression. Two years after the 1933 Agricultural Adjustment Act was implemented the Federal Government also passed the Soil Conservation Act of 1935 (PL 74–46), which established the Soil Conservation Service and made funding available for farmers who embraced soil conservation practices. “(Cain and Lovejoy [2004](#_bookmark33)). The legacy of these two Agriculture Acts continues on as the foundational principles of sustainable agriculture.

In the 21st century, issues related to rural well-being cannot be addressed as a single isolated event simply because there are multiple overlapping positive and negative issues impacting rural well-being. Social and economic impacts of agriculture, resource conservation, and management of the environment can strengthen efforts to create more resilient rural well-being. Establishing research-based principles, criteria, and indicators for evaluating current and emerging sustainable agriculture and rural community development policies and initiatives will also produce similar results. Such initiatives must include ongoing intensive involvement of rural communities and the residents that are most impacted by development policies and initiatives. The most important objective, that of social, economic, and environmental resilience, is achievable if focused on strengthening the symbiotic relationship between sustainable agriculture and rural communities, and their relationship with the environment.

While undertaking this structured approach to reinvigorating rural well-being conditions, we have found tested evidence that a validated framework model of tested best management practices can create the foundation for achieving strong sustainable agriculture and rural communities, which in turn will potentially promote advances in domestic and international sustainable agriculture and rural community development policies and practices. Hypothetically, the outcomes from the process of connecting sustainable agriculture and rural communities can inform the future structures of support for sustainable agriculture and rural likelihoods in the US and UK. There is strong potential for both the US and a post-Brexit UK to learn from the products of this and related research efforts as an informative research-based support source.

# **Rural well-being in the US and UK**

In the last half of the 20th century, rural development in the US has been significantly bolstered by recreation, tourism, and the financial opportunities that result from these entrepreneurial efforts. Development of recreation and tourism has had positive and negative impacts on rural well-being. Reeder and Brown ([2005](#_bookmark49)) have researched primary issues related to rural recreation and tourism development including cost of living fluctuations, benefits and liabilities of skilled and unskilled employment, reduction in unemployment and poverty levels. Their findings recognized that ‘recreation and tourism development has potential advantages and dis- advantages for rural communities. Among the advantages, recreation and tourism can add to business growth and profitability. Landowners can benefit from rising land values. Growth can create jobs…….. Recreation and tourism can help diversify an economy’. Reeder and Brown also make the point that ‘disadvantages of recreation-related development are associated with rapid growth that these counties often experience; on average, “recreational counties” grew by 20 per cent during the 1990s, nearly three times as fast as other rural counties. Rapid growth from any cause can erode local natural amenities, for example, by spoiling scenic views.’

Rural development often takes an economic approach to improving rural well-being. When that occurs the problem is that good intentions, although not fool proof, have the ability to turn out good or bad results. Rural well-being is often a victim of declining economics, sometimes paired with fiscal belt tightening. Economics alone will not solve the complex issue of achieving long-term sustainability of rural well-being. Rural agriculture and communities need to diversify reliable economic resources that are sustainable over the long hall. Rural recreation and tourism development is not fool proof. Rural recreation and tourism development has its benefits. However, rural development options such as recreation and tourism do not provide a viable blanket solution for rural well-being. That blanket is much too small to cover social, economic and environmental issues. Rural development must be strengthened by diversifying rural development options including sustainable agriculture, which is economically stable, viable, and resilient for the future. By definition sustainable agriculture is diverse. There are many adaptations and permutations of sustainable agriculture making it easier to customize each sustainable agriculture variation. At a micro level sustainable agriculture is adaptable to each local context. Many of these ‘sustainable’ agriculture approaches exhibit similar common principles and practices that can provide indicators of sustainable agriculture and rural livelihoods.

Van Cauwenbergh ([2007](#_bookmark57)) observes that sustainable agriculture lacks a generic framework. They emphasize, ‘in agriculture, unlike forestry, remarkably few efforts have been made to develop a generic, conceptual framework of Principles, Criteria and Indicators (PC&I) of sustainable agriculture'. Agenda 21 (Chapter 14, Section 14.2) proposes that ‘major adjustments are needed in agricultural, environmental and macroeconomic policy, at both national and international levels, in developed as well as developing countries, to create the conditions for sustainable agriculture and rural development (SARD).’ The major objective of Section 14.2 was and is still to *increase food production in a sustainable way and enhance food security*. In order to accomplish these goals, indicators of positive or negative outcomes will be required. Agenda 21 emphatically states ‘this will involve education initiatives, utilization of economic incentives and the development of appropriate and new technologies, employment and income generation to alleviate poverty, and natural resource management and environmental protection’ (Johnson [1993](#_bookmark43)).

According to the National Sustainable Agriculture Coalition ([2016](#_bookmark45)), common sustainable agriculture criteria include ‘enhancement of environmental quality and natural resources base upon which the agricultural economy depends, making the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls, and sustaining the economic viability of farm operations, while enhancing the quality of life for farmers and rural community societies as a whole’ (National Sustainable Agriculture Coalition [2016](#_bookmark45)). These macro-level criteria offer a broad and diverse set of customizable options applicable to multiple contexts. However, our findings to date indicate that sets of principles, criteria, and indicators would produce more in-depth findings than would criteria alone.

The basic goals of sustainable agriculture as practiced in the US include achieving and sustaining environmental health, economic profitability, and social and economic equity (sometimes referred to as the ‘three legs’ of the sustainability ‘stool’). Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. Therefore, stewardship of both natural and human resources is of prime importance. Stewardship involves taking care of the land, supporting sustain- able economies, and preserving/enhancing natural resources, community resilience, and environment health. Another characteristic of agricultural sustain- ability is the systems approach, which in its broadest sense is based on establishing direct, seamless connections from local farms to rural communities in a manner respectful of surrounding environmental con- texts and the enhancement of ecological integrity. A systems approach is based on the ecosystems model as a foundational principle of sustainable agriculture and the interconnections between farming and other aspects of our environment. Sustainable agriculture is fundamentally a process. All participants in the sys- tem, including communities, farmers, laborers, policy-makers, researchers, retailers, and consumers must adhere to the systems approach for this sustainable systems process to collectively succeed.

## 2.1. Sustainable agriculture, principles, criteria, and indicators of rural well-being

Agenda 21, Chapter 14 is titled *Towards Multifunctional Agriculture for Social, Environmental and Economic Sustainability*. Section 14.2 asserts that *major adjustments are needed in agricultural, environ- mental, and macroeconomic policy, at both national and international levels, in developed as well as developing countries, to create the conditions for sustainable agriculture and rural development (SARD)*. The major objective of Section 14.2 was and is to increase food production in a sustainable way and enhance food security. *This will involve education initiatives, utilization of economic incentives and the development of appropriate and new technologies, employment and income generation to alleviate poverty, and natural* *resource management and environmental protection* (UNCED Agenda 21 [1992](#_bookmark53)). We address this SARD objective through development and testing concepts and theories of pedagogy supporting sustainability in agriculture and rural communities. By means of this process education can play a significant role in maximizing and embedding positive social, economic, and environmental change in achieving sustainable livelihoods in agriculture and rural communities. Section 14.6 reinforced this statement. *Multifunctional approaches to implementing agricultural knowledge, science and technology (AKST) will enhance its impact on hunger and poverty, improving human nutrition and livelihoods in an equitable, environmentally, socially, and economically sustainable manner. Multifunctionality recognizes the inescapable interconnectedness of agriculture*’*s different roles and functions, that is*, *agriculture is a multi-output activity producing not only commodities, but also non-commodity outputs such as environmental services, landscape amenities* *and cultural heritages* (United Nations Environmental Programme [1992](#_bookmark54)).

From a European perspective, rural development programs should be capable of sustaining the development efforts over an extended period of time. However, in many cases permanent change is not a primary goal. The question is to what extent these schemes, which are designed to address the economic, environmental, and social issues in rural agriculture-based communities, have been successful in achieving positive change? In so doing our research aims to influence the type of change taking place in rural communities by informing future policy and future initiatives. There is a need for further evaluation of these schemes to better understand how they can operate more effectively, and to also identify the potential of facilitation in terms of enhancing skills. Similar conclusions were reached by the National Assembly for Wales in respect of ‘Tir Gofal’ the agri-environment scheme for Wales between 1999 and 2012. The Audit Committee Report on Tir Gofal identified potential benefits, but lacked evidence and a clear understanding of the impact the scheme was making on the rural economy, the environment and rural communities generally. Our project outcomes are building on positive and negative results of these initiatives, taking steps to ensure our findings are evidence-based and grounded in rigorous tested research processes.

In the US, the term ‘sustainable agriculture’ is broadly defined. The United States National Sustainable Agriculture Coalition states that sustain- able agriculture ‘as legally defined in U.S. Code Title 7, Section 3103 refers to an integrated system of plant and animal production practices having a site-specific application that will over the long term satisfy human food and fibre needs’ (US Government Publishing Office [2006](#_bookmark55)). Sustainable agriculture needs to be economically viable, diversified, and resilient in order to survive and prosper. Truly sustainable agriculture is a foundation for economic prosperity. Economic success depends on informed sustainable agriculture management. Sustainable agriculture education can change attitudes and outcomes of farm operators and the consumers of agricultural produce in supporting sustainability of agriculture and rural communities.

One way to change attitudes is to facilitate dissemination of sustainable agriculture information by making available understandable, applicable, and usable sustainable agriculture principles, criteria, and indicators supporting sustainable agriculture and rural communities (Pagella et al. [2013](#_bookmark46)). These principles, criteria, and indicators could also facilitate identification and documentation of the appropriate pedagogical approaches for delivering such information. An assessment of a wide range of indicators of sustain- able agriculture, and by implication, rural community sustainability makes the case that there are generally two sets of sustainability indicators, these being micro sustainability indicators and macro sustainability indicators. Micro indicators are site-specific and targeted at local- and regional-scale agriculture (Jackson and Roberts [2000](#_bookmark42)). Macro indicators are intended to be nationally or internationally applicable (Dariush Hayati et al. [2011](#_bookmark40)). We believe that by focusing on sustain- able agriculture macro principles, criteria and indicators development at the international level we can produce the most impact through influencing and supporting development of more effective default baseline micro indicators at the regional and local level.

In support of this effort, the Food and Agriculture Organization of the United Nations, provides this dis- claimer for their publication titled ‘SAFA Indicators’, clarifying that ‘*the SAFA default indicators are applicable at the macro level* – *meaning to all enterprise sizes and types, and in all contexts. However, default indicators of such a universally applicable tool can only contain the frame for the rating scale*. SAFA provides such indicators for users who do not necessarily have the knowledge to develop indicators themselves without the risk of lowering the bar of the assessment’ (FAO [2013](#_bookmark39)). We are working towards a set of macro-level indicators of sustainable agriculture as a *default base- line* and a method of providing knowledge for users of sustainable agriculture indicators. These macro- level indicators are discussed in more detail below. The objective is that developing and testing principles, concepts, and theories of pedagogy supporting sustainability in agriculture and rural communities will provide opportunity to empower users with the skills to develop their own indicators of rural sustainability in general, and rural well-being in specific.

A movement from protectionist to a more systemic perspective in farming systems coupled with a concern for sustainability has led to the formulation of more and more complex frameworks for the analysis of the sustainability of agricultural and rural livelihood systems. Sustainability, as defined in Agenda 21, has ecological, social, and economic objectives and recognizes the importance of understanding the nature of multi-functionality within farming systems. Many authors concerned with developing frameworks for the assessment of sustainability have explored the great variety of contexts in which they might be applied and have moved from earlier, relatively uncomplicated frameworks with limited numbers of individual indicators, to indicator groups (European Commission [2001](#_bookmark37), [2013](#_bookmark38); Bell and Morse [2008](#_bookmark31)). Rao and Rogers ([2006](#_bookmark47)) explore a systems approach to assessing agriculture in order to integrate the multi- dimensional goals of sustainable agricultural development and identify how sustainable agriculture can underpin sustainable livelihoods. They adopt the definition of sustainable agriculture based on one pro- vided by Tilman et al. ([2002](#_bookmark51)): ‘Sustainable agriculture is defined as a practice that meets current and long-term needs for food, fiber, and other related needs of society while maximizing net benefits through conservation of resources to maintain other ecosystem services and functions, and long-term human development.’ (Rao and Rogers [2006](#_bookmark47), p. 441).

In order to identify how to achieve an integrated approach that can accommodate the multiple dimensions of environmental, social, and economic aspects of sustainable agriculture, Rao and Rogers first reviewed three existing categories of assessment frameworks, namely: environmental assessments, agro-ecosystems assessments, and sustainable rural livelihoods assessment, with a view to analyzing the weaknesses in each approach and drawing on the strengths of each approach. Not surprisingly they find a lack of social and economic indicators in the environmental assessment approach, which limits the usefulness of these assessments in terms of sustain- able agriculture.

The focus within an agri-ecosystems approach on farm level activity raises the issue of an approach to assessing sustainable agriculture that is scalable, with appropriate indicators for different levels, whether that be: global, national, regional, local, or farm. This highlights one of the challenges of developing a systems based framework, which is identifying where the borders and boundaries reside (Bossel, [2001](#_bookmark32); Reed et al. [2005](#_bookmark48)). In looking at sustainable rural livelihood indicators, Rao and Rogers draw on Chamber and Conway ([1991](#_bookmark34)) for a clarification of the term ‘sustain- able livelihood’. ‘A livelihood comprises capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with the recovery from stress and shocks, maintain and enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which con- tributes net benefits to other livelihoods at the local and global levels and in the long and short term.’ (Rao and Rogers [2006](#_bookmark47), p. 445).

The sustainable rural livelihoods approach as presented by Rao and Rogers are underpinned by the five capitals model that has emerged over a period of time from the work of environmental economist Herman Daly. The breadth of the five capitals (natural, manufactured, human, social, and financial) attempts to address the multidimensional nature of sustainability by assessing increases and decreases within each capital. This approach was also widely used by the British Aid Agency, DfiD, for many years for analysis and as a constructive framework for developing country farming systems and rural livelihoods. Perhaps its main weakness is the lack of acknowledgment of the importance of power and governance at local and regional levels, which SAFA (above) recognized. The five capitals model is scalable and capable of providing an initial qualitative assessment. As with any systemic approach, the relationships between the elements of the model are of key importance and those relationships can be viewed in contrasting ways as demonstrated in Figure 1, which highlights the difference of perceiving the other four capitals as being ultimately dependent on natural capital.

The process of developing a more comprehensive framework that is both quantitative and qualitative and that draws on aspects of environmental assessment and agri-ecological assessment, requires attributing measurable values to the various capitals and identifying the movement in value between the capitals. This process results in a considerably more complex, in-depth analysis.

Figure 1. Examples of alternative links between the 5 capitals





## 2.2 Model initiatives outside the mainstream agri-environment schemes

Since the shrinking of direct research funding through the social and natural science research councils in the UK, many agricultural and related sciences researchers have looked toward the European Union (EU) for funding their main support. For many years, the EU has strongly influenced agricultural research and rural livelihoods through the development of multi-agency and interdisciplinary research. The natural resource- based projects and programs are designed to encourage joint research initiatives across member states, which facilitate research capacity building and exchange visits on emerging themes of interest.

Some earlier EU-funded research on natural resource management was designed to stimulate social learning among researchers, land managers, and agency staff on a catchment scale (e.g. <https://sites.google.com/site/slimsociallearningforiwm/home>). More recent research programs have focused on learning and innovation networks with support for sustainable agriculture.

For example, the SOLINSA project involved 17 partners across Europe using transdisciplinary approaches based on participatory methods. The partners included 11 research institutions across eight countries (see [www.solinsa.net](http://www.solinsa.net/) and a series of papers in a special issue of the *Journal of Agricultural Education and Extension* 2015. e.g. Ingram et al. [2015](#_bookmark41)). All these programs were based on the premise that more sustainable land management systems could evolve from learning networks between multiple resource users and actors who had different roles to play in the management of natural resources. At a more local level in the UK, projects have emerged from the EU Rural Development Program which have supported the establishment of partnerships of farmers, local communities, environmental and natural resource management agencies in order to develop stronger local communities, improve their quality of life and the health and well-being of their landscape. One such project is the Clun Forest ‘Land Life and Livelihoods’ Project, which has benefited 105 farming families and 334 participants.

There are also examples of projects and initiatives being established outside of any national or EU frame- work by individuals and community groups. The Denmark Farm Conservation Centre[1](#_bookmark29) (DFCC), located between the Cambrian Mountains and the Ceredigion coast in West Wales is an example of an agro-ecology project started by an individual, which has developed into a broader sustainability project and that has both ecological and educational dimensions and is embedded in a strong community network. DFCC is a 16-hectare holding; it was farmed until 1984 under the system that predominates in the area, which is based on improving grassland by introducing ryegrass (*Lolium perenne*) and maximizing growth with the aid of chemical fertilizers. The effect of reducing the plant biodiversity is to also reduce other biodiversity, most noticeably birdlife. DFCC demonstrates how reducing high-energy inputs allow diversity to re- establish itself at all levels. Extensive ecological monitoring over the years following a change in management of the DFCC site has shown how allowing an increase in plant diversity leads to a vast increase in invertebrate diversity, which in turn has seen a significant increase in species and total numbers of birds and other vertebrates, compared to the surrounding farmland, which can best be described as a ‘green desert’.

The practical experiences of DFCC have been used as a basis for training courses for landowners who wish to encourage biodiversity on their own holdings. The aim is not for every holding to be fully converted to the low level management system at DFCC, which is based on late summer hay making, and late summer and autumn grazing, but for parts of farms to be managed in this way in order to establish wildlife corridors. Since 1987, DFCC has been managed by the Shared Earth Trust and has diversified its activities to providing a range of education courses on various aspects of sustainable living alongside the ecology courses. The overall aim is to not only influence land owners, whose practice directly impacts on biodiversity, but also to influence consumers generally to understand how their lifestyles indirectly impact on the ecosystems that ultimately sustain life. DFCC is connected to and works in partnership with the local university, particularly in relation to ecology courses, and community organizations such as the local Transition Town organization, a community woodland and the Wildlife Trust.

From a 5 capitals perspective, the ecological surveys provide data for a measurable increase in natural capital on the 16-hectare holding. Through the social capital of its network of community organizations and the increase in human capital through its education program, DFCC’s aim is to increase natural capital on a wider scale. DFCC has developed its manufactured capital by installing a photovoltaic array, a biomass heating system and developing its buildings for training and accommodation, which all contribute to increasing financial capital, with the sole purpose of reinvesting in natural and human capital in rural areas.

Another example that has established itself as a sustainable business outside of any national or regional support framework is the Real Seed Collection Company[2](#_bookmark30) (RSCC), a commercial horticultural enterprise. Based in Pembrokeshire, South-West Wales, the RSCC is aimed at providing non-hybrid and non- genetically modified seed to small-scale growers. The inspiration for establishing the Company was the decline in traditional varieties of vegetable seeds and the domination of large seed producers with a focus on a relatively small number of varieties, which are often hybrids designed to produce a single high yielding crop, but which require the purchase of new seed each year. The business model is unusual in that each packet of seed is accompanied by information on how the grower can save seed for the following year, which in effect is reducing the demand for new seed from the RSCC. However it does fulfil the aim of the Company to promote and spread the diversity of varieties, and to re-skill growers in terms of seed collection. In spite of the unusual business model, the business has grown steadily since 1997 when the Company was established by two individuals and now has additional employees drawn from the local community. The Company also provides a model of how a commercial operation can apply sustainable principles to reduce its carbon footprint, to treat its staff on an equitable basis, and to influence its customers to adopt sustainable practices.

A cursory view of the Company from a five capitals perspective illustrates how the human, social, manufactured, and financial capitals are all used in the broadly increased natural capital by increasing the diversity of non-hybrid seed varieties, which have been in decline for several decades. The network of customers and the re-skilling of growers in terms of seed saving are the basis for this increase in natural capital. The focus on the ecological footprint of the company to minimize mechanization and to provide employment to members of the local community result from careful decision-making in respect of manufactured capital and the desire to increase local social capital, while maintaining sufficient financial capital to develop the organization.

# **Conclusions**

The above comments represent very small fragments of a complex and evolving picture surrounding aspects of sustainability among farming and rural communities. In the US, the UK and the rest of Europe, farming communities have access to and are managing very different scales of farms and natural resources. They often have very different perceptions of the nature of sustainability in relation to farming and livelihoods. In the US, the scale of farming varies widely from vast cattle ranches to small farms and a slow growing presence of urban farming in its variety of forms. The US perception of the nature of sustainability in farming and livelihoods is more difficult to gauge, although one indicator is increased interest in organic farming over the last two decades. At a policy level, there is recognition that some sectors of the farming community (the young, the organic and those who are very sensitive to sustainable environmental management) have been neglected in the past and there is an attempt to rectify this through more sympathetic support mea- sure and payments. Such measures have been considered essential to counter heavily subsidized export strategies by many countries, including the US, that make it difficult for many smaller farmers in the EU to compete in World markets. There is also evidence that individuals can take action outside of policy frame- works and influence practices at local levels without the support of subsidies or incentives.

Table 1 The USDA Sustainable Agriculture Goals

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| --- |
| ✓ USDA recommends that improving soil quality can achieve greater resilience to drought, and reduced greenhouse gas emissions;✓ USDA also recommends that practicing integrated pest management, crop rotation, and crop diversification will also minimize the use of pesticides and herbicides;✓ USDA promotes development and practice of environmental management systems such as treatment of solid waste, manure, and wastewater, and environmentally sensitive disposal of agricultural chemicals.✓ USDA promotes maintaining habitats to support wildlife and conserve biodiversity as a tested method of sustaining healthier environmentally responsible environments. |

Table 2 Proposed baseline macro-indicators

|  |  |
| --- | --- |
| Indicators | Source of indicator |
| 1. Focuses on agriculture, as a symbiotic socially, economically, environmentally based system | Community Supported Agriculture (CSA) (UK/US) |
| 2. Optimizes health of soils, plants, animals, and people | Organic agriculture |
| 3. Uses ethics, design principles, and locally adopted practices to achieve equal ecological footprint | Permaculture |
| 4. Enhances resilience, ecological, cultural, social/economic sustainability of farm systems. | Agro-ecology |
| 5. Sustains environmental health, economic profitability, and social and economic equity. | National Sustainable Agriculture Coalition |
| 6. Provides suppliers and buyers with prices that reflect the true cost of the entire process of sustaining a regenerative ecological system, including support for the livelihood of primary producers, their families and employees. | Fair trade and supply chain equity (SAFA: Sustainable Assessment of Food and Agriculture, FAO 2013, p. 185.) |

The study and analysis of sustainability remains a difficult and elusive endeavor and the design of ever more complex analytical tools may or may not, help future planning. That said, we offer a default baseline set of indicators of rural livelihood sustainability as illustrated in [Table 2](#_bookmark28) below. To reiterate, Dariush Hayati et al. ([2011](#_bookmark40)) propose that there are generally two sets of sustainability indicators including micro sustainability indicators and macro sustainability indi- cators. Micro indicators are site-specific and targeted at local and regional-scale agriculture (Jackson and Roberts [2000](#_bookmark42)). Macro indicators are intended to be nationally or internationally applicable.

We believe that a framework of indicators for sustainable agriculture can only be relevant and influential when located within a broader set of indicators for well-being, sustainable livelihoods and community resilience. Developing a set of baseline macro-level indicators that see sustainable agriculture, as part of this broader systemic whole is a foundation for developing and customizing micro-level indicators that are adaptable to all micro-level conditions and contexts. [Table 2](#_bookmark28) above illustrates a macro-level set of indicators of sustain- ability in agriculture and livelihoods and well-being. The macro-level set of indicators presented in [Table 2](#_bookmark28) above is not intended to be complete. It is proposed as a flexible and customizable starting point with the intention that the indicators listed herein will be tested, altered, and improved on. Within research, there is an increasing emphasis on inter- and transdisciplinary thinking and practice and the recognition that all actors and stakeholders have important, participatory roles to play in collective learning for more sustainable rural livelihoods and well-being.

# Notes

1. See: [http://www.denmarkfarm.org.uk/about/biodiver](http://www.denmarkfarm.org.uk/about/biodiversity/)[sity/](http://www.denmarkfarm.org.uk/about/biodiversity/)
2. See: <http://www.realseeds.co.uk/about.html>.

# **References**

Bell S, Morse S. [2008](#_bookmark20). Sustainability indicators: measuring the immeasurable. 2nd ed. London (UK): Publ. Earthscan Publishers.

Bossel H. [2001](#_bookmark23). Assessing viability and sustainability: a systems-based approach for deriving comprehensive indicator sets. Conservation Ecol. 5(2):12.

Cain Z, Lovejoy S. [2004](#_bookmark9). History and outlook for farm bill conservation programs. Choices: the magazine of food, farm and resource issues publisher, 4th Quarter 2004.

Agricultural & Applied Economics Association. 555 E. Wells St. (Suite 1100, Milwaukee, WI 53202).

Chamber R, Conway G [1991](#_bookmark24). Sustainable rural livelihoods: practical concepts for the 21st century. IDS Discussion Paper No. 296, Published by University of Sussex. Brighton: UK BN1 9RE

Cook B, Miller R, Seager R [2009](#_bookmark5). Did dust storms make the Dust Bowl drought worse?. Lamont-Doherty Earth Observatory. New York (NY): Published by The Earth Institute at Columbia University.

Dwyer J, Kambites C [2005](#_bookmark7). UK agri-environmental measures evaluation. AGRI/G4/2004. Annexe 19: Etude Nationale Royaume-Uni. Cheltenham (UK): University of Gloucestershire.

European Commission. [2001](#_bookmark20). A framework for indicators for the economic and social dimensions of sustainable agriculture and rural development Published by the European Commission Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00153 Rome Italy. Brussels: Agriculture Directorate-General.

European Commission. [2013](#_bookmark20). Overview of CAP Reform 2014-2020. Agricultural Perspectives Brief No. 5/ December 2013. DG Agriculture and Rural Development, Unit for Agricultural Policy Analysis and Perspectives. Brussels.

Food and Agriculture Organization of the United Nations (FAO). [2013](#_bookmark19). Sustainability assessment of food and agri- culture systems: SAFA guidelines, version 3.0. Food and Agriculture Organisation of the United Nations (FOA). 00153 Rome Italy: Published by the FOA at Viale delle Terme di Caracalla.

Hayati D, Ranjbar Z, Karami E. [2011](#_bookmark17). Measuring sustainable agriculture. Department of Agricultural Extension and Education, College of Agriculture, Shiraz University, Shiraz, Iran. London and New York: Springer Publishers.

Ingram J, Maye D, Kirwan J, Curry N, Kubinakova K. [2015](#_bookmark27). Interactions between niche and regime: an analysis of learning and innovation networks for sustainable agriculture across Europe. J Agric Educ Extension. 21(1):55–71. Wageningen University, The Netherlands.

Jackson T, Roberts P. [2000](#_bookmark18). A review of indicators of sustain- able development: a report for Scottish Enterprize Tayside. In: Munier N, editor. Introduction to sustainability: road to a better future. Published by the Geddye Centre for Planning Research, School of Town And Regional Planning; Dundee: University Of Dundee.

Johnson SP [1993](#_bookmark12). The earth summit: the United Nations Conference on Environment and Development (UNCED). Graham & Trotman/Martinus Nijhoff, London.

National Drought Mitigation Center. [2016](#_bookmark6). Drought in the Dust Bowl. National Drought Mitigation Center. Lincoln Nebraska: University of Nebraska. accessed on March 21st, 2016 at drought.unl.edu.

National Sustainable Agriculture Coalition. [2016](#_bookmark13). What is sustainable Ag? [accessed 2016 May 15]. [sustainableagri](http://sustainableagriculture.net/)[culture.net](http://sustainableagriculture.net/)

Pagella T, Reynolds F, Frogbrook B, Wheater Z, Marshall HM, Jackson BM, Henshaw AJ, Sinclair FL [2013](#_bookmark8). Developing markets for ecosystem services in Welsh and English Catchments. [accessed 2018 January 14]. [www.werh.org/](http://www.werh.org/documents/TimPagellaPontBrenCaseStudy.pdf)[documents/TimPagellaPontBrenCaseStudy.pdf](http://www.werh.org/documents/TimPagellaPontBrenCaseStudy.pdf)

Rao NH, Rogers PP. [2006](#_bookmark21). Assessment of agricultural systems. Curr Sci. 91(4):439–448. ResearchGate GmbH Invalidenstr. 115 10115 Berlin Germany.

Reed M, Fraser EDG, Morse S, Dougill AJ. [2005](#_bookmark25). Integrating methods for developing sustainability indicators to facilitate learning and action. J Ecol Soc. 10(1). [http://](http://www.ecologyandsociety.org/vol10/iss1/resp3/) [www.ecologyandsociety.org/vol10/iss1/resp3/](http://www.ecologyandsociety.org/vol10/iss1/resp3/).

Reeder RJ, Brown D. [2005](#_bookmark10). Recreation, tourism, and rural well-being. Washington (DC): USDA, Economic Research Service. Economic Research Service, 355 E Street SW; p. 20024–23221.

Saltmarsh N, Mildrum J, Longhurst N. 2011. The impacts of community supported agriculture: final report. Soil Association CSA Support Project, Making Local Food Work. Soil Association. South Plaza (Marlborough Street, Bristol UK, BS1 3NX).

SARE. 2016. SARE vision and mission. Sustainable and Agriculture, Research, and Education. 1122 Patapsco Building (University of Maryland, College Park, MD 20742).

Smart S, Zdorovtsov C. 2016. Sustainable Agriculture Research and Education (SARE) & North Central SARE Grants. Accessed in SDSU Extension Contours iGrow. [accessed 2018 January 19]. [igrow.org](http://igrow.org/).

Smith GR, Nandwani D, Kankarla V. [2016](#_bookmark1). Facilitating resilient rural-to-urban sustainable agriculture and rural com- munities. Int J Sustainable Dev World Ecol. ResearchGate GmbH Invalidenstr. Berlin Germany. 115:10115.

Tilman D, Cassman KG, Matson P, Naylor R, Polasky S. [2002](#_bookmark22). Agricultural sustainability and intensive production practices. Science. 418:671–676. Department of Ecology, Evolution and Behavior, University of Minnesota, St Paul, Minnesota 55108, USA.

UN Inter-Agency Task Force on Rural Women. [2012](#_bookmark4). Facts & figures: rural women and the millenium development goals. UN Women Watch: Information and Resources on Gender Equality and Empowerment of Women Fact Sheet. Headquarters at 220 East 42nd Street (New York, NY 10017).

UNCED Agenda 21. [1992](#_bookmark14). Sustainable Agriculture Education Association. [accessed 2015 April 16] [http://sustainable](http://sustainableaged.orgon/)aged.org

United Nations Environmental Programme. [1992](#_bookmark15). Convention on biological diversity. Published by the United Nations. Rio de Janeiro. 1992 Jun 5.

US Government Publishing Office. [2006](#_bookmark16). 7 U.S.C. 3103 definitions. Washington, DC: United States Government publishers.

USDA. [2015](#_bookmark2). Poverty rates by metro/non-metro status, 2010-14. USDA Economic Research Service using data from US Census Bureau, American Community Survey, County 5-year Estimates 2010-14. Published by Economic Research Service 355 E Street SW (Washington, DC), p. 20024–23221.

Van Cauwenbergh. [2007](#_bookmark11). Framework for assessing the sustainability of agricultural systems: the SAFE concept. Louvain la Neuve: Unité de Génie rural, UCL.