Chapter 1

Investigating farm management practices that may foster green growth

This chapter outlines the structure of the full report. Based on a review of the literature, the report analyses the potential effects of key farm management practices on resource productivity and efficiency compared with conventional agriculture. Although only a selection of farm management practices are analysed, all farm management systems – from intensive conventional farming to organic farming and science-led technologies – have the potential to contribute to green growth. Whether they do or not in practice will depend on whether farmers adopt the appropriate technology and practices. This, in turn, will strongly depend on whether the right policy framework is in place. More intensive farming systems can co-exist with more extensive systems, with the overall effect of increasing productivity and natural resource efficiency in a sustainable manner. The selected practices examined include soil and water conservation practices, integrated pest management, organic farming, modern agricultural biotechnology, and precision agriculture.

The paramount objective of a "Green Growth" strategy in agriculture is to meet global food demand in a sustainable way. This challenge cannot be accomplished by a "business as usual" approach. Developments which can lead to new types of agricultural production and to innovative improvements of existing technologies and practices that are sustainable and environmentally sound, while also contributing to mitigating climate change are needed.

Farm management practices that increase productivity, stability, and resilience of production systems should be encouraged. Technology for sustainable development must go beyond raising yields to saving water and energy, reducing risk, improving product quality and protecting the environment.

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Concerning soil conservation management practices, the report reviews and examines conservation tillage and its variants, conservation crop rotation, and soil nutrient management techniques. For water conservation practices, the report examines land management practices for preparing fields for efficient irrigation and managing excess water, on -farm water delivery systems and the application of irrigation practices, irrigation water use management and protecting water from non-point source pollution and sedimentation.

Organic agriculture is the most developed integrated management practice, occupying almost 1% of agricultural land in the world. Although the rules of organic agriculture vary slightly from country to country, a number of general practices apply to all organic cultivation systems and to the stages of growing, storage, processing, packaging and shipping. Other integrated management practices, such as precision agriculture and IPM, present a "hybrid" approach between conventional practices and organic agriculture.

Modern agricultural biotechnology can be applied to all classes of organism – from viruses and bacteria to plants and animals – and is a major feature of modern agriculture. There are many examples of biotechnology applications to agriculture. They include using micro-organisms to transform materials (e.g. via fermentation), different methods of propagation (e.g. plant cloning or grafting), and genetic alteration (e.g. via selective breeding).

Precision farming is a relatively new management practice made possible by information technology and remote sensing. Precision farming is a whole-farm management approach to optimise crop yields via the systematic gathering and handling of information about the crop and field. It has the potential to contribute to nutrient management by tailoring input use and application more closely to ideal plant growth and management needs. A wide range of technologies are available, but the most widely adopted precision farming technologies are knowledge-intensive (e.g. GPS guidance).

Assessing the resource productivity of these farm practices extends well beyond examining conventional economic productivity results. A broad view of resource productivity is adopted in this report, defined by the ratio of output to the various resources used for production. Managing the natural resource base means matching farm practices with the agro-ecological and socio-economic conditions that will maximise resource productivity (i.e. attain maximum yields with minimum use of resources, such as nutrients, water and soil), maximise environmental and energy productivity (i.e. attain maximum yields with minimum total emissions and energy use), and maximise the production of public goods (e.g. biodiversity).

The OECD has undertaken several studies related to farm management practices, particularly in the context of analysing the environmental performance of agriculture and understanding the environmental impact of agricultural support policies in OECD countries. The main focus of such work has been on the "green" impacts of the various farming practices examined, and less on the "growth" dimension. This report will focus on both the "green" and "growth" impacts of farm practices.

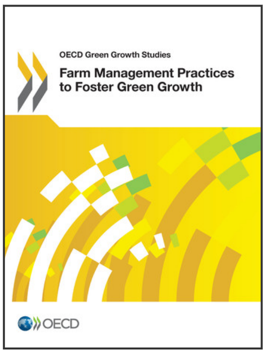
A few caveats should be mentioned. First, it is difficult to compare the overall impact of these farming practices on green growth to conventional farming systems as there are technical difficulties in defining the appropriate benchmarks for measurement. In addition, the analysis of the number of new jobs potentially "created" by "green agriculture" should take into account the jobs "lost" in more "conventional" segments of the sector. Finally, the impacts are usually context-specific and vary considerably according to crop and agro-ecological environment.

Box 1.1 Assessing the impacts of farm management practices on resource productivity: Defining the concepts

Economic productivity: measures the ability to produce by employing factors of production and resources. As such, the most widely used measures of productivity turn to simple ratios of output relative to inputs used to produce the output. In these ratios or indices the numerator is a measure of the output and the denominator is a measure of the employed resource/factors. Depending on what the numerator measures, productivity measures are categorised as partial or multifactor. In the partial factor productivity context, the numerator measures only the input by one single factor (e.g. hours of labour used for the production of the output), while a multifactor productivity setting measures the change in output per unit of a combination of factors (e.g. combined capital and labour input). Multifactor measures are designed to measure the joint influences of technological change, efficiency improvements, returns to scale, reallocation of resources, and other factors of economic growth, allowing for the effects of capital and labour.

Resource productivity: the ratio of output to the various single resources used in the production. Single resources include non-energy materials, nutrients, water and soil (in terms of productive capability and land-use). Main nutrients include nitrogen and phosphorus, which may lead to surface and groundwater pollution, due to excessive commercial fertiliser-use and intensive livestock farming. For instance, high stress on water resources and the consequent low water productivity are related to the inefficient use of water and to its environmental and socio-economic consequences: low river flows, water shortages, salinization of freshwater bodies in coastal areas, human health problems, loss of wetlands, desertification and reduced food production.

Energy productivity: the ratio of output to energy use. Energy productivity is closely related to the effects on greenhouse gas emissions and on local and regional air pollution. Energy productivity reflects, at least partly, efforts to improve energy efficiency and to reduce carbon and other atmospheric emissions. Energy productivity also is associated to water abstraction and intensity of land-use, which both absorb the largest amount of energy needed by agriculture.



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