



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

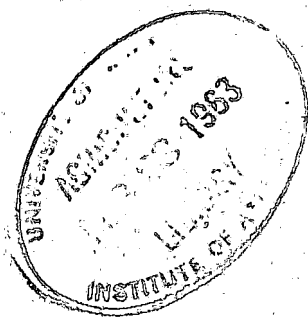
Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**INTERNATIONAL
JOURNAL OF
AGRARIAN AFFAIRS**

Vol. III, No. 4, January 1963



**The Economics of
Water Supply
and Control:
Greece
Italy**

*Produced by the
University of Oxford Institute of Agrarian Affairs
in conjunction with the International Association
of Agricultural Economists*

Price 10s. 6d. net

OXFORD UNIVERSITY PRESS

LONDON

By C. EVELPIDIS

Agricultural College of Athens

IRRIGATION IN GREECE

GREECE is 51,182 square miles in area but, owing to the pre-dominance of mountainous regions, only 27 per cent. (8,850,000 acres) is cultivated. The cultivated land is allocated amongst annual crops (80 per cent.), olive trees (10 per cent.), vineyards (6 per cent.), and orchards (4 per cent.).

The population (1961 census) amounts to 8,350,000 inhabitants, of which 53 per cent. are peasants. This is equivalent to 163 inhabitants per square mile of the whole area and to 0.9 inhabitants per cultivated acre, making this one of the highest densities of agrarian population in Europe.

Greece is primarily an agricultural country, 34 per cent. of the national income and 80 per cent. of exports coming from agriculture. There are about 1,000,000 farms with an average area of less than 9 acres, so that a rational exploitation of family salaries of peasants is impossible, and the family members are underemployed. This is one of the main causes of limited incomes and of the unsatisfactory standard of life of rural populations. Hence the need for major works of land improvement aiming at an increase in cultivated area in the agricultural production of the whole country, and hence, of the individual peasants.

Hydrological conditions

The climate of Greece is subtropical (Mediterranean): mild and rainy in autumn and winter, dry in spring, hot and dry in summer. Greece is situated between the 14.5° C. and 19.5° C. isotherms. But in the northern and mountainous parts of the country temperatures fall well below freezing-point, while they are always above it in southern districts and in the islands. Summer temperatures reach a maximum of 42° C. Annual average cloud cover is in the range of 4/10. On average, in spring and summer six days out of seven are clear and sunny.

From the point of view of rainfall, Greece is divided into three zones:

- (1) West continental Greece, west islands and west Macedonia, with more than 23 inches of rain;

- (2) East continental and insular Greece, from 16 to 23 inches;
- (3) Attica, South Cyclades, East Crete, from 8 to 16 inches.

Rainfall is not uniform throughout the year. The highest amount falls everywhere between October and February. Consequently, spring crops are short of water; and during the vegetative period they cannot develop satisfactorily owing to the low rainfall and to high evaporation rates. After a dry spring even autumn cultivations suffer.

It is, therefore, only by irrigation (apart from some exceptional conditions) that spring plants can be given all the water they need during the critical periods of growth.

Due to the mountains and general hydrological conditions Greece has no important rivers. The biggest are those originating in the Balkan Peninsula and flowing into the Aegean Sea. These are the Nestos, the Strymon, the Axios (Vardar) and the Evros (Maritza) which has the longest run on Greek territory (127 miles). The longest rivers with their sources in Greece are the Aliaknon (196 miles) in East Macedonia, the Acheloos (195) in West-Central Greece, the Pinios (135 miles) in Thessaly, the Sperchios in East Greece, the Arachthos (90) and the Louros (47) in Epirus, the Alpheus (75), the Peneus (48) and the Pamissos (27) in the Peloponnese. The other watercourses are better described as torrents than as rivers.

Natural springs are numerous, mainly with a relatively poor flow. They are spread out all over the country, both in the mountainous areas and in the plain and are used partly for providing inhabited places with water and partly for the irrigation of orchards. There are also lakes here and there in the country, mainly in North Greece, with a total area of 220 square miles; these are natural water reservoirs. There are finally, in many places, underground waters feeding artesian and other wells.

History of Greek irrigation. Agriculture in Greece has a tradition of several thousand years. So far as water is concerned, in ancient times the Greeks had deified the different forms in which it appeared on earth (rivers, springs, seas, rain &c.). The Naiads, protectors of the fresh water of rivers, lakes and springs which fertilized the earth, were considered to be the daughters of Jupiter, the highest of the gods. Homer often refers to the irrigation of gardens in the island of Calypso, and more particularly of Alcinous' gardens. He also insists on the importance of irrigation, even for olive plantations. Pausanias records that a statue of Earth entreating Jupiter to send rain stood on the Acropolis. Xenophon describes the methods of irrigation followed

in his time. Theophrastus emphasizes the importance of irrigation for fruit trees and remarks that best results follow the combination of irrigation and an appropriate atmospheric temperature.

In spite of this, it appears that the ancient Greeks did not use water for irrigation on a large scale; they were satisfied with using spring water for limited orchards. No ancient text mentions the use of water for large areas, or extensive irrigation works. This must be for the following reasons:

- (a) they grew mainly winter plants for which irrigation was not essential. (Most spring crops of our times were unknown in those days. Rice, maize, cotton, tobacco, potatoes and other vegetables, as well as fruit trees which are now an important part of Greek agriculture, were not cultivated);
- (b) there were no big towns requiring fresh vegetables and fruit. (Difficulties in communications were an obstacle to the transport of such products to distant consumer centres; orchards were local in character); and
- (c) most rural estates were being exploited by means of slaves and serfs while the landowners lived in town—a system which does not favour the development of intensive culture.

Furthermore, large irrigation works were made difficult by the division of the country into small states, unstable and sometimes hostile to each other; agreements on this and other points were, therefore, not easy to achieve.

Completed hydraulic works. Since the Proclamation of Independence (1828), both farmers and the state have made many efforts to carry out small and large hydraulic works. The first important one was the draining of Lake Copais, begun in 1865, which reclaimed 51,000 acres, half of which are already irrigated.

Later, and particularly after the arrival from Turkey and Bulgaria of 1,300,000 refugees (half of whom settled as peasants), the need for irrigation became more urgent. In 1930 large-scale works for land improvement were started, mainly in Macedonia. Lakes and marshes were drained and rivers were regulated. As a result, 300,000 acres—50,000 of them irrigated—were restored to agriculture.

Hydraulic works developed after the Second World War at an increasing speed, both with regard to regulation of rivers and to utilization of springs and wells. The main works were carried out on the rivers Louros and Arachtos in Epirus, and Pinios and Megdovas in

Thessaly. Underground water seams were also utilized, so that we have now in Greece 120,000 wells 50 feet deep and 15,000 artesian wells of an average depth of 260 feet.

In 1960 the irrigated area of Greece amounted to 1,025,000 acres, the water coming from wells (22 per cent.), artesian wells (10 per cent.), springs and rivers (66 per cent.) and lakes (2 per cent.).

Hydraulic works on rivers and the building of barrages are the concern of the Public Works Service, while smaller hydraulic works come under the Land Improvement Service of the Ministry of Agriculture. Well borings are left to private initiative, supported by long-term loans by the Agricultural Bank.

Further outlook. The competent authorities make every effort to increase the irrigated area of the country. Barrages play a great part in mountainous zones, cisterns in insular and dry zones. The five-year plan for economic development (1960-4) foresees the construction of some large and medium-scale works which will increase the irrigated area by 1,350,000 acres. Eventually, it is hoped to increase the irrigated area to 4,130,000 acres, viz. about half the arable land of the country. The total irrigated area would then consist of 250,000 acres irrigated by wells, 250,000 acres by artesian wells, 1,830,000 acres by rivers and springs, 200,000 acres by lakes, 1,350,000 acres by barrages and 255,000 acres by rain cisterns.

Economic conclusions. The cost of these large-scale hydraulic works has averaged 215 dollars per acre—at least equal to the value of the bare land. Small hydraulic works are cheaper, but to their cost must be added the cost of fuel needed for pumping. This expense is too much for most farmers (who, especially since the agrarian reform, are the principal owners of arable land). The State, therefore, meets up to 70 per cent. of the cost of large works and up to 40 per cent. of the cost of small works.

Irrigation is of extremely high importance because it has made it possible to substitute for cereals other crops giving much higher returns, such as cotton, leguminous plants, vegetables and fruit trees. (In general, irrigated land yields 4,650 drachms per acre, as against 1,400 for non-irrigated land.) This can be illustrated by a comparison between non-irrigated and irrigated crops (data for 1960, see opposite).

So far as shrubs are concerned, olive groves are becoming less important than citrus plants and orchards. It should also be noted that irrigation supplants fallow land and allows for supplementary cultivation on the same land.

| | <i>Area in hectares</i> | |
|-----------------------------------|-------------------------|------------------|
| | <i>non-irrigated</i> | <i>irrigated</i> |
| Winter cereals | 1,481,960 | .. |
| Maize | 135,220 | 75,190 |
| Rice | .. | 14,340 |
| Dry leguminous plants | 84,918 | 15,285 |
| Gourdes | 17,858 | 11,037 |
| Potatoes | 12,949 | 24,581 |
| Leguminous plants | 19,560 | 64,690 |
| Tobacco | 82,627 | 10,584 |
| Cotton | 55,238 | 112,552 |
| Other industrial plants | 39,720 | 3,521 |
| Leguminous grain | 58,184 | .. |
| Cereal hay | 48,064 | .. |
| Leguminous hay | 172,390 | 42,082 |
| Annual cultures | 2,228,100 | 374,508 |
| Double cultures | .. | 35,000 |
| Fallow | 230,000 | .. |
| Total | 2,458,100 | 339,508 |
| SHRUBS | | |
| Olives | 505,200 | 17,400 |
| Vines | 218,000 | 5,700 |
| Citrus fruits | 2,700 | 20,400 |
| Orchards | 97,900 | 27,000 |
| Total | 823,800 | 70,500 |
| Grand total | 3,281,800 | 410,008 |

On the other hand, the increased production, due to irrigation, of vegetables, cotton, potatoes, fruit, and citrus has led to a crisis, because these products cannot find a market in the country. A further development in irrigation works will make matters worse. It is hoped, however, to find a market for some of these products, especially in Western Europe, because of the development of the European Economic Community, from which much of the capital needed for the works may be borrowed.

Hydraulic works and land improvement works in general are too expensive. To their cost one must add every year the cost of keeping the water-courses free from obstruction, and also the cost of preventing the waters from changing courses. In order to obviate these disadvantages, the policy has been to build works with multiple aims, having an eye to integral improvements through the utilization of water for both irrigation and power-stations. This is possible in the greater part of Greece, owing to the mountainous nature of the country and the many existing water-falls. Dams keeping waters back are

often necessary in these cases, because waterflows tend to be too torrential. Such regulation has been achieved particularly at Megdova in Thessaly, and in the works which are still in progress for the utilization of the Acheloos, the most important watercourse with its source in Greece itself. Such works, however, are not possible for the rivers in North Greece, whose sources are in neighbouring countries.