Brief on Sustainable Agriculture

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Outline

- Why Sustainable Agriculture
- Definition and principles
- Sustainable Agriculture & food security
- Adoption levels
- Main constraints to adoption
- Policy recommendations and next steps

Why Sustainable Agriculture

Pros and cons of the Green Revolution?

Pros

- has led to increased food supply especially in the developed world
- dramatic production increases, in Asia and Latin America, in the 1960s
- mechanization produces high labor efficiency
- availability of agricultural inputs (though expensive for farmers in developing countries) for quick fixes to production problems

Why Sustainable Agriculture

Cons

- poverty and hunger persist (848 million people with chronic hunger (2003-2005), 98% in developing countries)
- land degradation and agriculture-driven environmental damage prevail
- food safety concerns (outbreaks of food poisoning, antibiotic resistance, toxins and pesticides)
- farm accidents, chronic diseases linked to agricultural chemicals
- water pollution, air pollution, habitat loss, water depletion
- reliance on fossil fuels, global warming

Why Sustainable Agriculture

- Challenge: people most affected by increasing hunger are smallholder subsistence farmers on marginal soils in developing countries, lack access to inputs and product markets, as well as financial resources to buy costly chemical fertilizer and other agrochemicals that might enhance the productivity of their land

So although conventional agriculture has had significant achievements

- …many problems still persist, creating a need to look into alternative approaches

- Sustainable agriculture is one such alternative that attempts to solve these problems – without creating new ones!!!

Definition

- SA is a system of agriculture that involves

  ….a combination of inter-related soil, crop and livestock production practices

  …discontinuation or reduced use of external inputs that are potentially harmful to the environment and/or the health of farmers and consumers

  …emphasizing instead the use of techniques that integrate and are adapted to local natural processes

Principles of SA

- **Economic sustainability**

  through e.g. improving soil management and crop rotation which raise yields, reducing reliance on machinery, chemical fertilizer and pesticides

- **Environmental sustainability**

  through e.g. protecting, recycling, replacing and maintaining the natural resources base such as land (soil), water and wildlife

  Avoiding synthetic chemicals known to harm the environment, soil structure and biodiversity

- **Social sustainability**

  through e.g. more extensive use of available labor, at least for some techniques, thus contributing to social justice and cultural cohesion

Sustainable Agriculture & food security

Evidence from global modelling

(Badgley *et al.*, 2007): used a global dataset of 293 examples to estimate the average yield ratio (organic : non-organic) of different food categories for the developed and developing world)

- For most of the food categories, the average yield ratio was slightly less than 1.0 for studies in the developed world, but more than 1.0 for studies in developing countries
- System of Rice Intensification (SRI): SA methods led to higher yields than conventional methods for the same crop in the same settings in 10 developing countries
- SA could produce enough food on a global per capita basis to sustain the current human population, and potentially an even larger population, without putting more farmland into production
- Leguminous cover crops could fix enough nitrogen to replace the amount of synthetic fertilizer currently in use

Sustainable Agriculture & food security

Evidence from reviews of SA projects

(Pretty et al. 2003, 2006): a review of 286 sustainable agricultural projects carried out between 1999 and 2000 across eight categories of farming systems in 57 developing countries in Africa, Asia, and Latin America

- farmers increased yields by an average of 79% by adopting SA practices
- Average food production per household rose by 1.7 tons per year (up by 73%) for 4.42 million small farmers growing cereals and roots on 3.6m ha
- Impacts of organic and near-organic projects on agriculture in Africa:
  - the average crop yield increase was 116% overall, and
  - 128% increase for the projects in East Africa

3 technical improvements played substantial roles in yield increases:

1) more efficient water use in both dryland and irrigated farming;

2) improvements in organic matter in soils and carbon sequestration;

3) pest, weed, and disease control emphasizing farm-biodiversity and reduced pesticides

Adoption levels

- (Pretty et al., 2006: surveys between 1999 and 2000): about 12.6 million farmers had adopted sustainable agricultural practices on 37 million ha

  ….equivalent to 3% of the 960 million hectares of arable and permanent crops in Africa, Asia and Latin America

- **Brazil:** the minimum tillage system has spread from less than 1,000 hectares in 1973/74 to 22 million hectares by 2003/04
- **Argentina:** there are more than 11 million hectares under zero-tillage, from less than 100,000 hectares in 1990
- **Zambia:** 10% adoption rates of conservation tillage among smallholder farmers in Zambia
- **Cambodia:** the number of System of Rice Intensification (SRI) users grew from 28 farmers in 2000 to 104,750 in 2008

- … adoption expected to increase over time as benefits are better understood and articulated, global support for environmentally friendly agricultural practices has been growing, and fossil fuel input price rises

Main constraints to adoption

- **Heterogeneity in agro-climatic environments**
  No single approach can be applied uniformly
  …heterogeneity of environment (agro-ecology, local and regional biophysical factors, and farmer characteristics) conditions the need to adapt and the type of sustainable agriculture practice adopted

- **Biomass availability**
  Amount and availability of biomass (e.g., crop residues, animal dung) crucial for most SA practices e.g. moisture conservation, soil fertility enhancement
  Competing uses for biomass e.g. as cooking fuels or as fodder for cattle
  Biomass constrained by limitedness of resource endowments

- **Economic incentives**
  Economic incentives (e.g. prices) determine the profitability of SA
  Final demand as a driver of adoption
  Integration of farmers into input and output markets

- **Access to information**
  Availability of information on net benefits of adoption, technical details on implementation of SA practices

Main constraints to adoption

- **Land issues**
  Tenure insecurity impact on investment in SA is country- and site-specific
  Fragmentation of land: farmers have to transport inputs to several isolated plots; decreasing plots size might make certain SA practices impractical

- **Institutions**
  Both formal and informal: Applied research, extension services, NGOs, rural institutions, social capital facilitate the promotion and adoption of SA

- **Extension services**
  Extension service delivery systems often under-funded
  …no updating of extension workers skills to boost technical competence

- **Political constraints**
  Policy environment not conducive to widespread adoption of SA, both at the national and international level:
  …lack of awareness by policy-makers on the net benefits of SA practices
  …possible resistance from agrochemical industries and other traditional actors in intensive agricultural supply

Policy recommendations

- Policy changes to put sustainable agriculture on par with conventional

- Desist from blanket recommendations and promotion of agricultural practices

  …understand how different factors condition performance of practices

- Stable and remunerative market prices for products produced using SA

  to enhance the economic viability of adopting SA and provide safety nets for resource-poor farmers

- Recognize the role of institutions (both formal and informal)

  Encourage farmer-to-farmer extension through proper training of selected farmers

Policy recommendations

- Improve access to as well as the quality of information

  education and training programs on SA for farmers and extension workers

  Develop a system of training and organizational development that constantly upgrades the capacity of extension workers to boost their technical competence

- Ease biomass constraints

  e.g. provide modern cooking fuel to rural households, encourage incorporating forage legumes in the cropping systems, etc

- Develop policies that address market imperfections

  e.g. by supporting social capital-based connections and rural institutions; improve security of land tenure

Next steps

More research and understanding needed on:

- what institutions create closer links between applied research and farmers?
- what SA practices are available?
- which SA practices perform best under what environments?
- do practices require major initial resource endowments e.g. are there minimum farm or plot sizes for some practices?
- what kind and how much capacity will scale up SA?
- what data and analytical tools are needed to improve understanding?
- further demystify myths about SA: does it mean going back to what our grandparents did and rejecting appropriate technologies, is it a fancy catch phrase for rich countries, etc

- ….continue to prove that SA can feed the world sustainably and spread the word…target policy-makers!!!

Keeping in mind that: *Sustainable agriculture "…is a journey, not a destination "*