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Chapter 1 : Sustainable Agriculture | Agriculture and Food Security | U.S. Agency for International Develop

Developing and Extending Sustainable Agriculture: A New Social Contract explores the challenges faced by today's farmers and ranchers to provide practical strategies to develop a twenty-first century system of sustainable agriculture that is economically sound, environmentally compatible, and socially acceptable.

The State of Food Insecurity in the World As the world population continues to grow, much more effort and innovation will be urgently needed in order to sustainably increase agricultural production, improve the global supply chain, decrease food losses and waste, and ensure that all who are suffering from hunger and malnutrition have access to nutritious food. Many in the international community believe that it is possible to eradicate hunger within the next generation, and are working together to achieve this goal. The Zero Hunger Challenge has since garnered widespread support from many member States and other entities. Beyond adequate calories intake, proper nutrition has other dimensions that deserve attention, including micronutrient availability and healthy diets. Inadequate micronutrient intake of mothers and infants can have long-term developmental impacts. Unhealthy diets and lifestyles are closely linked to the growing incidence of non-communicable diseases in both developed and developing countries. The Scaling-Up Nutrition SUN Movement has made great progress since its creation five years ago in incorporating strategies that link nutrition to agriculture, clean water, sanitation, education, employment, social protection, health care and support for resilience. Extreme poverty and hunger are predominantly rural, with smallholder farmers and their families making up a very significant proportion of the poor and hungry. Thus, eradicating poverty and hunger are integrally linked to boosting food production, agricultural productivity and rural incomes. Agriculture systems worldwide must become more productive and less wasteful. Sustainable agricultural practices and food systems, including both production and consumption, must be pursued from a holistic and integrated perspective. Land, healthy soils, water and plant genetic resources are key inputs into food production, and their growing scarcity in many parts of the world makes it imperative to use and manage them sustainably. Boosting yields on existing agricultural lands, including restoration of degraded lands, through sustainable agricultural practices would also relieve pressure to clear forests for agricultural production. Wise management of scarce water through improved irrigation and storage technologies, combined with development of new drought-resistant crop varieties, can contribute to sustaining drylands productivity. Halting and reversing land degradation will also be critical to meeting future food needs. Given the current extent of land degradation globally, the potential benefits from land restoration for food security and for mitigating climate change are enormous. However, there is also recognition that scientific understanding of the drivers of desertification, land degradation and drought is still evolving. There are many elements of traditional farmer knowledge that, enriched by the latest scientific knowledge, can support productive food systems through sound and sustainable soil, land, water, nutrient and pest management, and the more extensive use of organic fertilizers. An increase in integrated decision-making processes at national and regional levels are needed to achieve synergies and adequately address trade-offs among agriculture, water, energy, land and climate change. Given expected changes in temperatures, precipitation and pests associated with climate change, the global community is called upon to increase investment in research, development and demonstration of technologies to improve the sustainability of food systems everywhere. Building resilience of local food systems will be critical to averting large-scale future shortages and to ensuring food security and good nutrition for all.

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Chapter 2 : Developing and Extending Sustainable Agriculture : Raymond P. Poincelot :

Both Developing and Extending Sustainable Agriculture and Agroecology in Action promote sustainable farming systems and practices that are based on ecological principles. Read together, they provide a comprehensive picture of the current state of sustainable agriculture in the United States and highlight the broad-based social partnerships that.

Increased Production Costs A growing movement has emerged during the past two decades to question the role of the agricultural establishment in promoting practices that contribute to these social problems. Today this movement for sustainable agriculture is garnering increasing support and acceptance within mainstream agriculture. Not only does sustainable agriculture address many environmental and social concerns, but it offers innovative and economically viable opportunities for growers, laborers, consumers, policymakers and many others in the entire food system. This page is an effort to identify the ideas, practices and policies that constitute our concept of sustainable agriculture. We do so for two reasons: Because the concept of sustainable agriculture is still evolving, we intend this page not as a definitive or final statement, but as an invitation to continue the dialogue. What is Sustainable Agriculture? A variety of philosophies, policies and practices have contributed to these goals. People in many different capacities, from farmers to consumers, have shared this vision and contributed to it. Despite the diversity of people and perspectives, the following themes commonly weave through definitions of sustainable agriculture: 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 of human resources includes consideration of social responsibilities such as working and living conditions of laborers, the needs of rural communities, and consumer health and safety both in the present and the future. Stewardship of land and natural resources involves maintaining or enhancing this vital resource base for the long term. A systems perspective is essential to understanding sustainability. The system is envisioned in its broadest sense, from the individual farm, to the local ecosystem, and to communities affected by this farming system both locally and globally. An emphasis on the system allows a larger and more thorough view of the consequences of farming practices on both human communities and the environment. A systems approach gives us the tools to explore the interconnections between farming and other aspects of our environment. Everyone plays a role in creating a sustainable food system. A systems approach also implies interdisciplinary efforts in research and education. This requires not only the input of researchers from various disciplines, but also farmers, farmworkers, consumers, policymakers and others. Making the transition to sustainable agriculture is a process. For farmers, the transition to sustainable agriculture normally requires a series of small , realistic steps. Family economics and personal goals influence how fast or how far participants can go in the transition. It is important to realize that each small decision can make a difference and contribute to advancing the entire system further on the "sustainable agriculture continuum. Finally, it is important to point out that reaching toward the goal of sustainable agriculture is the responsibility of all participants in the system, including farmers, laborers, policymakers, researchers, retailers, and consumers. Each group has its own part to play, its own unique contribution to make to strengthen the sustainable agriculture community. The remainder of this page considers specific strategies for realizing these broad themes or goals. The strategies are grouped according to three separate though related areas of concern: They represent a range of potential ideas for individuals committed to interpreting the vision of sustainable agriculture within their own circumstances. Farming and Natural Resources Back to top. When the production of food and fiber degrades the natural resource base, the ability of future generations to produce and flourish decreases. The decline of ancient civilizations in Mesopotamia, the Mediterranean region, Pre-Columbian southwest U. Water Water is the principal resource that has helped agriculture and society to prosper, and it has been a major limiting factor when mismanaged. Water supply and use. In California, an extensive water storage and transfer system has been established which has allowed crop production to expand to very arid regions. In drought years, limited

surface water supplies have prompted overdraft of groundwater and consequent intrusion of salt water, or permanent collapse of aquifers. Periodic droughts, some lasting up to 50 years, have occurred in California. Several steps should be taken to develop drought-resistant farming systems even in "normal" years, including both policy and management actions: The most important issues related to water quality involve salinization and contamination of ground and surface waters by pesticides, nitrates and selenium. Tile drainage can remove the water and salts, but the disposal of the salts and other contaminants may negatively affect the environment depending upon where they are deposited. Temporary solutions include the use of salt-tolerant crops , low-volume irrigation, and various management techniques to minimize the effects of salts on crops. In the long-term, some farmland may need to be removed from production or converted to other uses. Other uses include conversion of row crop land to production of drought-tolerant forages, the restoration of wildlife habitat or the use of agroforestry to minimize the impacts of salinity and high water tables. Another way in which agriculture affects water resources is through the destruction of riparian habitats within watersheds. The conversion of wild habitat to agricultural land reduces fish and wildlife through erosion and sedimentation, the effects of pesticides, removal of riparian plants, and the diversion of water. The plant diversity in and around both riparian and agricultural areas should be maintained in order to support a diversity of wildlife. This diversity will enhance natural ecosystems and could aid in agricultural pest management. Energy Modern agriculture is heavily dependent on non-renewable energy sources, especially petroleum. The continued use of these energy sources cannot be sustained indefinitely, yet to abruptly abandon our reliance on them would be economically catastrophic. However, a sudden cutoff in energy supply would be equally disruptive. In sustainable agricultural systems, there is reduced reliance on non-renewable energy sources and a substitution of renewable sources or labor to the extent that is economically feasible. Air Many agricultural activities affect air quality. These include smoke from agricultural burning; dust from tillage, traffic and harvest; pesticide drift from spraying; and nitrous oxide emissions from the use of nitrogen fertilizer. Options to improve air quality include: Soil Soil erosion continues to be a serious threat to our continued ability to produce adequate food. Numerous practices have been developed to keep soil in place, which include: Enhancement of soil quality is discussed in the next section. Sustainable production practices involve a variety of approaches. Despite the site-specific and individual nature of sustainable agriculture, several general principles can be applied to help growers select appropriate management practices: Selection of site, species and variety Preventive strategies, adopted early, can reduce inputs and help establish a sustainable production system. When possible, pest-resistant crops should be selected which are tolerant of existing soil or site conditions. When site selection is an option, factors such as soil type and depth, previous crop history, and location e. Diversity Diversified farms are usually more economically and ecologically resilient. By growing a variety of crops, farmers spread economic risk and are less susceptible to the radical price fluctuations associated with changes in supply and demand. Properly managed, diversity can also buffer a farm in a biological sense. For example, in annual cropping systems, crop rotation can be used to suppress weeds, pathogens and insect pests. Also, cover crops can have stabilizing effects on the agroecosystem by holding soil and nutrients in place, conserving soil moisture with mowed or standing dead mulches, and by increasing the water infiltration rate and soil water holding capacity. Cover crops in orchards and vineyards can buffer the system against pest infestations by increasing beneficial arthropod populations and can therefore reduce the need for chemical inputs. Using a variety of cover crops is also important in order to protect against the failure of a particular species to grow and to attract and sustain a wide range of beneficial arthropods. Optimum diversity may be obtained by integrating both crops and livestock in the same farming operation. This was the common practice for centuries until the mids when technology, government policy and economics compelled farms to become more specialized. Mixed crop and livestock operations have several advantages. First, growing row crops only on more level land and pasture or forages on steeper slopes will reduce soil erosion. Second, pasture and forage crops in rotation enhance soil quality and reduce erosion; livestock manure, in turn, contributes to soil fertility. Third, livestock can buffer the negative impacts of low rainfall periods by consuming crop residue

that in "plant only" systems would have been considered crop failures. Finally, feeding and marketing are flexible in animal production systems. This can help cushion farmers against trade and price fluctuations and, in conjunction with cropping operations, make more efficient use of farm labor. Soil management A common philosophy among sustainable agriculture practitioners is that a "healthy" soil is a key component of sustainability; that is, a healthy soil will produce healthy crop plants that have optimum vigor and are less susceptible to pests. While many crops have key pests that attack even the healthiest of plants, proper soil, water and nutrient management can help prevent some pest problems brought on by crop stress or nutrient imbalance. In sustainable systems, the soil is viewed as a fragile and living medium that must be protected and nurtured to ensure its long-term productivity and stability. Methods to protect and enhance the productivity of the soil include: Regular additions of organic matter or the use of cover crops can increase soil aggregate stability, soil tilth, and diversity of soil microbial life. Efficient use of inputs Many inputs and practices used by conventional farmers are also used in sustainable agriculture. Sustainable farmers, however, maximize reliance on natural, renewable, and on-farm inputs. Equally important are the environmental, social, and economic impacts of a particular strategy. Converting to sustainable practices does not mean simple input substitution. Frequently, it substitutes enhanced management and scientific knowledge for conventional inputs, especially chemical inputs that harm the environment on farms and in rural communities. The goal is to develop efficient, biological systems which do not need high levels of material inputs. Growers frequently ask if synthetic chemicals are appropriate in a sustainable farming system. Sustainable approaches are those that are the least toxic and least energy intensive, and yet maintain productivity and profitability. Preventive strategies and other alternatives should be employed before using chemical inputs from any source. However, there may be situations where the use of synthetic chemicals would be more "sustainable" than a strictly nonchemical approach or an approach using toxic "organic" chemicals. For example, one grape grower switched from tillage to a few applications of a broad spectrum contact herbicide in the vine row. This approach may use less energy and may compact the soil less than numerous passes with a cultivator or mower. Consideration of farmer goals and lifestyle choices Management decisions should reflect not only environmental and broad social considerations, but also individual goals and lifestyle choices. Management decisions that promote sustainability, nourish the environment, the community and the individual. Animal Production Practices Back to top. In the early part of this century, most farms integrated both crop and livestock operations.

Chapter 3 : What is sustainable agriculture? â€” UC SAREP

Explores the challenges faced by farmers and ranchers to develop a system of sustainable agriculture that is economically sound, environmentally compatible, and socially acceptable.

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