Fertilizer use by crop in India

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Contents

List of tables

List of figures

Preface

This study, commissioned by the Food and Agriculture Organization of the United Nations (FAO), is one of a series of publications on fertilizer use on crops in different countries.

The aim of the series is to examine the factors underlying present fertilizer usage. These factors include the agro-ecological conditions, the structure of farming, cropping patterns, the availability and use of mineral and organic plant nutrients, the economics of fertilizers, and research and advisory requirements. The reports examine those factors that will or should determine the future development of plant nutrition on a country-by-country basis.

In the past two decades, there has been an increasing focus on the adverse environmental impact of both the underuse and the overuse of plant nutrients. The efficient use of plant nutrients, whether from mineral fertilizers or from other sources, involves the shared responsibility of many segments of society including international organizations, governments, the fertilizer industry, agricultural research and advisory bodies, traders and farmers. The publications in the series are addressed to all these parties.

Fertilizer use is not an end in itself. Rather, it is a means of achieving increased food and fibre production. Increased agricultural production and food availability can, in turn, be seen as an objective for the agriculture sector in the context of contributing to the broader macroeconomic objectives of society. The FAO/IFA 1999 publication *Fertilizer strategies* provides a review of the options available to policy-makers.

The contents of the series of studies differ considerably from country to country in view of their different structures, histories and food situation. However, in each case the aim is to arrive at a better understanding of crop nutrition in the country concerned.

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Cover photographs (wheat – background – paddy, cotton and litchi) provided by the FAI.

Abstract

In India, agriculture accounts for about 22 percent of gross domestic product. There are about 116 million farmholdings with an average size of 1.4 ha. The cultivated area is about 141 million ha and has remained constant for the past 30 years although the cropping intensity has increased from 118 to 135 percent during this period. The area of land receiving irrigation from different sources is almost 55 million ha.

The country has been divided into 20 agro-ecological zones and the soils classified into 8 major groups. The organic carbon content of most Indian soils is very low and nitrogen deficiency is universal. Most of the soils are low to medium in phosphorus and potassium, and sulphur deficiencies have developed over time. Soil fertility depletion and the increasing deficiencies of certain micronutrients are causes of concern.

Fertilizer consumption has increased from less than 1 million tonnes of total nutrients in the mid-1960s to almost 17 million tonnes today. The introduction of high-yielding varieties in the 1960s boosted fertilizer use. The high grain and fertilizer prices on the international markets during the oil crisis of 1973–74 provided a further impetus to policies aimed at improving the country's fertilizer supplies and food security. The production of nitrogen and phosphate increased from 1.8 million tonnes of nutrients in 1975/76 to 14.2 million tonnes (K_2O) in 2003/04. In the absence of domestic natural resources, all potash fertilizers are imported; the imports in 2003/04 were to 2.6 million tonnes K_2O compared with 0.4 million tonnes in the mid-1970s.

The intensity of fertilizer consumption varies greatly between the regions, from 40.5 kg/ha of total nutrients in Rajasthan to 184 kg/ha in Punjab. Urea accounts for 82 percent of total nitrogen consumption and di-ammonium phosphate for 63 percent of phosphate consumption.

Organic manures make a significant contribution to the supply of plant nutrients and soil fertility. However, a substantial proportion of cattle manure is used for purposes other than fertilization and the share available for crop nutrition is shrinking. The use of biofertilizers has

increased in recent years although inconsistent crop responses to these products remains a constraint.

Six crops (rice, wheat, cotton, sugar cane, rapeseed and mustard) consume about two-thirds of the fertilizer applied. The irrigated area, accounting for 40 percent of the total agricultural area, receives 60 percent of the fertilizer applied.

The Government of India fixes minimum support prices for the main crops, controls the farm price of urea and issues indicative selling prices of other fertilizers. The prices of fertilizers are subsidized. The Government's aim is that farmers should receive a price for their crops and pay a price for fertilizers that makes the use of fertilizers acceptable and remunerative. The subsidy on fertilizers is channelled through the fertilizer production industry, being calculated to ensure a reasonable return to the industry.

Fertilizer distribution is effected through private channels, cooperatives and certain institutions. There are 283 000 sales outlets in the country.

The population of India exceeds 1 000 million people. It is estimated that it will reach 1 400 million by 2025, requiring 300 million tonnes of foodgrain. Little extra land is available and the increase in production will have to come from higher yields, for which there is ample scope. In order to reach the required yield levels, fertilizer use will need to increase and improve. Present application rates are relatively low in many areas. The efficiency of fertilizer use could be improved through fertilization practices that include an application of macronutrients and micronutrients according to crop requirements. An adequate supply of credit for farmers and distributors is necessary to ensure the availability of fertilizers when and where they are required.

Abbreviations and symbols

AEZ	Agro-ecological zones
Al	Aluminum
B	Boron
C	Carbon
Ca	Calcium
Cu	Copper
ECA	Essential Commodities Act
FAI	Fertiliser Association of India
Fe	Iron
GCA	Gross cropped area
GDP	Gross domestic product
GPS	Group Pricing Scheme
ha	Hectare
HYV	High-yielding variety
ICAR	Indian Council of Agricultural Research
IGP	Indo-Gangetic Plains
INSS	Integrated nutrient supply systems
KCC	Kisan (farmer) credit card scheme
LGP	Lower Gangetic Plain
Mn	Manganese
Mo	Molybdenum
MSP	Minimum Support Price
N	Nitrogen
Na	Sodium
NBSS&LUP	National Bureau of Soil Survey and Land Use Planning
P	Phosphorus

PET	Potential Evapotranspiration
PSB	Phosphate-solubilizing bacteria
RPS	Retention Pricing Scheme
A	Sulphur
TGP	Trans-Gangetic Plain
VCR	Value-cost ratio
Zn	Zinc

Fertilizers

ACl	Ammonium chloride
AN	Ammonium nitrate
AS	Ammonium sulphate
CAN	Calcium ammonium nitrate
DAP	Diammonium phosphate
KNO_3	Potassium nitrate
MAP	Mono-ammonium phosphate
MOP	Muriate of potash (potassium chloride)
SOP	Sulphate of potash (potassium sulphate)
SSP	Single superphosphate
TSP	Triple superphosphate
NPK	Compound fertilizer containing N, P_2O_5 and K_2O
NP	Compound fertilizer containing N and P_2O_5
PK	Compound fertilizer containing P_2O5 and K_2O

N: Nitrogen

P_2O_5 or P: Phosphate*

K_2O or K: Potash*

* Phosphate and potash may be expressed as their elemental forms P and K or as their oxide forms P_2O_5 and K_2O. Nitrogen is expressed as N. In this study, phosphate and potash are expressed in their oxide forms.