

SUSTAINABLE AGRICULTURE AND FUTURE CHALLENGES FOR AGRICULTURAL RESEARCH AND EXTENSION SERVICES

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Abstract

Development policies in agriculture have been very effective in addressing the problems of agricultural productivity. However, this process caused a global growth in consumption of pesticides, inorganic fertilization components, animal feed-stuffs and heavy machinery. The transfer of technology, usually produced in developed countries, caused a depletion of natural resources and produced social and economic problems that, by neglecting the local knowledge and tradition together with applying not adaptive breeds and varieties, in fact, increased the problem of food insecurity worldwide. Nowadays, many evidences show that resource-conserving technologies and practices, incorporated into the framework of sustainable agriculture, can provide many benefits for farmers, even improved yields and productivity, with introducing only few, or no external inputs.

There is a need for clear national strategy for agriculture and rural development with clearly defined points of sustainable agriculture. The role of research and extension services in implementation of such a strategy is irreplaceable. The present system of extension services has to be reformed in order to achieve the goals of sustainable agricultural development.

Key words: sustainable agriculture and rural development, research and extension

Introduction

Adoption of sustainable agriculture will inevitably involve losing money. This sentence illustrates one of the myths about sustainable agriculture, promoted

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by people who stubbornly stand at the position of supporting conventional agricultural production. Money! Profit! Is this the main life motive? A man, professor, who spent all of his life investigating the honey-bees colonies once, said something that completely corresponds to the main driving force of sustainable agriculture. He said: The main thing forcing people to work hard and that organizes the life is the “fear”. Fear for those and that they care for. So, concern for the future is the main postulate of sustainable agriculture movements which was set out in Chapter 14 of Agenda 21. Meeting the needs of the present without compromising the ability of future generations to meet their own needs is the key principle behind the concept of sustainability.

Actually, the fear for feeding the hunger after the World War II, was the initial factor of launching a transformation process of agriculture, known as a Green Revolution, that increased the agricultural productivity, but at the same time, has had major social and ecological impacts and side effect that, in turn, installed the base for the new approach to agricultural production. Sustainable agriculture tends to address these side effects, so that there are three pillars of sustainability as a commitment to future generations that they will be able to live in economically prosperous, socially just, and environmentally healthy communities.

We should ask ourselves why practices consistent with sustainable agriculture are not adopted more widely. It is obvious that many production questions about sustainable agriculture are unanswered, partly because of continuing low levels of research funding available for directly addressing sustainable agriculture issues. Additionally, higher education institutions do not pay adequate attention to that issue and the conventional agriculture still persists as the focal point of their work. And finally, transfer of knowledge from educational and research subjects to the farmers stayed challenging even regarding the regular activities already incorporated into agenda of research and extension services. There is a lack of strategic planning that indicates future directions. These institutions remains oriented towards the large scale production systems, while small farmers stay away of adequate institutional support. Farmers and households are in the center of sustainable agriculture philosophy, so it is necessary to adopt new principles and to reform research and extension system in order to support agricultural development in as much as possible sustainable way.

Sustainable agriculture principles

The concept of sustainable agriculture represents a response to the decline in the quality of the natural resource base as a result of introducing modern, intensive agriculture (McIsaac and Edwards 1994). The multifunctional nature of agricultural production and repercussions of intensive agricultural production redefined the

concept which has evolved from a technical one to a more complex one characterized by social, cultural, political and economic dimensions. Agriculture jointly produces much more than just food, fiber or oil, having a profound impact on many elements of local, national and global economies and ecosystems (FAO, 1999). The mentioned impacts can be negative or positive and the green revolution agriculture, so far, exerted to many negative ones. The negative environmental and human health effects of conventional agriculture are dominating in scientific literature (Pretty, 1995, 2005; Altieri, 1995; EEA, 1998), and include:

- Water contamination by pesticides and fertilizer
- Contamination of food and fodder by residues of pesticides, nitrates and antibiotics; ecosystems disruption and harm to wildlife;
- The atmosphere contamination by ammonia, nitrous oxide, methane and the products of burning, which contributes in ozone depletion, global warming and atmospheric pollution;
- Overuse of natural resources, causing depletion of ground water and loss of wild foods and habitats, and of their capacity to absorb wastes, causing water logging and increased salinity;
- The tendency in agriculture to standardize and specialize by focusing on modern varieties, causing the displacement of traditional varieties and breeds.

In addition, there are many negative social impacts associated with modern agriculture. European countries suffer from land abandonment as a result of farms enlargement and consequently farms number decreasing which also brought a dramatic decline in the numbers of people working in agriculture. During the 1980s it was recorded a 10% fall in total agricultural labor force across the EU that means 1.93 million jobs (Bollman and Bryden, 1997; Eurostat, 1997). Large-scale farming causes smaller number of farms, jobs and also contributes to the rise of rural poverty and economic disadvantage (Pretty, 1998; MAFF, 1999).

It is obvious that natural processes and resources have been replaced by external inputs. Inorganic fertilizers have replaced livestock manures, composts, and nitrogen-fixing crops; pesticides have replaced biological, cultural, and mechanical methods for controlling pests, weeds, and diseases; information for management decisions comes from input suppliers, researchers, and extension agents rather than from local sources; and fossil fuels have substituted for locally generated energy sources. Thus the basic goals of sustainable agriculture are to make better use of internal resources, both by minimizing the external inputs used, and by regenerative technologies introduction (FAO, 1998).

The current excessive use of nonrenewable resources will not be possible for future generations. Sustainable agriculture means greater reliance on renewable methods and enhancing the resource base for future generations by exploiting useful biological cycles, thereby saving money spent on externally purchased inputs. Sustainable agriculture is able to survive in the current economic ambience by working with nature's biological cycles (through diversification); reducing expenditure for purchased inputs, relying on income generated through human creativity, labor, and constant sources of energy, especially the sun (Savory, 1988). Even in highly industrialized agriculture countries, farmers adopting regenerative technologies have maintained yields at the same time as substantially reduced use of external inputs (Kamp, 1993; UNEP, 2005, Pretty et al, 2006). The evidences of profitability maintained even though input use has been cut dramatically, are coming also from Europe (Vereijken et al, 1994; Van Weeperen, 1995; FAO, 2003, Damljanovic, 2006).

We can say now that advocates of conventional agriculture have no real arguments. In sustainable agriculture money stays at the farm, while in conventional farming it goes to the multinational companies, who exploit the created "vicious circle" in which resistance of different species created by their products, constantly requires new and expensive treatments, giving them opportunity to expand new technology packs which will require new ones, and so in a circle. So who wins? For sure losers are farmers and the nature. Expensive deteriorating inputs in conventional system should be replaced by internal resources in which we can also assort the ingenuity and innovative spirit of farmers. Self reliant farmers able to adapt to the changing reality are the key factor for sustainable development. However, success of sustainable agriculture depends not just on the motivations, skills, and knowledge of individual farmers, but also on action taken by groups or communities as a whole. This implies the need for greater empowerment of farmers and their families and emanates the need for their involvement in decision making processes and adequate transfer of knowledge (Milosevic, 2006). In this process the role of agricultural research and extension services is essential.

Research and extension services - key elements for sustainable agriculture

Agriculture can only be persistent and sustainable when resource conserving technologies are developed and used by local institutions and groups, who are supported by external research, extension and development institutions acting in an enabling way. For sustainable agriculture to spread, the wider policy environment must too be enabling (Pretty, 1995). This sentence clearly identifies the importance of enabling external institutions, at first, research and extension services, in supporting local institutions toward achieving sustainable agricultural

development. The agricultural research and extension system is one of the primary tools for spreading the knowledge and technologies and therefore has a very important role in the development process (World Bank, 2005). The framework of Community Strategic Guidelines and Rural Development Axis, associated with jobs creation, economic growth and environmental sustainability, requires from the EU member states to have a clear national strategy for agriculture and rural development with clearly defined points of sustainable agriculture. However, clear agriculture and rural development strategies with measurable and benchmarked performance indicators and specific targets generally do not exist or have been inadequately formulated (Lamberti et al, 2006). The system of research, education and extension still performs its previously defined role to support the needs of large scale technology, intensive ex-state or commercial farms. Most small farmers are used to obtaining information and guidance from informal and predominately local sources and seldom view the existing extension service as a supportive institution for development (FAO, 2007).

Table 1 Key features of research and extension transformation

Feature	Conventional agriculture	Sustainable agriculture
Driving motive	Efficiency: maximize productivity and profit/return to limited resources; competitiveness	Productivity, achieving food and nutritional security, poverty alleviation, ecological sustainability and equity
Assumed causes of problems	Lack of knowledge Farmers are irrational	Political-economic roots of problems, neglect of ecology and farmers' needs (and knowledge)
Postulates and key features	Crop/commodity specific monoculture, uniformity/homogeneity, reductionism, simplification of system	Agro-ecosystems, polycultures, multiple and high value crops and resources in system, diversity, holistic approach
Institutional relations and actors	Top-down (linear) technology development and transfer model Research to extension (or private sector) to farmers	Collaboration and networks, horizontal relations (farmer to farmer); innovation systems, pluralism (research, extension, NGOs, education, civil societies, private sectors)
Main beneficiaries	Private sector, formal institutions	Public interests, communities and farmers (especially poor), women and children, vulnerable groups

Focus of innovation	Single technologies (seeds, agro chemical, bio-technology) Production technologies	Agro ecological principles, institutional innovations, empowerment and capacity building, relationship among partners and actors
Main types of research	Unidisciplinary, reductionist, scientists or private sector generate knowledge, mainly done in laboratories and research stations	Both production and R&D technologies; Multidisciplinary, farmers are researchers and innovators, on-farm, participatory, in communities
Common view of farmers	Passive audience/partners, irrational seen as conservative and ignorant	Active, rational, key partners in the innovation process with valuable knowledge; Farmers are active in adopting new research findings
Skills required	Specialization in technology, biological/agronomic sciences, business/finances, bio technology	Biological systems management, social and institutional relations, people/partnering skills, facilitating skills.
Policy arena	Political agencies form rules, close connection with private sectors	Community actively involved in setting agenda and decisions environmental/social/ interests

Extension workers are selecting key farmer “leaders” supposing that technologies and approaches will be disseminated to other farmers. However, they tend to select “suitable farmers” so it is not possible to achieve “farmer to farmer” extension of obtained experiences. Finally, maybe the main constraint factor for effective research and extension services represents a lack of accountability. There is no feedback on effectiveness of extension program with no developed system for measuring and monitoring the impact. This problem still persists not only in this part of the world (Richardson, 1999).

Evolution of development philosophy, experiences in agricultural extension and development have indicated that traditional top-down approaches will need to transform in order to move toward sustainability. It is necessary to change attitude towards farmers who were treated as a simple, stubborn, receiver of what others regard valuable. Yet, examples of innovative and research oriented farmers are coming from Serbia where an extensionist published a brochure about the innovation and all the measures that follow the removal of the young sprouts in order to obtain high yield and good quality raspberry, that originally was developed

by a farmer (Treskic, 2006). Such example of extensionist approach recognizing the farmers as an intelligent partner in the development process should be the basis for future reform of agricultural extension.

Consequently, one of the new challenges for extension services is to become learning organization (Leeuwis, 2004), with ability to continually expand capacity to create their future and future of entire society. Public agricultural extension organizations in the Western Balkans countries are disrepute due to poor progress in achieving policy aims such as export, food security, sustainability and social well-being. Now, Extension systems should be much broader and more diverse, including public and private sector and civil society institutions that provide a broad range of services such as advisory, technology transfer, training, promotional and information on a wide variety of subjects (such as agriculture, marketing, social organization, health and education (World Bank, 2005). So it means that pluralism, as a key element of new paradigm, provides framework for multiplication of actors providing services, either autonomously in response to farmer demand or facilitated by government policy measures (Ponniah et al, 2008). Decentralization is one of the most important aspects in agricultural extension restructuring toward green agriculture. Decentralization could be defined as the reassign of planning, decision making and management functions from the central government to field organizations, secondary units of government, semi-autonomous public corporations, regional development organizations, specialized functional authorities or non-governmental organizations (Rivera, 1997). So, the goal of decentralization would be better tuning of public services to the needs and demands of local people. Ability of local institutions and organizations to actively participate in agricultural development based on SARD principles has been proven in Serbia. Emerged associations of agricultural producers in the area of Sandzak, established very good connection with the local government in defining their own future. They know what their needs are. They are ordering and financing the specific advisory services from those who are the best. This area is very specific with specific demands so that official extension system is not able to answer in a proper manner (Milosevic, 2006). Consequently research and extension institutions need a strategy that will incorporate regional production, cultural and social specificities. Research information and results need to be better summarized, presented and exchanged nationally and regional research programmes identified and developed in areas such as for, pests and disease (IPM), forecasting and water management. Farmer innovations need to be identified, documented and disseminated regionally. It is necessary to provide environment for extension stakeholder multiplication with a stable accreditation system and network of information, together with farmers' active participation in decision making. In such a sector competition of extension providers could be established, which means that farmers can eliminate those who do not respond to their demands (Volker et al,

2000). Finally in discussing about the financing of these institutions there are many who say that farmers and processors should pay for delivering of advisory services. But government should stay primary source of funds for promoting the sustainable agricultural practices. There are evidences that adoption of these principles in agricultural production minimizes the negative externalities of agricultural production that could be expressed, let's say, in expenses for provision of health services (Pretty, 2001). Besides that, there are also irreplaceable positive externalities of sustainable agricultural practices, such as landscape and aesthetic value; water supply; nutrient fixation; soil formation; biodiversity; flood control; and carbon sequestration (OECD, 1997), great arguments for governmental support.

Conclusions

Sustainable agriculture offers progress toward forgotten, green agriculture. It seeks technologies that are environmentally friendly, economically viable and socially just. In promoting and disseminating the idea of agricultural production sustainability, research and extension services role is crucial. However, these institutions need a reform that should include decentralization and shift to farmer centered approach. An interdisciplinary, holistic approach is needed in order to address the problems derived from intensive, conventional production. That means development of innovative training delivery methodologies tackling ecology, natural pest management, minimum tillage, team working principles etc. Research and extension will need to build on communication systems and involve farmers in the process of extension making the process really participatory and demand driven.

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