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Short Communication

Fate of organic farming in contrast to conventional farming systems - A thrust to organic food

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Abstract: India had been basically a country of organic farming and after thousands years of organic farming the annual food grain production in 1951 was only about 50 million tones. The country witnessed a severe famine in 1942-43 popularly known as Bengal famine, which whirl about 4-5 million lives. This force the government to launch “Grow more food campaign” with fertilizer as a key input. The coordinated effort of all concerned resulted in 200+ million tones of food grains through increased use of fertilizer coupled with use of high yielding varieties and better water management While it is difficult to make quantitative estimates, the productivity of organic cropping systems is considerably lower than that of conventional or integrated cropping systems. This reduced productivity could potentially lead to less land available for non-agricultural land uses such as wildlife habitat, greater negative impacts on environment and reduced sustainability. To ensure that the practice of organic farming aligns with its perception by the public, its conceptual definition must avoid misleading connotations regarding its ability to produce healthy and safe food in an environmentally sustainable manner.

Keywords: Organic farming, conventional farming, food.

نصيب الزراعة العضوية مقارنة بنظام الزراعة التقليدية لتعزيز الزراعة العضوية

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الملخص: لقد كانت الهند دولة تستخدم الزراعة العضوية. وبعد آلاف السنين من استخدام هذه الطريقة وصل إنتاج المحاصيل الحقلية حوالي 50 مليون طن سنة 1951. ولقد عانت الدولة من مجاعة شديدة حوالي سنة 1942-1943 سميت بمجاعة البنغال والتي أودت بحياة حوالي 4-5 مليون نسمة. وأدى ذلك إلى تدخل الحكومة في حملة "ازرع غذاء أكثر" باستخدام الأسمدة كمدخل. وأدت الجهود المشتركة إلى إنتاج أكثر من 200 طن من المحاصيل الحقلية من خلال استعمال المخصبات معززا باستخدام أصناف ذات إنتاجية عالية وكذالك باستخدام المياه بشكل أفضل. وحيث انه لا يمكن تقدير الكميات فأن إنتاج الغذاء بطريقة الزراعة العضوية اقل من الزراعة التقليدية. وأدى هذا النظام التقليدي إلى توفير أراضي اقل للزراعة وخاصة للإنتاج الحيواني فضلا عن التأثير المعاكس على البيئة وعلى الاستدامة. ولتأكيد أن الزراعة العضوية تتناسب مع المفاهيم المجتمعية لابد من إزالة اللبس حول قدرتها في إنتاج غذاء صحي وامن في بيئة تتسم بالاستدامة.

الكلمات المفتاحية: الزراعة العضوية، الزراعة التقليدية، الغذاء.

Compairing productivity

Comparing organic and conventional cropping systems for productivity is difficult. Since crop production depends on many sources of input of a diverse nature, the definition of productivity depends on particular input efficiency under consideration and on the interactions among inputs. For high productivity, higher yield has become imperative if ever growing population of India is to be fed properly. Therefore, if inorganic fertilizer use has to be reduced so must be the population. Fortunately in agriculture short as well as long term yield per unit area of land is most critical component of sustainable productivity.

Yield per unit area of land is important not only economically, but also environmental, ecological and social regions. For agriculture to be both sustainable and compatible with biodiversity in non-agricultural areas, most stakeholders agree that yield on existing cropland must increase while nutrient losses from cropland to air and water must be reduced. “For agriculture to be more ecologically, socially and economically viable it is more favorable to increase productivity on existing land rather than expanding cultivation to marginal areas or fragile ecosystems. Manufactured plant nutrients, crop protection products and enhanced plant varieties contribute to this extensively and therefore allowed farmers to increase productivity per unit-cultivated areas. The use and application of these products has to be adopted to local conditions, markets and consumer demands. Integrated farming systems, which include a standard of best agricultural practices, are increasingly demonstrating the most appropriate way of achieving the goals of sustainability”(IAFN, 2000).

In the literature comparing yields of organic and conventional systems, productivity claims are often made based on yield per unit area of specific crops in a rotation without bringing time into the evaluation .if the organic rotation contains fallow years or years in which a crop with limited marketable value is included, specific crop yields can be very misleading. Comparisons must be based on yield of marketable product per unit area per unit time.

Crops produced organically will not always yield less, but often do. For example a 21-year study in Switzerland found that yields were 21% less when a rotation including wheat potato and forage was grown organically (Madder et al., 2002). However economically most important crop, potato suffers a high yield loss (38%) these yield reductions occurred despite the better soils, but achieved due to external organic material input not supplied to organic system. Rotation includes 43% forage crops which could imply greater emphasis on animal agriculture than would be justified by local or organic demand as started by Per Pinstrup-Anderson (2002) “yields per unit of total land used for organic agriculture including the land needed to produce green manure and animal waste are not at level necessary to avoid encroachment on ecologically fragile soils and still met future demands”.

External inputs of organic nutrients sources often contains nutrients that were originally supplied inorganic form such as commercial fertilizers. Were organically farming to be more broadly adopted, such practice would lead to extensive soil nutrient depletion.eg.in US and Canada P_2O_5 is removed more than potash that is recoverable from inorganic fertilizer plus manure applied (PPI, 2002).

Nutrient input boundaries

Because organic productions have many restrictions on inputs, it is more difficult to maintain the same yield levels sustainably. Organic standards minimize or eliminate use of synthetic or manufactured inputs and encourage maximum use of local natural resources. Organic food producers rarely use readily soluble mineral nutrients excluding sewage, sludge and composts derived from wastes. Thus, have to rely on crop rotation, green manure and animal manure.

The inputs allowed as fertilizers in organic production are generally lower and more variable in nutrient content and plant availability than commercial fertilizers. To meet the crop needs these must be given at higher rates, which elevates to losses and negative environmental impact. A report by Trewaves (2001) published in *“Nature”* pointed out the hazards of recycling

solely on organic sources for nutrients. He reported, “Manure breakdown cannot be synchronized with crop canopy growth, as is desirable, but continues throughout the growing season. Ploughing in of legume crops and continued manure breakdown leads to nitrate leaching to aquifers and waterways at identical rates to conventional farms.”

Organic systems rely on tillage to incorporate organic materials and control weeds. Tillage increases mineralisation (breakdown) of soil organic matter. Todays integrated cropping systems are reducing or eliminating tillage, allowing crop residues to contribute more to increasing soil organic matter content. Organic systems also vary more widely in nutrient availability because of reliance on indigenous soil fertility which exhibits strong spatial variability (Brandt and Molgaard, 2001) nutrient input levels in organic farming systems tend to lower than in conventional systems because the philosophy is aimed at growing the crops under more natural conditions. Deficiencies of nitrogen phosphorous and potassium are natural conditions. These deficiencies reduce productivity.

Magnitude of soil quality

A large section of Indian soils are poor and ill, so are our crops, animals and human population, because they are malnourished. Poorly fed plant supply poor quality and unbalanced diet to humans and animals resulting in widespread malnutrition and diseases. This in turn results in many nutrient deficiency diseases, higher infant mortality rates, and low productivity. The best means to solve these problems is to supply balanced plant nutrients through integrated use of bio fertilizers, organic manures and inorganic fertilizers (FN, 2004). Productivity depends upon soil quality its structure and its capacity to retain water and nutrients depends upon inputs of organic material to maintain appropriate level of humus. Nutrient inputs have large impact on total quantity of organic matter produced and available to build soil humus. When nutrient deficiency yields soil limits it also limits their contribution of organic material to the soil. Nitrogen has a particular importance, since soil humus maintains a carbon to nitrogen ratio of 10, and nitrogen inputs have shown to stabilize soil carbon in the long term (Paustain et al., 1997).

The nutrient inputs critical to photosynthetic productivity (the original source of all organic matter) should be supplied by a combination of organic and mineral sources, as defined by integrated plant nutrition (IPN). “IPN implies a combined use of various nutrient sources with special emphasis on those which can be mobilized by the farmers themselves. The benefit of organic inputs extends beyond their nutritional value, e.g by contributing to improved soil physical conditions. But organic materials are not sufficient to replenish nutrients removed by crop harvests. The complementary use of mineral fertilizers is essential to sustain soil fertility and to achieve increased production”(IFA, 1996).”The use of inputs external too farm and community should complement the use of available organic materials, crop rotation and other improvements in production systems” (Pinstrup- Anderson, 2002).

The danger of nutrient deficiency limiting the primary production of organic materials for soil improvement is highlighted in the following statement”. In most of developing countries too little intensification [of agriculture production] is a major cause of natural resource degradation, as desperately poor farmers mine soil fertility and climb the hillsides in effort to survive low soil fertility and lack to access to reasonably priced fertilizers constrain farmers in many countries. Policies should encourage farmers to make appropriate use of

inorganic and organic fertilizers and improved soil management" (IFPRI, 2002).

Distinction of natural versus synthetic

It is often implied that nutrients used in organic cropping systems are "natural" as opposed to the synthetic or chemical sources used in conventional systems. Actually any effort to differentiate foods from nutrient source stand point is of limited use because whether the source of nutrients is organic or inorganic, all nutrients are absorbed by plant in soluble inorganic form. The natural versus synthetic distinctions are not defensible on the basis of science.

Environmental crash and sustain-ability

Crop production uses the natural resources of soil water and air as well as genetic resources. Producing high yield crops saves space for natural habitat. Managing inputs for profitable high yield production minimizes losses of nutrients that could potentially adversely affect the quality of surface waters that surround the cropland and groundwater below it. Crop production impacts on atmosphere are also important, increased crop growth will help to store more carbon in soil to mitigate the increase the green house gases.

Integrated farming systems face productivity challenges by managing site specifically, meeting the landscape specific needs of soil and crops.prudent, speciaficallysound use of technology in a systematic management programme is essential to long term sustainability. Improved and adapted genetic materials are a key component. Integtated pest management must include, using best practices from cultural biological and chemical approaches. Conservation tillage and other practices to control erosion, maintain water quality and reduce herbicide use are often critical components.

Several researchers have acknowledged that environmental impact of organic farming system is unknown and require more research (Condron et al., 2000; Hansen et al., 2001) while risk per unit area of farm may be lower, when practiced as small percentage of agricultural land, the overall environmental risks of organic production may increase dramatically as organic farming expands. Few studies have compared organic and conventional systems for risk per unit of production.

Sustainable crop production requires the efforts of all the worlds' farmers. Both large scale enterprises and small holder agriculture have a role to play in the increasingly intensive business of producing crops to sustain both large and small, the public must be continue to provide the infrastructure to deliver agri-inputs and outputs, the educational resources for knowledge generation and transfer and the regulatory framework to assure rational business climate. This includes development of mechanisms to assure consumers of the quality and safety of food and other crop products.

Conclusion

The challenges facing agriculture today is to increase the quantity and quality of food produced, with less detrimental impact on environment. Concerned about India certification cost is exorbitantly high and inorganic input use is prohibited in nearby areas, organic farming cannot be practiced by small and marginal farmers who constitute about 80% (FN, 2004). For sufficient flexibility to meet that challenge, integrated cropping systems should have to access to the necessary resources for efficient, bio- intensive production. If organic farming is defined only as that which is done with a restricted list of inputs, its ability to meet the challenge will be less

than that of integrated farming systems. Lower input use equates to lower quantity and quality of food produced with greater detrimental impact on environment.

Public perception of the term organic connotes concern for product safety healthfulness, and environmentally sustainable production. Policy development for organic agriculture must recognize that simple avoidance of specific inputs cannot assure that these concerns are addressed. Organic production must also include accountability for these concerns.

The concept of organic farming must be defined in a manner that accurately communicates a practice in a non-misleading way, to public. Acceptance of separate standards must avoid implying the organic crop production delivers benefits that have not been established on the basis of sound science. Such acceptance must recognize that integrated farming systems also produce safe, healthy food in an environmentally sustainable manner.

References

Brandt, K and J. P. Molgaard. 2001. Organic Agriculture: Does it enhance or reduce the nutritional value of plant foods?" Journal of the science of food and agriculture l81:924-931.

Condron, L. and M. Cameron. 2000. A comparison of soil and environmental quality under organic and conventional farming systems in newzealand. Newzealand Journal Of Agriculture Research,Vol.43 No.4, pp 443-466.

FN [Fertilizer news]. 2004. Organic farming present status and future needs, India, Nov.2004 pp: 11.

Hansen, B. and H. F. Alroe. 2001. Approaches to access the enviro-nmental impact of organic farming with particular regard to Denmark. Agriculture Ecosystems and Environment. Vol.83 No. 1-2:11-26.

IAFN [International Agri-Food Network]. 2000. Statement of industry topic-i, segment on sustainable agriculture. New York, United States Of America.

IFA [International Fertilizer Industry Association]. 1996. Plant nutrient for food security, FAO, World Food Summit, November.

IFPRI [International Food Policy Research Institute]. 2002. Achieving sustainability food security for all by 2020. Priorities and responsibilities. May, Washington DC, United States Of America.

Mader Paul, Andreas Filebbach and David Dubois. 2002. Soil fertility and biodiversity in organic farming. Science Vol. 296, pp1694-1697.

Paustain, K., H. P. Collins and E. A. Paul. 1997. Management control on soil carbon, soil organic matter in temperate ecosystems, Chapter 2 CRC Press. Inc. pp39-41.

Pinstrup-Anderson, Per. 2002. Towards a sustainable global food system: What will it take? Key Note presentation Lowa State University, USA 26-27 March.

PPI [Potash and Phosphate Instute, United States Of America]. 2002. Plant nutrient use in North American Agriculture. PPI/PPIC/FAR Techni-cal Bulletin 2002-1 ISBN#0-9629598-4-7, Norcross, Georgia, United State of America.

Trewaves, A. 2001. Urban myths of organic farming–organic agriculture began as an ideology: But it can meet today's need. Nature 410:409-410.