Sustainable CROP PRODUCTION INTENSIFICATION *around the world*

IMPROVING THE EFFICIENCY OF NUTRIENT INPUTS: *experience, technologies, and enabling policies*

SOIL HEALTH REFERS TO ITS PRODUCTIVE CAPACITY WHICH IS INFLUENCED BY ITS PHYSICAL, CHEMICAL AND BIOLOGICAL ATTRIBUTES. SOIL FERTILITY REFERS TO STATUS AND ABILITY OF SOILS TO MEET CROP NEEDS FOR A DESIRED LEVEL OF PRODUCTION. AN INTEGRATED APPROACH OF SOIL AND WATER MANAGEMENT FOLLOWING CONSERVATION AGRICULTURE (CA) PRINCIPLES ALONG WITH BALANCED AND EFFICIENT MANAGEMENT OF PLANT NUTRIENTS THROUGH MINERAL, ORGANIC AND BIOLOGICAL SOURCES (INTEGRATED PLANT NUTRIENT MANAGEMENT-IPNM) WILL ENSURE PRODUCTION INTENSIFICATION WITH ECOSYSTEM SUSTAINABILITY.

SUB-SAHARAN AFRICA
underuse of fertilizers and declining soil fertility

Fertilizer nutrient use is less than 10 kg/ha compared to a global average of about 100 kg/ha. The declining fertility of SSA soils due to continuous nutrient mining (where farmers remove more of the essential mineral nutrients than they replenish) along with poor biomass management is a major cause of low agricultural productivity and unsustainable farming systems. Farmers' willingness to apply fertilizer is dependent on its availability at affordable price.

FAO is promoting better soil fertility management practices, including IPNM, CA, IPM, etc. FAO is collaborating with other partners in increasing fertilizer demand through the promotion of "microdosing" fertilizer application (small dose, but at the right time and right place), joint fertilizer procurement initiative, providing inputs to farmers through voucher system, and value-chain approach. Farmers and policy makers are gradually appreciating the need for soil productivity improvement.

BANGLADESH
inefficient use of fertilizers

Nitrogen use efficiency of urea broadcast on flooded rice fields hardly exceeds 30%, with the consequence of wastage of costly inputs and environmental pollution (emission of GHG, nitrate pollution of water bodies). As part of a crop intensification programme, the government of Bangladesh is concerned to increase the N use efficiency in its rice production system.

FAO is supporting the programme to scale-up the adoption of Urea Deep Placement (UDP) technology in Bangladesh (whereby urea briquettes are introduced into the sub-surface layer of the soil in a single application rather than surface broadcasting on submerged rice fields). This results in an improvement of N use efficiency by about 30%. Also, support is provided in decision making for topdressing of N based on crop requirements, with the help of Leaf Colour Chart (LCC). These efforts are bringing a substantial savings to N fertilizer application and notable improvement to ecosystems.

INDIA
unsustainable use of fertilizers

Once soil organic matter falls below a threshold limit (typically 2%) and micronutrient deficiencies appear due to intensive cultivation and imbalanced fertilizer application, the crop response to applied nutrients is reduced. Adding more fertilizer does not produce a proportionate increase in crop production and nutrient use efficiency is reduced affecting productivity and sustainability. In the intensive rice-wheat production systems of Indo-Gangetic plains, this effect is increasingly observed.

FAO is collaborating with the rice-wheat consortium, including scientists from the relevant national and international agricultural research organisations, to address this problem. Work focusing on resource conserving technologies – particularly conservation agriculture in wheat and rice, and improving levels of soil organic matter – is underway with extension, lead farmers and farmer community groups.


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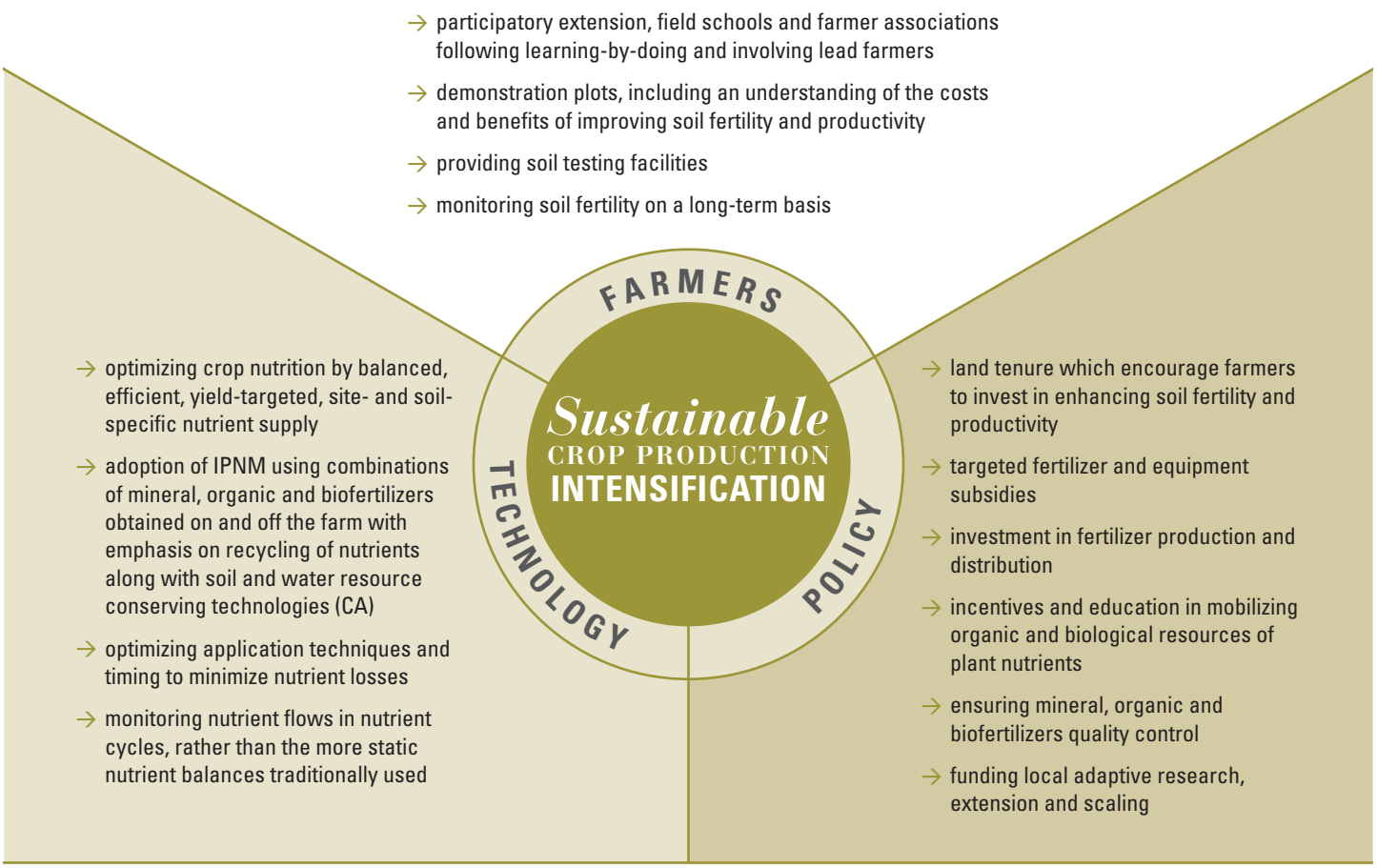

- participatory extension, field schools and farmer associations following learning-by-doing and involving lead farmers
- demonstration plots, including an understanding of the costs and benefits of improving soil fertility and productivity
- providing soil testing facilities
- monitoring soil fertility on a long-term basis

- optimizing crop nutrition by balanced, efficient, yield-targeted, site- and soil-specific nutrient supply
- adoption of IPNM using combinations of mineral, organic and biofertilizers obtained on and off the farm with emphasis on recycling of nutrients along with soil and water resource conserving technologies (CA)
- optimizing application techniques and timing to minimize nutrient losses
- monitoring nutrient flows in nutrient cycles, rather than the more static nutrient balances traditionally used

- land tenure which encourage farmers to invest in enhancing soil fertility and productivity
- targeted fertilizer and equipment subsidies
- investment in fertilizer production and distribution
- incentives and education in mobilizing organic and biological resources of plant nutrients
- ensuring mineral, organic and biofertilizers quality control
- funding local adaptive research, extension and scaling

EXTERNAL NUTRIENTS (MAINLY MINERAL FERTILIZERS) APPLICATION IS NEEDED WHEN SOIL SUPPLY IS INADEQUATE, BUT UNDER OR OVERUSE AND INEFFICIENT APPLICATION METHODS DAMAGE ECOSYSTEMS AND SUSTAINABILITY OF PRODUCTION. INTENSIVE CROPPING SYSTEMS NEED ADEQUATE NUTRIENTS, TO MEET THE YIELD TARGET. ADEQUATE ORGANIC MATTER (OM) CONTENT IS A KEY INDICATOR OF GOOD SOIL HEALTH. ATTAINING OR MAINTAINING AN OPTIMUM LEVEL OF OM LEVEL UNDER INTENSIVE CROPPING SYSTEMS IN TROPICAL AND SUB-TROPICAL CLIMATE IS AN UPHILL TASK.

MINERAL NUTRIENTS, IF ADDED IN EXCESS, IN IMBALANCED PROPORTION AND IN AN INEFFICIENT WAY LEAD TO ECONOMIC LOSS TO FARMERS AND TO ENVIRONMENTAL PROBLEMS. THERE IS A NEED TO ADOPT THE IPNM APPROACH ALONG WITH BEST MANAGEMENT PRACTICES WITHIN THE CONCEPTUAL FRAMEWORK OF ECOSYSTEM SUSTAINABILITY.

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