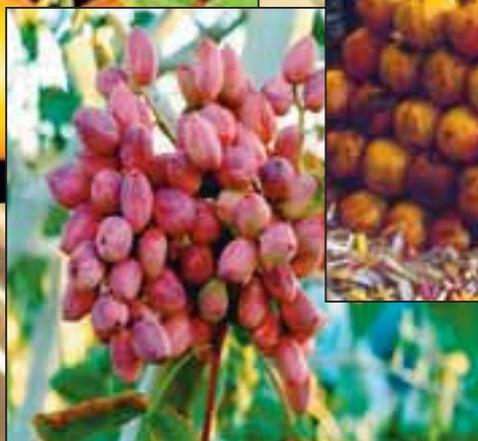


Fertilizer use by crop in the Islamic Republic of Iran



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**Land and Plant Nutrition Management Service
Land and Water Development Division**

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2005

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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 agro-ecological conditions, the structure of farming, cropping patterns, the availability and use of mineral and organic plant nutrients, the economics of fertilizers, research and advisory requirements and other factors that have led to present fertilizer usage. The reports examine, country by country, the factors that will or should determine the future development of plant nutrition.

During the past two decades, increasing attention has been paid to 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 agricultural sector in the context of contributing to the broader macroeconomic objectives of society. A review of the options available to policy-makers is given in the FAO/IFA 1999 publication entitled *Fertilizer Strategies*.

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 the nutrition of crops in the country concerned.

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The background photograph (barley) is from the FAO Media FAO/23196/O. Tuillier as well as the pomegranate photograph FAO/23429/J. Boethling. The citrus photograph is from EcoPort (Arnoldo Mondadori S.p.A.) and the pistachio photograph is from J.M. Malakouti.

Abstract

With an area of more than 1.6 million square km, Iran is the sixteenth largest country in the world. In the ten agro-ecological zones of the country, the cultivated area amounts to about 15 million hectares, of which over half is irrigated. A wide variety of field, fruit and vegetable crops is produced but by far the most important irrigated crop is wheat.

According to soil and land surveys, a total of about 17 million hectares of land could potentially be cultivated although most have some limitations. The main limitation to agricultural expansion is water availability not land availability. Low rainfall, high air temperatures and high evaporation rates result in a high water requirement for agriculture. Salinity and drought are among the most important environmental stresses that limit crop production in Iran.

Until recently, Iran relied heavily on wheat imports to meet its growing domestic demand. Annual imports have ranged from 2.5 to 7.5 million tonnes per annum during the past two decades, making Iran a major world wheat importer.

In the context of a policy to become self-sufficient in wheat, over the past two years the Government has raised spending on wheat farming sharply by supplying higher quality seeds, improving machinery services, augmenting fertilizer usage and enhancing water systems and pest management practices. The guaranteed procurement prices have been raised significantly.

A record wheat harvest in 2004 followed an already excellent crop in 2003, reduced wheat imports in 2004/05 to only 0.2 million tonnes. The strong government support for wheat production has played a large part in raising output but favourable rainfall during these seasons, after three years of drought, also had a major impact.

At least 40 percent of Iran's wheat is rainfed with an average yield of only 0.8 tonnes/ha. Even under irrigation the average wheat yield rarely exceeds 3 tonnes/ha, which is low by world standards. The country cannot always rely on favourable rainfall and an intensification of production providing higher yields under less favourable climatic conditions is

necessary if the target of self-sufficiency is to be maintained. Balanced and efficient fertilization is a major component of such an intensification. An improvement in the efficiency of irrigation is also indicated. Water losses in conveyance and use are very high.

The consumption of fertilizers has increased by over 50 percent since 1999. The nutrient balance and provision of micronutrients has also improved. The use of biofertilizers is being promoted. However, further improvements are necessary. It is estimated that correct fertilization could increase production levels by up to 60 percent.

The Agricultural Support Services Company is responsible for providing and distributing mineral fertilizers, pesticides, seeds and improved plant varieties. The rural and agricultural cooperative network has 4 935 branches, 10 693 shops, and 11 794 units for the distribution of fuel. With around five million members, the network covers 98 percent of the villages of the country, with a population of approximately 25 million people. The cooperatives play an important role in the marketing of produce and providing services and support.

Fertilizer research in Iran is carried out mainly by the Soil and Water Research Institute. In cooperation with the agricultural universities, the Institute is carrying out research and development activities on a wide range of topics concerning the efficient use of plant nutrients.

Fertilizers are subsidized and the amount of subsidy has risen sharply with the increase in the amount of fertilizer used. There is some abuse of the system.

Unsatisfactory availability of fertilizers is a major constraint. The distribution of fertilizers needs to be improved, providing the required quantities and types of fertilizer at the time they are needed by the farmers.

Abbreviations and symbols

ASCC	Agricultural Support Services Company
COIRPC	Organization of Iranian Rural Cooperatives
FUE	Fertilizer use efficiency
GNP	Gross National Product
OPFO	Organization of Professional Fertilizer Producers
SRIO	Scientific Research and Industrial Organization of Iran
SWRI	Soil and Water Research Institute

AS	Ammonium sulphate
DAP	Diammonium phosphate
MOP	Muriate of potash (potassium chloride)
NPK	Compound fertilizer containing N, P and K
SOP	Sulphate of potash
SSP	Single superphosphate
TSP	Triple superphosphate

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.

Chapter 1

Introduction

With an area of more than 1.6 million square km Iran is the sixteenth largest country in the world. The country is situated in the eastern part of the northern hemisphere, in southwest Asia (Figure 1).

The elevation ranges from below sea level to more than 5 000 metres above sea level. The temperature varies between minus 30°C and plus



50°C. Annual precipitation varies from about 25 mm in the Central Plateau to over 2 000 mm in the Caspian Coastal Plain, with a national annual average of 250 mm. Central Iran is a steppe-like plateau with a hostile climate, surrounded by desert and mountains (Zagros on the western border and Alborz to the north). Approximately 90 percent of the country is arid and semi-arid.

Underground water irrigates the oases where a wide variety of grains and fruit trees are cultivated. The shores of the Caspian Sea have a humid climate and are suited to tropical and subtropical crops (citrus, cotton, rice and tea). The annual evaporation loss is high, ranging from about 700 mm along the Caspian Sea shores to over 4 000 mm in the Central Plateau and southern part of the Khuzestan and Southern Coastal Plains in the southwest, more than 16 times the annual average rainfall (Moameni, 2000).

In 2002, the population of Iran amounted to 68 million people, the rural population being about 23 million. The food sector accounts for about 40 percent of Iran's gross national product (GNP) and 40 percent of the "added value" in the national economy. The farming subsector contributes 57 percent of the added value of the food sector. Food security has a high priority in the country.

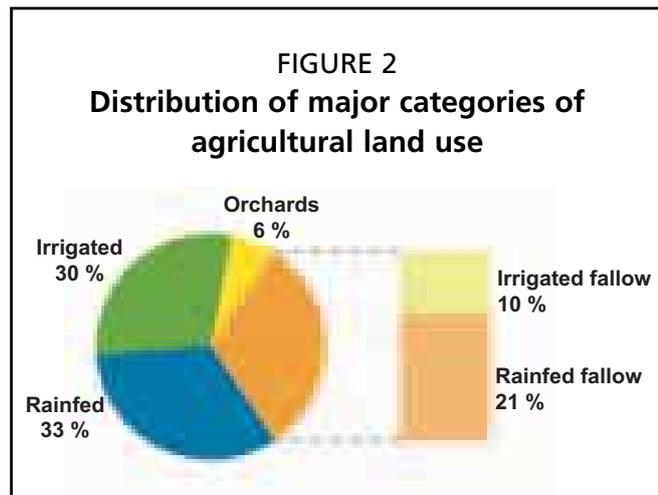
According to FAO statistics, in 2001 the cultivated area amounted to 16.5 million ha, of which 14.3 million ha were planted to arable crops and fallow and 2.3 million ha to permanent crops. The irrigated area in 2001 amounted to 7.5 million ha. Agricultural land availability is not a major constraint in the development of Iranian agriculture. The major constraint is the availability of water.

About 90 percent of the irrigated land is under annual crops (including fallow), the remaining 10 percent being used for the production of perennial crops (mostly orchards). In rainfed areas, annual crops constitute about 98 percent of the total production (Moameni, 2000). During dry years, about 8 to 12 percent of the total production comes from dry land areas. However, in wet years this figure can rise to 35 percent. Figure 2 shows the land use distribution.

In many regions of the world, the increasing demand for food in the coming decades cannot be met by extending the area of land under cultivation but only by increasing the intensity of their agriculture. A more efficient use of the land as a result of intensification requires less

forest to be cleared for farming purposes and preserves a greater genetic diversity of plant species. In Iran the cultivable land area could in principle be increased but an intensification of crop production is needed to compensate in particular for water scarcity.

It is unlikely that the required level of crop production could be obtained simply by increasing the irrigated area. An intensification of production is necessary. This involves several factors, such as land consolidation, leveling, improved irrigation methods, balanced fertilization, improved seeds, disease and pest control and mechanization. Balanced fertilization is an essential factor for achieving yield and quality improvements (Malakouti *et al.*, 2004).



Source: Moameni, 2000.