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BALANCED FERTILIZATION OF MAJOR CROPS IN EGYPT : A REVIEW

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Abstract

The aim of this study will be to have the ratio of nitrogen fertilizers applied to the main crops, using various sources of nitrogen, time and method of application, in order to increase the efficiency of nitrogen fertilizers and nitrogen to reduce losses. Most of the soil cultivated in clay, Egypt is alluvial soils in texture. About 420 thousand hectares, sandy and limestone. The results of the average physical and chemical analyses of the soil and samples from different sites to represent the different types of soils. The results obtained indicate the presence of a wide range of physical and chemical properties. The organic matter content is low and, accordingly, is the total nitrogen concentration.
With regard to alluvial soils and available phosphorous determined by the Olsen method is generally moderate. The results indicate that available (soluble and exchangeable) potassium extract with a neutral solution of high ammonium acetate, this is a characteristic of alluvial soils of most Egyptians. Available levels of phosphorous, potassium, and micronutrients are relatively low on limestone and sandy soils.
***Keywords*:** Fertilizers, Nitrogen, phosphorous, Potassium, Major crops, Egypt.

Introduction

Satisfactory land management is the main factor limiting agricultural productivity. Land and water management following practices needed to extract the maximum benefits from fertilizer use: Control of logging, water salinity, and soil structure deterioration, prevention and control of soil degradation, the proper use of land reclamation, based on the ability to land.

Focusing efforts on intensifying the best lands, recycle organic materials for use as fertilizer, identify areas in which high priority should be given to soil regeneration, building open sewage networks and installing shallow tiles and drains, promote land levelling to increase water use efficiency in the transition and freshwater areas, development of land use plans in the extraction areas, land use in the regions Reclaim fresh water to grow crops suitable environmentally, promote more efficient crop breeding practices, integrated crops and livestock systems, ecological agricultural areas and agricultural systems. On the other hand, the optimizing use of the fertilizers within the farm of nutritional balance, based on the analysis of the soil and plant can be improve the nutritional status of the crops and reflected on their quality, Rezk *et al*., 2013; Goyal and Mansour 2015; El-Hagarey *et al*., 2015; Mansour *et al.* (2019 a,b,c,d,), Hellal *et al.*, 2019; Hu *et al.*, (2019 a,b).

The soil in the Nile, Delta and silt, clay is a mixture of good quality, deposited during thousands of years of Nile floods. The total cultivated area is estimated at approximately 5.8 million hectares with a crop density of 180 percent. Most newly reclaimed desert areas use modern irrigation methods such as drip irrigation and sprinkler irrigation systems, Ayyad *et al*. (1990), Yassen *et al*. (2011), Mansour *et al.* (2015, 2016; 2019).

An estimated 3.5 million farmers cultivate approximately two-acre acres (acres = 0.42 hectares). Intensive and relatively high production compared to global yield standards in countries with similar agro-climatic conditions.

Ecological agricultural areas

The old land is located in the Nile Valley and Delta regions. It covers a total area of 2.25 million hectares, and is characterized by alluvial soils (clay loam). The Nile River is the main source of water for irrigation, Mansour *et al.* (2013); Mansour *et al.* (2014); (2016a-c), (2019a,b), Abd-Elmabod *et al*. (2019).

New lands are located mainly on the east and west of the delta sides and spread in different regions of the country. It covers 10.5 million hectares. Land reclamation began in the early 1950s and continues. Nile water is the main source of irrigation water, but in some desert regions, groundwater is the only source of irrigation water. Sprinkler and drip irrigation systems are practiced.

The oases are distinguished by soil, silt and limestone sands. It covers a total area of 40, 000 hectares. Groundwater is the main source of irrigation.

Rain-fed areas include approximately 1.71 million hectares of land located in the northern coastal areas, where rainfall ranges between 100 and 200 mm annually.

The traditional management of soil fertility can lead to nutrient extraction from the soil due to insufficient application of nutrients, nutrients to imbalances and environmental pollution through the excessive application of fertilizers, Ayyad *et al.* (1990); Mansour *et al.* (2015, 2016; 2019).

Land use and agricultural systems, The current distribution of land use in Egypt is mainly the result of long-term historical processes, as a result of the interaction between social, economic, political and environmental factors. These factors have affected land ownership and tenure, population growth and urban and industrial development.

The objectives of this study will be to have the ratio of nitrogen fertilizers applied to the main crops, using various sources of nitrogen, time and method of application, in order to increase the efficiency of nitrogen fertilizers and nitrogen to reduce losses.

Crop requirements and needs for fertilizers

Recommendations are based on the use of fertilizers in experiments carried out by the Ministry of Agriculture of Egypt. The rates recommended by the Ministry of Agriculture are averages, not according to the specific needs of crops in a particular area. In practice, neighbouring farmers use different rates of fertilizers for the same crop, Rezk *et al*., 2013; Goyal and Mansour 2015; El-Hagarey *et al*., 2015; Mansour *et al.* (2019 a,b,c,d,); Hellal *et al.*, 2019; Hu *et al.*, (2019 a,b).

Fertilizer Requirements

Estimating fertilizer needs in the country are crucial not only for the development of agriculture but also for allowing the right investment decisions in the fertilizer industry. Incorrect expectations may result in either a farmer shortage or excess capacity and lower profits for producers. Two main factors are taken as a basis for estimating the fertilizer needs of the country. The first factor is the "connotation of cropping pattern", that is, the optimum rotation, and the area allocated to each crop. The second is the optimal economic rate of fertilizers for each crop under different climatic agricultural conditions. In addition to these two main factors, Ayyad *et al*. (1990), Mansour *et al*., (2015, 2016; 2019). The following factors are considered very important:

Expansion of the newly reclaimed area:

1. Crop rotation and its effect on crop response to fertilizers.
2. Soil and plant tissue analysis.
3. The value of fertilizing from different sources of fertilizers.
4. Residual effect of organic fertilizers and fertilizers.
5. Intensification of crops, whether by increasing the number of plants per unit area or interstitial.
6. Nutritional balances of different crops.
7. Improvements in irrigation and drainage systems.
8. New technology implemented by the fertilizer industry to produce new types of fertilizers while increasing its efficiency.

In Egypt, mineral fertilizers, especially nitrogen, phosphate and potash, are being applied to an increasing degree. The consumption of nitrogen fertilizers and phosphates has tripled over the past 30 years. This increase in consumption is due to various factors, including: Introduce new high-yielding varieties that need higher fertilizer rates, as evidenced by an increase in the recommended rates. It deposited the construction of the High Dam in Aswan, which reduced the amount of suspended matter in the soil during the floods, which allowed thousands of years to restore the fertility of the Egyptian soil.

Aside from mineral fertilizers, organic fertilizers are the main source of plant nutrition, especially nitrogen and micronutrients, Rezk *et al*., 2013; Goyal and Mansour 2015; El-Hagarey *et al*., 2015; Mansour *et al.* (2019 a,b,c,d,); Hellal *et al.*, 2019; Hu *et al*, (2019a,b).

During the 2002/03 agricultural season, crop areas in old and new lands amounted to 5.1 and 1.4 million hectares, respectively. According to the "Guidance Crop Model", the area allocated to different crops and the recommended rates for nitrogen and phosphate fertilizers, it is estimated that the country needs 1.1 million tons of N and 364 thousand tons of P_2O_5. The condition of potash and micronutrients in the soil in most Egyptians differs from that of N and P. As a result, it has been decided to determine the requirements for these foodstuffs by taking consumption from the previous year and increasing it by about 10 percent. Most poor farmers have knowledge of potash and micronutrient requirements and it is hoped that, with the help of extension staff and farmers, you will recognize their importance.

Nationally, recommended rates of N, P_2O_5 and K_2O for crops are released by MALR, 2002 and 2003) each year through an annual ministerial decree. Prices for fertilizers to be applied to crops obviously vary according to the soil types and variety type, as well as the area allotted for each crop that year. The effectiveness of various food sources An important factor affecting the efficiency of fertilizer use is the nutrient source. In Egypt, studies have been conducted to evaluate the effectiveness of different sources of N, phosphorus and potassium with respect to different field crops. With regard to nitrogen, field experiments carried out on cotton, wheat, corn and rice indicate that calcium nitrate and urea are almost equal value. On rice and sugar-coated urea and super-urea granules were found to be superior to ammonium sulphate and urea, while ISO-butidylin diurea was less effective (Hamissa *et al*., 1997), Mansour *et al.* (2014), Goyal and Mansour 2015, El-Hagarey *et al*., 2015; Mansour *et al.* (2019 a,b,c,d,), Hellal *et al.*, 2019; Hu *et al.* (2019a,b).

Time means to use fertilizers

Studies have been conducted in Egypt to determine the most appropriate time and the correct way to use fertilizers to grow different crops. Here are some examples (Taha *et al*., 1996).

Rice

For seeded rice broadcasting, recent work by the Rice Research and Training Center (RRTC) indicated that the most effective treatment is to apply a split of nitrogen to produce fertilizers in three equal doses: a third applied before planting, and included in dry soil; 1/3 in the middle of the stage Agriculture and the third one to start a bouquet.

For rice planting, using the fertilizer N 15 labelled, it was found that the comparison of ranges in dry soil and placement was ten cm deep in the soil, two thirds of the higher wore 35 days after seedling and the third one in the primary initiation of the flower bouquet, and the treatments gave almost similar results, (Mansour *et al*. (2013); Mansour *et al*. (2014); Mansour *et al*. (2015, 2016; 2019); Goyal and Mansour *et al*. (2015), (2016a-c), (2019a,b).

Wheat

Studies were conducted to determine the most appropriate time for nitrogen application to produce the highest grain and protein yield. In a coordinated field experiment, using N 15 fertilizer labelled, it was found that for the application of dividing the amount of nitrogen in three equal doses in agriculture, early farming and smoothing stages of growth are more effective than applied N fertilizers in two doses equally in agriculture and agriculture or in One single dose in agriculture, Mansour *et al.* (2013); Mansour *et al.*, (2014); Goyal and Mansour (2015); El-Hagarey *et al.* (2015); Mansour *et al.* (2016a-c) and (2019 a,b); Abd-Elmabod *et al.* (2019).

285 kg N/ha and ammonium nitrate and ten percent are applied to the soil before planting and cultivating in, and the remainder is applied to irrigation water. 70 kg P_2O_5/ha/one is applied to soil superphosphate in two doses on equal footing in front of agriculture and in agriculture. 115 kg K_2O/ha and potassium sulphate applied in three doses (half for application in the soil before planting, one quarter in agriculture and one quarter during the growing season in irrigation water). Maize yields 7.9 tons/ha and wheat 6.4 tons / ha indicated that it is possible to increase crop yields from sandy soils for low soil fertility with the use of fertilizers, Rezk *et al.*, 2013; Goyal and Mansour 2015; El-Hagarey *et al.*, 2015; Mansour *et al.* (2019 a,b,c,d,); Hellal *et al.*, 2019; Hu *et al.*, (2019a,b).

Maize

Data obtained from the Harmonized Program on Maize, using N 15 fertilizers labelled, showed that applying N split fertilizers in three equal doses applied to agriculture, at 50 cm and plant length in tasseling was more effective than N fertilizers applied in two doses equally, Mansour (2006; 2012) Mansour *et al.* (2013); Mansour *et al.* (2014); Mansour *et al.* (2015a-f); Mansour, 2015; Mansourl *et al.* 2015 a, b, c). (Mansour *et al.*, 2016a, b, c; and Mansour and Goyal, 2015); Goyal and Mansour (2015) and El-Hagarey *et al.* (2015) (2019a,b), Abd-Elmabod *et al.* (2019a,b).

Cotton

Some 22 field experiments were conducted to study the most effective and timely method for nitrogen application. The deep side dressing after thinning was the most effective treatment compared to topdressing after thinning or contrasting at the bottom of the hills. The nitrogen dose split was in two equal doses, the first before the second watering (after thinning), the second before the fourth watering and the most effective treatment. Data from different field experiments showed that applying phosphate fertilizers in one single dose before planting or before the first or second watering was almost equal in their effect on crop production, (Mansour *et al.* (2013), Mansour *et al.* (2014), Goyal and Mansour (2015), Mansour *et al.* (2015, 2016), Mansour *et al.* (2016a-c) Mansour *et al.* (2019a,b).

Fertilization

The traditional fertilization practice involves applying potassium and phosphate and part of the nitrogen requirements before implantation and applying one or two doses of N fertilizer during growth. Radio and mechanical, manual used to spread or spray.

Fertilization is used, and the use of fertilizers with irrigation water in Egypt on sandy soil, especially for the production of vegetables, where the productivity of crops in this soil is less than the possible yield from the recommended varieties. The optimum yield below is the result of poor soil and water fertility, low fertilizer efficiency, and inappropriate management practices. Fertilization permits improved irrigation efficiency and food use and reduce application costs. It improves plant growth and nutrient absorption and reduces nutrient losses, Rezk *et al.*, 2013; Goyal and Mansour 2015; El-Hagarey *et al.* 2015; Mansour *et al.* (2019 a,b,c,d,); Hellal *et al.* 2019; Hu *et al.* (2019 a,b).

In Egypt, fertilization is practiced on only 13 percent of agricultural land, and it is being applied to 87 percent of fertilizers to the soil. One of the main recommendations adopted at the 2000 FAO meeting on the importance of fertilization in both systems is pressure (sprinkler and drip irrigation) and surface irrigation. Fertilization has been shown to enhance the overall root activity, improve the mobility and absorption of nutrients, as well as reduce pollution of surface water and groundwater. The fertilizer application technique is mainly used N and K (Taha, 1999).

Under the Egyptian agricultural conditions, nitrogen is considered to be the most important factor in crop production. The nitrogen application rate in Egypt is one of the highest in the world. As a result, pollution from nitrogen wastewater reaches an average of 1.5 ppm N in drains in the Nile Delta region. These results from the application of heavy nitrogenous fertilizers, filtration and exit from easily soluble nitrogen through uncontrolled surface irrigation practices commonly practiced by Egyptian farmers. These nitrogen losses are a major financial waste and pollute the environment with nitrates.

Applying fertilizers through the irrigation system has several advantages:

1. Food can be applied at any time during the season according to the requirements of the factory,
2. Placement of portable foodstuffs such as nitrogen in the soil can be regulated by defining the amount of applied water.
3. The application of nutrients is readily available for rapid plant absorption. Food is applied uniformly to the field.
4. Groundwater pollution is likely to be lower since nitrogen may be applied at any given time.
5. Most often applied when absorbing and using crops to their highest levels.

   Crop damage is minimized while using fertilizers.
6. Localized fertilizers such as ranges cannot be achieved in a sprinkler system.
7. To a limited extent, it can be achieved by drip irrigation. Water pollution can be a major source if the injection system is not properly installed or poorly, maintained. Here are two fertilization programs, for maize and wheat grown in sandy soil in open fields, Leithy *et al.* (2010), Rezk *et al.*, 2013; Mansour *et al.* (2014); Goyal and Mansour 2015; El-Hagarey *et al.*, 2015; El-Bassiouny *et al.* (2015); (Bargaz *et al.*, (2016); Mansour *et al.* (2019 a,b,c,d,); Hellal *et al.,* 2019; Hu *et al.* (2019a,b), Islam *et al.*, (2019).

Fertilizer distribution, pricing and trade

Until 1996, it was publicly owned by local fertilizer production capacity. With additions planned capabilities, ownership can be changed considerably, although the "private sector" involved appears to be made up of mixed companies that are over 25 percent owned by government agencies. Fertilizer distribution, in contrast, became increasingly dominated by the private sector during the period 1991 to 1998, despite some significant turmoil. The main bank for development and agricultural credit (PBDAC) was previously the exclusive domain of fertilizers distributed to both local and imported fertilizers of all types, through a credit system linked to branches at the village level. In 1992, support was removed from most fertilizers. Private traders and cooperatives were allowed to purchase fertilizers directly from processing plants and to import nitrogen and phosphate fertilizers subject to a 30 percent import duty. By 1994, private sector traders had handled about 70 percent of the market (based on food) (Saad, 2002).

PBDAC, agricultural cooperatives and private sector dealers continue to participate in the distribution of mineral fertilizers. The government determines the share of each participant. There are about 27 large-scale distributors who deal directly with fertilizer manufacturers within the limits of the fixed share of the private sector by the government. A stake is assigned to each distributor, according to its previous dealings with manufacturers. A trader who does not observe good storage practices or the sales price range is deleted from the list. The number of private sector dealers is around 6 000. About half are licensed, while the other half is unlicensed, and generally small retailers are located in the villages. Sellers generally receive their fertilizers from distributors and sell them to retailers. The Egyptian Fertilizers Association has established distributors and dealers bases for its members to ensure appropriate and appropriate pricing margins so that private sector traders are not accused of inappropriate practices, as was the case in 1995, Yassen *et al.* (2011); Mansour *et al.* (2013); Mansour *et al.* (2014); Mansour (2015); El-Hagarey *et al.* (2015); Yassen *et al.* (2018); Mansour *et al.* (2016a-c) and (2019a,b), Abd-Elmabod *et al.* (2019).

Ayyad *et al.* (1990); Nivo and Chen (2010); Dawson *et al.* (2015), Mansour *et al.* (2015, 2016; 2019c), and have determined that the water stress criteria to produce some field crops and food supplies sometimes go, through certain stages that depend on weather conditions and water shortages in the soil, often with a clear rise in temperatures and lack of adequate use of nutrients and salinity in the soil, which leads to an inappropriate osmotic pressure to absorb nutrients with Soil water.

Conclusion

The entire fertilizer sector faces fundamental changes as a result of changing production patterns and trade policies, such as removing price and subsidy controls, producing new types of fertilizers, increasing the role of the private sector, and using modern methods to determine crop requirements for fertilizers according to a diverse group, location, and agricultural system.

Effective and proper use of fertilizers is necessary to increase soil productivity. Soil productivity and soil fertility levels over time are constantly changing and studies are needed. Here are some suggestions to help improve fertilizer use:

Reliable systems for soil and plant tissue testing need to be developed to complement the results obtained from field trials. Much has been done in this area, but more work is needed to define the critical boundaries of key elements and micronutrients for different soils and crops.

Many complex and mixed fertilizers were developed for the farms before evaluating their effectiveness and suitability under different climatic agricultural conditions.

The direct and residual effect of some organic fertilizers and organic fertilizers. In Egypt, the soil is poor in organic matter, with less than two percent in most soils. However, very few studies have been done on the use of organic fertilizers and fertilizers, despite the fact that these organic fertilizers improve the physical, chemical, and biological properties of the soil, as well as protect the environment from pollution.

Preparation of fertilizer recommendations for newly released crop varieties. Crop breeders develop new varieties of different crops, with high yield potential. Before introducing these new varieties to farms, high priority should be given to developing appropriate fertilizer management techniques, to ensure that appropriate fertilizer recommendations are available.

NP, nitrogen, PK, should be developed in addition to nitrogen fertilizers microelements that are suitable for drip and sprinkler irrigation systems used especially in the newly reclaimed areas.

The nutritional value of food crops and the quality of cooking are also affected by fertilizer applications

Studies have been done on very little nutritional value and food quality. The main objective of this proposal is to improve the nutritional value and food quality of food crops through efficient use of fertilizers.

Most studies were conducted to evaluate different sources of phosphate and focused on the direct impact of these sources. Very little work has been done to assess the residual effect from these sources through long-term trials. The value of fertilization from different sources should include both direct phosphates and the residual effect from different sources under different cropping systems.

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