



SAND FIXATION AND ITS IMPLICATIONS FOR
AGRICULTURAL DEVELOPMENT IN LYBIA

*Abdelkader M. El-Meheshi**

Since the discovery and utilization of Libyan oil in 1959, the government has paid more attention to agriculture, to obtain self-sufficiency and to secure an exportable surplus. Studies have been carried out to improve various crops, both indigenous and imported, by testing. The most promising varieties are compared with standard varieties, already planted in farmer's fields. With the help of foreign agricultural experts and the application of oil revenues to the importation of the most current agricultural machinery, projects have been initiated which try to maximize utilization of agricultural lands and to provide surface storage to impound runoff for irrigation. The government has allocated L. D. 700,856,560 (the Libyan Dinar is equal to about \$3.38 U. S.) for the integrated agriculture development plan in the Ten-Year-Development Plan 1973-1983.¹

Introduction

This paper proposes to trace the government's and individual farmer's efforts to protect a large agricultural region in Tripolitania's

*Dr. El-Meheshi recently completed the Ph.D. at the University of California, Riverside. His current position is Lecturer in Geography, University of Libya, Tripoli.

coastal zone from invasion by moving sand dunes. (Fig. 1) It also discusses the potential economic impact in the region.

Through the ministry of agriculture, about two million transplants have been planted in 1977 for stabilizing sands and for economic reasons on an area of 2,000 hectares.² It is difficult to estimate the seashore sand dunes area because, as one advances inland, they are replaced by dunes of continental sand. By rough estimate, however, the area is about 60,000 hectares; about 30,000 hectares under castor beans, about 20,000 hectares under eucalyptus, and about 10,000 hectares under acacia. Because two-thirds of the sand dunes (about 40,000 hectares) is located in the zone of 300 mm. rainfall (Fig. 2) the castor beans could be planted on 30,000 hectares and eucalyptus on 10,000 hectares and acacia on 10,000 hectares.³

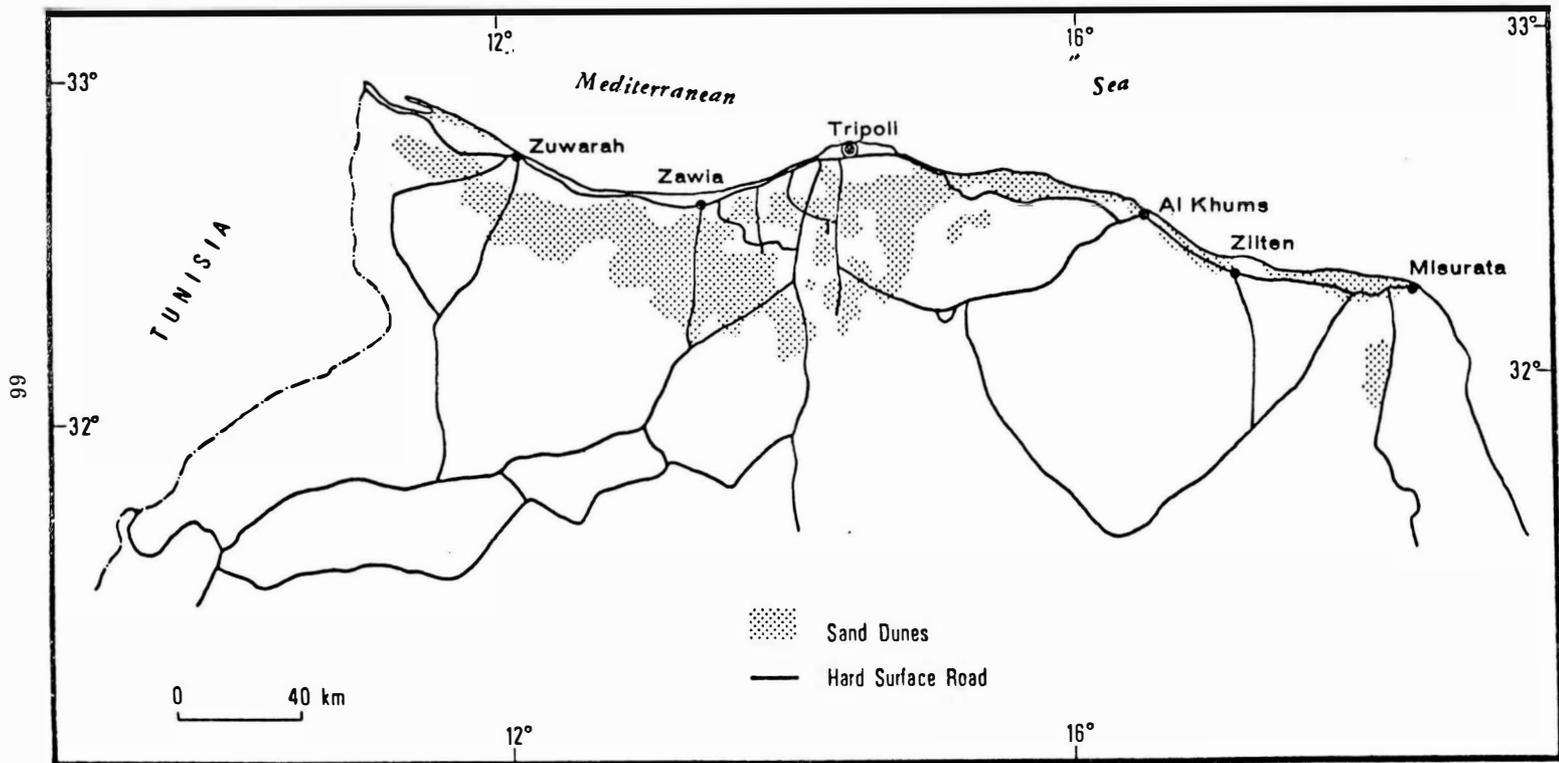
The Libyan oil revenues have a continuing effect on the country's agricultural projects and policies. For example, an area of 2,966 hectares, in 1974, was planted to prevent sand encroachment on surrounding arable lands.⁴ Before 1959 the acreage was very small compared to the area reutilized in the 1960's, and early in the 1970's. About 1,420 hectares and less than 10,800 were transplanted in the period of 1969-1970.⁵ Over 2 million Libyan Dinars have been allocated for sand dunes fixation and afforestation.

The significance of this land is its location in a belt of adequate rainfall relative to the rest of the country, and its location near markets associated with Libya's major population concentration in the vicinity of Tripoli.

The fixation of sand dunes through the use of plantings has dramatically facilitated the halting of shifting sands. A meaningful expanse of land surrounding fertile agricultural areas have been saved. Small plots have been put under cultivation because of the introduction of new agricultural machines and the establishment of new roads among sand dunes.

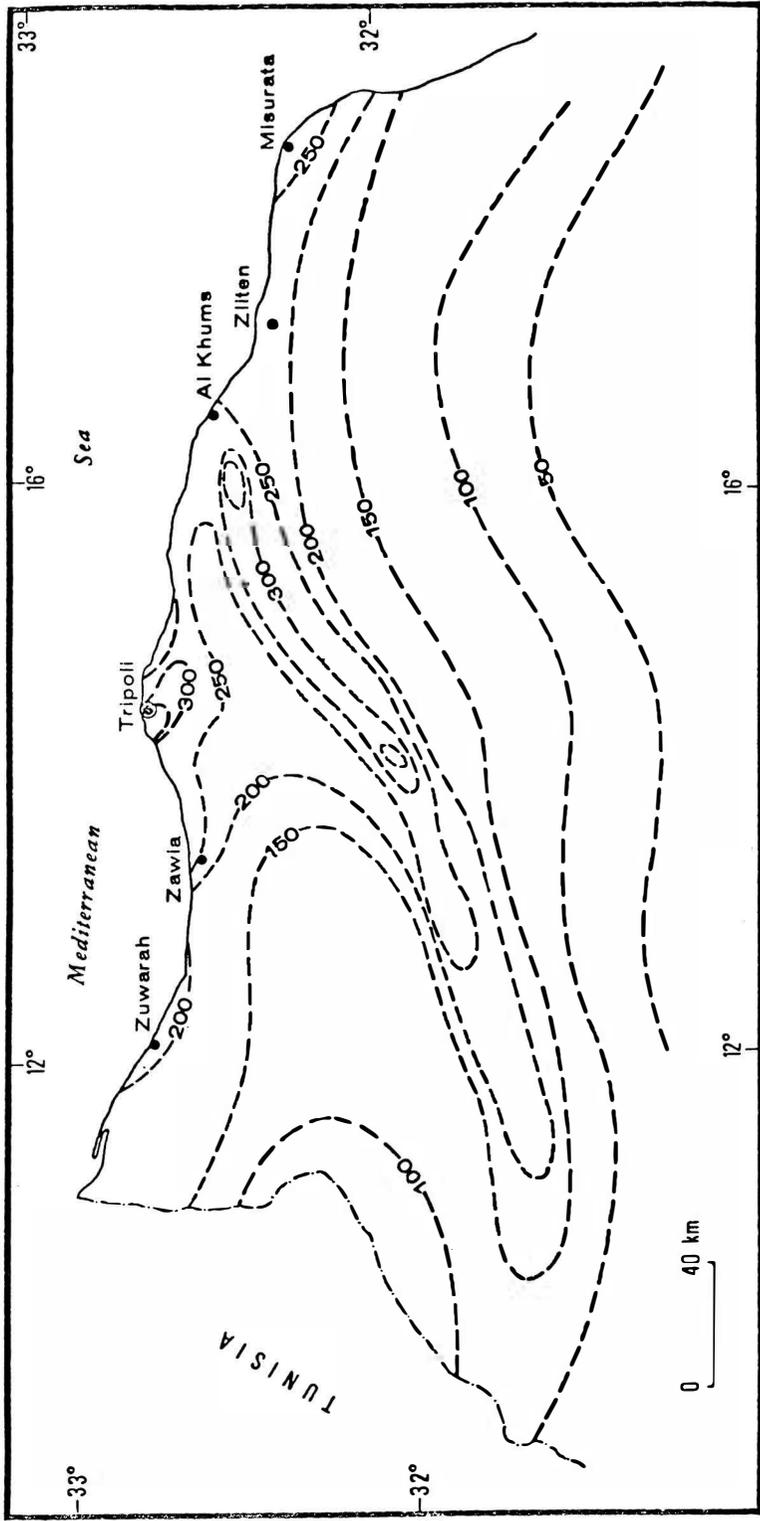
In 1953, Leone indicated that the potential for fixing and afforesting the dunes was in the water-holding capacity of the dunes. The sand dunes generally absorb and hold rain water very easily, especially when the filtration is obstructed some meters underneath by a hard surface. Their capacity for holding water increases with the fineness of the sand grains. This capacity is particularly high in the dunes of Tripolitania, which consist mainly of the fiber fractions. By decreasing the loss of water through evaporation, they act as true reservoirs of rain water.⁶

It is impossible to consider the planting or seeding of trees and other plants without first undertaking some preventive measures against the wind. (Fig.5) Without this caution, everything would be buried by the sand or destroyed by the corrosive action of the



Sand Dunes of Northern Tripolitania

Figure 1



Mean Annual Rainfall of Northern Tripolitania (mm)

Figure 2

sandbearing winds. On the other hand, in a land as deficient by forests as Tripolitania, it was not possible to take advantage of the system used in other lands, i.e., covering the area with small branches and seeding many varied plants in order to obtain, within a short time, a vegetation cover sufficiently dense to stabilize the dunes.⁷

After several years of experiments, during the colonization period of 1911-1938, the Italians developed a technique for sand fixation. They found small hedges of a plant called Dis (Imperata cylindrica) to be very efficient defense against sand. Messines stated that they stabilized and afforested over 3,500 hectares of sand dunes; after the first uncertain attempts, excellent results were obtained especially the protection of roads and highways. Before the intervention of the Italians, travel beyond Tripoli was precarious, whether in the direction of the east or the interior of the country, and involved many roundabout routes, but now the main highways are clear.⁸

These dunes of shifting sand are transported by the violent, predominantly NW-SE, winds of winter storms. They are a threat to a number of cities, especially Zuara, Homs, Zliten and Misurata. Some action must be taken to combat this, since it is difficult to reforest these lands because in some areas the coarse-grained

sand will not retain water. The area is, however, a fairly humid one, with a mean precipitation of 150-300 mm. The sea winds also carry moisture, and the sea induces mild temperatures. The Ghibli wind blows less often and with less intensity than in the interior, and evaporation is less.⁹

Sand can be stabilized in part by networks of small and low hedges constructed of dry vegetation, dune grass, and rushes. Dis plant is the most commonly employed. This dry vegetation slows down the shifting of sands considerably, but does not arrest it altogether. Their action, however, enables seedlings of forest trees, planted in squares or diamond-shaped enclosures of Dis, usually 3 to 7 meters long per side, to take root, so that the sands are finally stabilized by the growth of the new forests.

Most trees being used in fixing sands are acacia, eucalyptus, Aleppo pine, locust, tamarix, castor bean, bamboo, and the Australian pine, because they are well suited to the region's environment.

The use of high continuous barriers also aids in the fixation of the sea shore sands. These rigid barriers help build up artificial littoral dunes, in the shelter of which the sand invading the inland plam groves and agricultural lands can be fixed and covered with small, low thickets.¹⁰ So a combination of both methods is called for. Covering the sand completely with sticks and branches,

a system which, according to some authors, was an indispensable feature of stabilization, has been completely give up in Libya.¹¹

Present Economic Activities in Region of Sand Dune Fixation

Economic activities such as herding, forage, fruit trees, practices in this region, after the completion of fixation and planting In addition, the revitalized areas became important in terms of wood as fuel for heating, cooking, building homes and animal huts and for charcoal making in the surrounding areas.

Herding: Although it is illegal to keep animals on the recently fixed sands, there is an exception. The ministry of agriculture allows grazing in areas that have been fixed in the 1960's or earlier under seasonal regulations.

Among the animals, sheep and goats predominate. Their number stands about equal, and together they far outweigh the numerical importance of cattle and donkeys, which make up the greater part of the remainder of the livestock being maintained in this region.

The great majority of the herders depend entirely upon natural vegetation for maintenance of their flocks, and the hazards associated with the low, erratic rainfall and periodic droughts are, therefore, at a maximum. As a consequence, the number of animals, together with their price, fluctuates considerably as a result of heavy death losses and forced sales of breeding stock during years of droughts.¹²

In the last years the government has established a policy of importing forage from Europe to meet the demands in drought years.

It has been estimated that the number of animals in some parts of Tripolitania is as much as 50% above what the range would support even in those years when rainfall is comparatively high.¹³ To those herders, the government provides continuous support.

A number of crops can be used as feed for animals. Agricultural experts in Tripolitania have variously recommended the production of alfalfa, barley, carob, and varieties of cactus, as well as the collection of indigenous grasses for use as hay.¹⁴ The use of cereals as a supplemental feed may hold out more hope for profitable enterprise.

Livestock drives should be placed under some form of management; vast regions should be allowed to recover their vegetation by regular rotation of range and the prohibition of grazing in some areas for certain periods, especially after the planting of small trees.¹⁵

Forestry and grazing are both of prime importance in forest economy in Libya and must be studied together so that a solution encompassing both can be found.¹⁶

The government's efforts to increase animal production have included massive allocation of funds to numerous agricultural cooperatives and individual farmers. The immediate goals were to provide interest-free loans, grants, and technical assistance

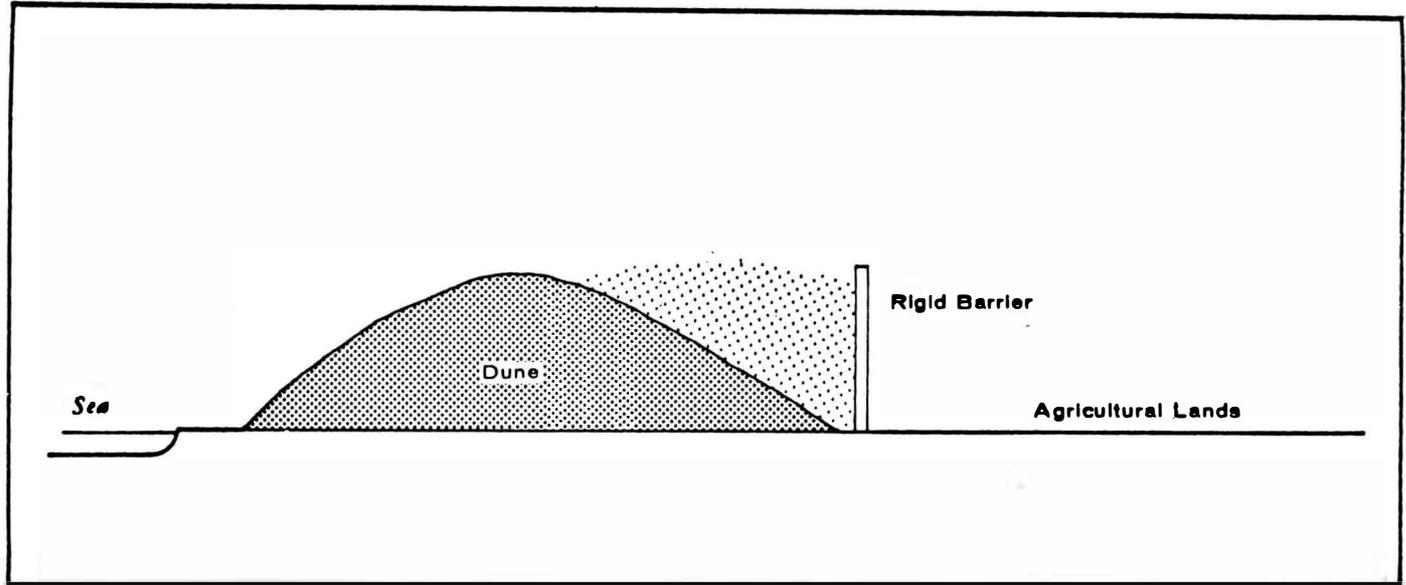
for farmers to meet the ever-increasing demands for meat and dairy products.

Castor Bean Seed Production: Castor bean culture has a significance for Libya as a crop successfully grown on sand soils even in areas with low rainfall. Although a relatively new crop, by 1960 castor beans occupied 5,218 hectares of crop land in these areas, resulting in an annual production of 2,388 quintals.¹⁷ The production has been growing more than threefold.¹⁸

Foreign demand appears to be increasing steadily. It is the oil of the castor beans that is of value. Employed primarily as a lubricant for aircraft engines and hydraulic cylinders, it is also used in textiles and leather industries and particularly for the production of synthetic rubber, synthetic leather, linoleum, varnish, and typewriter tapes.¹⁹ Most of the export goes to Italy and a small percentage to Lebanon and England.

Vegetable Production: Vegetables, most of which are perishable, tend to show a production concentration near the urban markets such as Tripoli, Homs, and Misurata. However, a sizable segment of the production is marketed in other centers such as Benghazi. (Fig.4).

These fertile agricultural plots, among the sand dunes, are one of the important suppliers to the demands of the Libyan population. With the increase in national affluence and urbanization, demand for



High, rigid continuous barriers are widely utilized to halt seashore sands. This is usually followed by the planting of trees for stabilization in the rainy season

Figure. 3

these plots continues to grow. However, the application of new irrigation systems, fertilizers, and other forms of agricultural technology to the arable lands of Libya, and particularly, the reclaimed areas among and around the sand dunes, should more than offset this trend.

The region is very specialized in terms of vegetables: onions, tomatoes, parsley, lettuce, potatoes, and peppers are the most suitable for planting in these sandy soils. The application of chemical and organic fertilizers on some parcels of land are required due to the lack of organic material in the soil.

Fruit trees: Palm trees are grown in a considerable number in these plots. Dates are a major item in the diet of the Libyan population. Small quantities are brought by the date packing plant in Tripoli for distribution under the school food program. Another date packing plant is under construction in Homs for packing the surrounding area date production. The export goes mainly to Niger and Chad.

Apples constitute the principal fruit in these reclaimed areas. The bulk of the commercial crop is grown within a relatively small area near the city of Misurata. Production goes as far as Benghazi and Tripoli. To satisfy demands, the country imports large quantities mainly from Lebanon, Italy, and France every year.

Citrus, especially lemons, has shown very rapid expansion. The sandy soil has proven suitable for growing lemons. With the availability of large quantities of underground water the crop is meeting a high percentage of demand. (Fig. 5)

Olive production is well adapted to the soil and rainfall; it resists wind and high temperatures, and its cultivation is relatively simple. A few olive areas are irrigated but fundamentally olive groves are watered by rainfall, irrigation being essential only in getting young trees started and to guarantee top quality.

Wildlife and Hunting: Hunting of small game animals and wild birds is important for some farmers in the fixed sand areas. Varieties of wildlife are present: rabbits, foxes, jackals, reptiles, and quails, to mention a few.

Recreation Areas: The sand dunes are located on the beautiful Mediterranean Sea Coast. With the planting of trees and recent building of cabins along some parts of the Tripolitanian coast these areas become one of the country's most important recreational areas. It is possible to drive through a network of newly paved roads to the beaches. The government has given due attention to connecting cities with each other and to connecting areas of production with markets. The fixation of shifting sands has also hastened the process of building roads and the expansion in the



Figure 4. Agriculture in the sand-fixed zone: Pumpkin squashes.



Figure 5. Agriculture in the sand-fixed zone: citrus.

the fishing industry so that some fishing activities are now taking place on a commercial basis.

Labor: A large number of workers derive their income from participating in the sand dunes fixation services. A number of workers are required for cutting, collecting, and loading in trucks the Dis grass to be planted in shifting dunes.

The source of the grass are located in areas from 15 to 50 km. from the sands. During the winter planting season the government supervises the operations. After the fixation, the planting of seedlings usually follows. All phases of sand fixation have to be manually completed. It is the farmers' opportunity to earn cash, especially since the fields require little work during the winter season.

Conclusion

Apart from oil, agriculture represents the greatest resource of the country, as 30 percent of the population obtain their income from agriculture and related services. Currently agricultural production in Libya does not meet the demand.

The discovery of petroleum brought about prospects for the improvement of the agriculture sector. The agricultural policy in the nation aims, with the investment of oil revenues, to satisfy local demands and even to become involved in export as well. For attaining this goal, the government invested effort and money

in promoting this vital sector. Loans and subsidies have been extended to the farmers and agricultural cooperatives for reconstruction, reclamation, land reform purposes, and for setting up marketing cooperatives. Oil revenues have also helped the carrying out research work in water resources and soil protection, for promoting agricultural and livestock, and for developing forests and pastures.

The government has already executed a number of agricultural projects, such as sand dunes fixation discussed here. These projects are important contributors to the country's increasing demands. The government's plans aim toward self-sufficiency by the 1980s.

Plans to increase staple crops, vegetables, and fruit production have included massive allocations of funds. More sand dunes will be put into production and millions of seedlings will be planted.

NOTES

¹Libyan Arabic Republic, The Human March in the L.A.R. (Tripoli: Government Printing Office, 1976), p. 95

²New Dawn Newspaper (Tripoli), Jan. 20, 1977

³D. Lalevic, et. al., Agriculture in Lybia and a Plan for Its Development (Tripoli: Government Printing Press, 1966), p. 370.

⁴Libyan Arabic Republic, 1st September Revolution Achievements, 1969-1974 Tripoli, Government Printing Press, 1974, p. 55.

⁵Ibid.

⁶G. Leone, "Origin and Reclamation of the Dunes in Tripolitania," in Desert Research Proceedings, Jerusalem Symposium, May 7-14, 1952, (UNESCO, 1953), pp. 401-402.

⁷Op. cit., 402.

⁸P.D. Messines, "Report to the Government of Lybia on Forestry," Report No. 221, (UNESCO, 1953), pp. 36-37.

⁹Op. cit., p. 23.

¹⁰Op. cit., p. 37.

¹¹Ibid.

¹²Benjamin Higgins, The Economic and Social Development of Lybia Tripoli: United Nations Mission to Lybia, 1953, pp. 83-84.

¹³World Bank, The Economic Development of Lybia Baltimore: Johns Hopkins University Press, 1960, p. 168.

¹⁴Anthony Bottomley, "Economic Growth in Semi-Nomadic Herding Community," Economic Development and Cultural Change, Vol. XI, No. 4 July, 1968, pp. 414-415.

¹⁵Messines, op. cit., p. 188.

¹⁶Ibid., p. 185.

¹⁷Abdelkader M. El-Meheshi, Ezzeria' ah Al-Libiyah: A Study of Libyan Agriculture, Unpublished M. A. Thesis, San Jose State University, 1974.

¹⁸Lalevic, op. cit., p. 105.

¹⁹Op. cit., p. 106.