TREE FRUIT GROWING IN SPAIN

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SINCE old times writers and poets have often praised the fruits of Spain in a flattering way. Already in the first century A.D. Marcial, writing about a district near Zaragoza, mentioned that it was “happily loved by Pomona”. References to the varieties of fruits grown and their delights can also be found in writings of the thirteenth century. Spain has also played an important role in spreading fruit growing to the New World. There is evidence that citrus seeds were taken to America by Columbus on his second expedition in 1493. The first olive plants were carried by Spaniards from Sevilla to the Antilles and from there to the American continent. Spanish colonists have contributed greatly to the distribution of fruit trees from Spain to America. A Bill of August 1531 ordering that all ships leaving for America should take a certain amount of plants, vines and olive trees, in order that no one should leave without taking some of them, may have been an important factor in the introduction of Spanish fruit varieties to the colonies. The first peach, for instance, was introduced to the United States by a Spanish colonist who settled in St. Augustine in the sixteenth century, and the first apricots introduced to America were brought to California from Spain by the early Mission Fathers in the eighteenth century.

It is not an easy task to give a clear picture of what fruit growing is like nowadays in Spain. There is little statistical data of recent date available concerning the industry, while the problems confronting it are many. This short account is therefore just an attempt to give a general idea of the extent and localization of the industry, the general methods of culture and the main varieties of fruits grown in Spain.

The geographical position of Spain and the great variations not only in rainfall but also in altitude and soil create regions which are different from each other. We can almost consider the north-western and south-eastern regions as being the climatic poles of the Iberian Peninsula: north-western Spain has a rich precipitation and uniform climate, whereas south-eastern Spain is dry and has a warm climate with great temperature differences. The position regarding rainfall is recorded on the map in Fig. 1. It will be seen that in extensive areas precipitation
is very light. Very broadly, Spain may be divided into the following areas, each with its own distinctive climate:

(1) The Cantabrian provinces of north-west Spain with its coastline open to the Atlantic. The average annual rainfall over this area is 1,000 mm. and evenly distributed. The climate is more or less similar to south-east England but milder. The fruits grown here are mainly apple, chestnut, plum and pear.

AVERAGE ANNUAL RAINFALL

Fig. 1.—Map of Spain representing the average annual rainfall for the period 1913–32. Copied from Mapa pluviométrico de España—Servicio Meteorológico Nacional

(2) The eastern Mediterranean provinces, including the Balearic Islands, with mild winters and winter precipitation. Save for a small part in the north against the slopes of the Pyrenees, the rainfall is rather low, the average annual precipitation being 300 mm. with some small patches receiving 600 mm. Many fruit orchards here are depen-
dent on irrigation water. The kinds of fruits are vine, olive, almond, hazelnut, citrus, fig, peach, apricot and date.

(3) The Andalusian provinces in southern Spain with its coastline open to the Atlantic and the Mediterranean. Inland the winters are mild and the summers very hot. Rainfall is unevenly distributed. The lowland along the coast in the province of Malaga has a sub-tropical climate with mild winters and summers. The chief fruit crops are vine and olive, and where irrigation water is available stone fruits, sour oranges and bananas.

(4) The province of the central tableland where the climate is continental and rainfall unevenly distributed. The chief fruit crops are vine and olive in unirrigated lands. Where irrigation water is available stone fruits, apples, and pears are also grown.

(5) The provinces of the valley of the Ebro and its tributaries in north-east Spain, between the Pyrenees and the central tableland. Precipitation in this region is slight and occurs in the winter months. Thanks to the irrigation schemes of the Ebro many irrigated lands are occupied by fruit orchards. The chief fruit crops are vine, olive and almond in unirrigated areas, and apples, pears and stone fruits where there is irrigation water available.

(6) The province of the Canary Islands lying between 27° and 30° N. latitude near the West African coast. The climate is sub-tropical with mild winters and summers. The rains occur in the winter months and fruit growing is dependent on the establishment of co-operative irrigation schemes, which are very well organized here. The chief fruit crop is banana. Due to the mildness of the climate several tropical fruits are grown in gardens for the local market such as avocado pears, mango, guava and papaya.

Rainfall and irrigation schemes are very important factors in Spanish fruit growing. Vines and olives are virtually grown only on unirrigated lands, whereas citrus fruits and bananas are only grown on irrigated ones. Where precipitation is light apples, pears, peaches, plums and cherries are grown when water for irrigating is available. Irrigation water is distributed in the orchard by the furrow method or by flooding. Irrigation systems have been used in Spain for many years. Even in Roman times aqueducts and water basins were used not only to supply water to the towns, but also for irrigation of the fields. But it was the Arabs who systematically introduced irrigation schemes to the country when they came to Spain at the beginning of the eighth century A.D. They also introduced waterwheels and small channels for the distribution of the irrigation water. Some of these channels are still in use to-day.
Many Spanish orchards are small and usually planted with varieties of fruits grown mainly for the local market. The fruit trees are often planted on the borders of other agricultural crops such as broad beans and potatoes. They may also be scattered among other cultures, or different kinds of fruits are planted together in one orchard. Many of these orchards are just a sideline on small farms where the farmer has neither inclination nor time to do much more than plant the trees and pick the fruit. Only bananas, citrus fruit, vines and olive plantations are generally managed on an effective commercial basis. They are also mainly grown as single crops. Of the cherries, plums and pears only approximately 20 per cent of the total number of trees are grown in single-crop orchards.

Clean cultivation is the most popular method of soil management in single-crop cultures. Cover cropping is very little used.

Vine and olive crops occupy the greatest acreage of Spanish orchard land; vine covering 3,774,859 acres and olive 5,391,621 acres. As for
the other fruits, no reliable data on the acreages of each kind are available. To give, however, some idea of the relative importance of some of them the graph in Fig. 2 is given, showing the different kinds of fruits which have a total number of more than one million trees.

The total acreage under fruits, including vines and olives, covers more than 18 per cent of all lands under cultivation. But the value of the fruit crops comprises more than 33 per cent of the total value of the agricultural output. And 52 per cent of the value of our export trade is for agricultural products, of which not less than 74 per cent comprises fruit and fruit products (fresh and dried fruits, fruit conserves, wines and olive oil). Hence fruit growing is an extremely important factor for the nation's economy. In spite of this fact for some kinds of fruit, relatively little has been done to improve the industry. The varieties of many kinds of fruit now grown in Spain are mainly local ones. There is indeed an overwhelming number of local varieties of apples, pears, peaches and apricots. It would be relatively easy to improve upon these by selection. There is great scope for the fruit breeder in Spain, where very little breeding of fruit varieties has been done.

The different kinds of fruit will be dealt with below in the order of their importance for our national economy. The various aspects of the industry will be treated in a general way. All data concerning acreage and total number of trees are obtained from "Anuario Estadístico de las Producciones Agrícolas, 1947", and average annual export values are for the period 1946–8.

VINES

The vine is one of the most important fruit crops of Spain, both because of its export value and of the important position it takes in the nation's social economy. Millions of Spanish families have their livelihood very closely linked with vine growing and wine making. And in many arid areas the vine is almost the only remunerative crop. It is grown in all fifty Spanish provinces (see Fig. 3). The largest acreage is to be found in the province of Ciudad Real in central Spain, followed by Valencia and Tarragona on the east Mediterranean coast, whereas Toledo in central Spain occupies the fourth place. The districts with the smallest acreage are to be found in the Cantabrian provinces of north-west Spain. Of the total acreage covered by vines 97 per cent is not irrigated and 83 per cent are cultivated in single cultures. The annual output comprises 94 per cent of the grapes for wine making and 6 per cent for the table and for drying.
Varieties

The main varieties of grapes for red wine and the regions where they are grown follow: Garnacha, Cencibel and Tinto de Madrid, grown in central Spain; Monastrel and Garnacha Tintorera, grown in the province of the central Mediterranean coast; Garnacha, Carinena and Sumoll, grown in Cataluña, Navarra and Aragon; Caino, Boscellao and Mencia in Galicia.

For white wine: Jaen, Airen, Malvar and Pardillo are grown in central Spain; Viana in Pamplona and Logroño; Xarel-lo, Parellada, Macabeo and Malvasia, grown in Cataluña; and Merseguera, grown in the provinces of the central Mediterranean coast.

Some regions produce typical regional wines with certain varieties. In Valladolid the variety Verdejo is made; in Galicia, Treixadura. In Jerez de la Frontera the variety Palomino or Listan is used for making the well-known sherry, and Pedro Ximenez for the montilla and moriles types of wine.
The chief table grape varieties are: Albillio and Moscatel, grown in the central region; Gatela, Planta Mula, Valensi and Moscatel Romano, in Valencia; and Ohanes, in Almeria. Ohanes is the chief variety for export, as it has a good keeping quality.

Rootstocks

The problem of the rootstocks arose, as in the other European vineyards, when Phylloxera vastatrix (Planckon) made its first appearance at the end of the last century. Before the invasion of this pest many varieties of Vitis vinifera were grown on their own roots. Its susceptibility to Phylloxera resulted in the destruction of a great part of the Spanish vineyards. Two methods of control were tried: (1) American Vitis spp. and their interspecific hybrids were used as rootstocks; (2) ungrafted hybrids between V. vinifera and American Vitis spp. were grown.

The American V. spp. introduced for rootstocks show a wide range of resistance to Phylloxera attacks. V. rotundifolia seems to be immune to this pest. The other American V. spp. show, however, great variation in resistance, V. rupestris, V. riparia and V. cordifolia being more resistant than V. Berlandieri.

The use of ungrafted hybrids of V. vinifera with American V. spp. has become more and more unpopular, both because of the difficulties of their adaptation to the soil and climate and because of the poor quality of the fruits.

With the introduction of American V. spp. a new problem arose, viz. their adaptation to soil with a high lime content which is very common in Spanish vineyards. The Spanish varieties of V. vinifera are very suitable for this soil type. But the American V. spp. show a great variation in their adaptation to it. Some varieties of V. Berlandieri grow well on certain soils with 60 per cent lime content, whereas varieties of V. riparia show signs of chlorosis even on soils with 10-12 per cent lime. It is not yet known whether this chlorosis is a deficiency symptom. But a study in progress on the chlorosis found in apple, pear and peach trees grown on lime soils at the Estación Experimental de Aula Dei has shown that iron deficiency is apparently the cause in these cases.

OLIVES

The olive is mainly grown in unirrigated areas and as single crop. Of the total acreage covered by it, 94 per cent is not irrigated and only 15 per cent is interplanted with other crops. Olive plantations are to be found in almost all Spanish provinces. They are absent in
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FIG. 17.—A Date Palm plantation in the province of Alicante (see p. 63)
Figs. 18, 19.—Millenary Olive trees in the Balearic Islands (see p. 57)
Fig. 20.—A Peach orchard in the province of Barcelona interplanted with Broad Beans (see p. 61)

Fig. 21.—Cherry growing in the province of Zaragoza. On many farms the Cherry trees are planted as borders to other crops
Fig. 22.—Bleaching the leaves of male Date Palms in the province of Alicante. A man is seen on the top of a male Date Palm tying the leaves together. The new leaves growing under the tied ones will grow in darkness and will be therefore free from chlorophyll and pale in colour (see p. 63)

Photo: C. Suñer

Fig. 23.—A Banana plantation in the Canary Islands. Close to the bearing plants suckers can be seen, which will continue to bear fruit after the parent plant is cut when the fruit bunch has been picked (see p. 60)

Photo: A. Bonaché
the provinces of the Cantabrian coast and in the highlands with a cold climate, such as Burgos, Palencia, Segovia, Soria and Valladolid. The provinces of Andalusia and of the Mediterranean coast form the most important commercial growing section, with the production centering around Jaen. Fifty per cent of all the Spanish plantations are situated in the Andalusian provinces.

Many olive plantations are more than a century old, and trees of more than a thousand years are to be found in the Balearic Islands (Figs. 18 and 19). This long life forms a handicap for the introduction of new varieties.

Ninety-seven per cent of the annual output is destined for the extraction of oil, which is the national cooking fat. Only 3 per cent is preserved for the table. Both olive oil and pickled green olives for the table are very important export items. Their value comprises 14 per cent of our agricultural exports.

The pickling of green olives for the table is of considerable importance and is chiefly concentrated in Sevilla, which produces 76 per cent of the total output. Green olives have been grown for the table for very many years. In the first century A.D. Columella, a Roman writer, wrote many formulas for their preservation. And at the beginning of the sixteenth century Herrera, a Spaniard, gave several other methods, such as maceration and preservation with salt, the perforation of the fruits and the use of various herbs for dressing them, such as fennel. Nowadays the industrial preservation of olives for the table comprises various treatments: (1) "Endalzado", a lye treatment by covering the olives in shallow vats with a dilute sodium or potassium hydroxide solution; (2) "Lavado", the olives are covered with water which is changed several times daily until the fruit is almost free of lye; (3) "Salado" and "En bocoyes", salting and casking. After washing, the fruits are transferred to "bocoyes" (casks of chestnut or oak), which are filled with brine, closed tightly and placed in a sunny position for the lactic fermentation to finish the process.

**Varieties**

Mainly local varieties are used, each zone having its dominant and sometimes unique variety. To mention some popular varieties: Gordal and Manzanilla for the table, and Verdillo, Picudo, Racional, Carrasqueño, Cornicabra, Lechin and Negral for oil extraction. Gordal is the chief variety used for the pickling industry in Sevilla.

**Propagation**

Propagation is mainly vegetative by cuttings or suckers. Some
varieties such as Gordial are grafted on to wild olive seedlings or on to plants raised from cuttings of other varieties.

NUT FRUITS

The nut fruit industry of Spain includes almonds, hazelnuts, chestnuts and, to a small extent, walnuts. Nuts form an important item of our export trade, representing 6 per cent of the total value of exported agricultural products.

Almonds, comprising 85 per cent of the nut export value, are by far the most important. They are to be found in almost all Spanish provinces, absent only in the Cantabrian provinces bordering the Atlantic. The largest plantations are situated in Alicante and Murcia and in the Balearic Islands. Seventy per cent of the total number of our almond trees are to be found in these areas. Almond is chiefly cultivated as a single crop on unirrigated lands. Varieties worth mentioning are Desmayo, Pestañeta, Mollar, Blanqueta, Comun. The variety Desmayo is preferred for areas where spring frosts occur, as it is considered to be more frost-resistant. Seedlings of bitter almond are generally used as rootstock.

The hazelnut industry is concentrated in the province of Tarragona, where 80 per cent of the total number of our hazelnut trees are to be found. A popular local variety is Negreta de Tarragona.

Chestnut growing is chiefly situated in the Cantabrian provinces in north-west Spain. Half of the total number of our chestnut trees are grown in this area.

Walnuts, with a total number of 634,000 trees, are scattered over the whole country.

CITRUS FRUITS

The first orange trees were apparently introduced to Spain by Arabs during the tenth century; they used them mainly as ornamental trees. The Spanish name for orange, *naranja*, is undoubtedly derived from the Arabic, *naranj*. As early as the sixteenth century Spanish oranges were sent abroad, although citrus growing on a commercial scale did not begin to be developed until the start of the eighteenth century. Now citrus growing is by far the most important Spanish fruit industry because of its export value, although vine and olive have the largest acreages. Twenty per cent of the total export value of our agricultural products is represented by citrus fruits and chiefly oranges.

Until the Civil War of 1936-9 Spain was the second largest orange-producing country in the world, being exceeded only by the
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United States. The Civil War and the Second World War gave a serious setback to the industry.

The Spanish citrus industry comprises sweet and sour orange, mandarin orange and lemon. Grapefruit is not popular and is very little grown.

The most important commercial citrus areas are the provinces of Tarragona, Castellon, Valencia, Alicante, Murcia and Almeria on the coast bordering the Mediterranean, between 37° and 41° N. latitude. The production is concentrated around Valencia. Seventy per cent of the total production comes from this area. In the provinces of Sevilla, Cordoba and Cadiz in southern Spain sour oranges form the basis of citrus growing. The production is concentrated around the city of Sevilla. Before the recent Civil War considerable quantities of sour oranges were exported, mainly to Britain, where they were used for the manufacture of marmalade.

Citrus groves are also to be found to some extent in the Balearic Islands and the Canary Islands.

Sweet oranges take a predominant place in our citrus industry. Much attention has been given to standardizing the varieties and to extending the season of ripening by the use of early and late maturing varieties.

Varieties

The following standard varieties are popular: Washington Navel, imported from the U.S.A. in 1909, and Cadenera, both early varieties; Comuna (common) and Sanguina (blood orange), mid-season varieties; Verna and Late Valencia, both late varieties. The mandarin oranges are mainly Clementine. The sour oranges of the Andalusian citrus groves, known as naranja agria in Spain and Seville, are called bitter, sour or bigarade oranges abroad.

The grapefruit are American-imported varieties. But little study has been made of these varieties or of varieties of lemon.

Rootstocks

The sour orange is also important for the citrus industry for its general use as a rootstock because of its resistance to gummosis. It is the chief rootstock used in Spanish citrus groves. Other rootstocks used, but of very little importance, are seedlings of trifoliate orange (Poncirus trifoliata (Linn.) Raf.) and lemon (Citrus limon (Linn.) Bur.).

BANANAS

Banana growing in Spain is chiefly concentrated in the Canary
Islands. Small plantations can be also found in the southern part of the Spanish peninsula.

The time when the first banana was introduced to the Canary Islands is not known. It is, however, supposed that they were already in the islands during the fifteenth century. Banana plantations on a commercial scale were begun towards the end of the nineteenth century after nopal growing (*Nopal coccinellifera, Salm-Dyck*) for the cochineal industry was not profitable any more. The nopal-cactus was an important foodstuff of the cochineal insect (*Cactus casti*) which produced cochineal, a dyestuff for making carmine. This industry ended when the much cheaper synthetic aniline dyes appeared in the world market.

In the Canary Islands the banana is raised chiefly for export. Bananas are cultivated on the level plains of the lowlands and the artificial terraces of the hilly sites of the Islands of Tenerife, Gran Canaria, Palma and Gomera. About 1½ million plants are grown, which is 90 per cent of the total number of banana plants in Spain.

The export trade in bananas from the Islands has assumed very large proportions. It provides the bulk of bananas for the large consuming markets of the Spanish peninsula, western Europe and Scandinavia.

The chief variety grown is Enana, a dwarf banana (*Musa Cavendishii*).

Bananas are vegetatively parthenocarpic and effectively seed sterile. They must therefore be propagated by suckers. The plant is, in fact, a huge perennial herb. It produces a bunch of fruits, and the stalk then dies if it is not cut down after picking. In the meantime suckers have arisen from the rhizome. Thus a stalk bears only once, but the sprouts which arise from the rhizome of the same plant continue the fruit-bearing (Fig. 23). A plantation will therefore continue to produce for some years. For new plantations the suckers are separated from the parent plant with a spade and transplanted to the new site. This is usually done in the summer.

When harvesting the fruit the whole bunch of fruit is cut after they reach full size and are almost mature but still green in colour. Ripening is effected during shipping or by storing in dark, artificially heated rooms.

**Apples and Pears**

Although apple orchards are scattered more or less over the whole peninsula, they are nearly all limited to the Cantabrian provinces bordering the Atlantic coast and to the irrigated lands of the valley of the Ebro and its tributaries. The greatest density of distribution is
to be found in the province of Oviedo, where a flourishing cider industry is established.

Many varieties are grown in Spain, but little attention has been given to their study. Many are supposed to be of Spanish origin such as Verde Doncella, Pero Mingan, Esperiega, Miguela and Roja de Benejama. But some varieties are undoubtedly imported. American varieties such as Delicious and Jonathan are becoming popular.

Seedlings of apples from cider orchards in Oviedo are used to a great extent as commercial rootstocks. Clonal rootstocks are not yet used on a commercial scale.

Pears are also widely distributed in Spain. The commercial orchards are concentrated in the arid areas where irrigation water is available, as in the province of Zaragoza which has the greatest number of pear trees.

Although French pear varieties were introduced to Spain many years ago, the main varieties in many commercial orchards have Spanish names of unknown origin, such as Agua de Aranjuez, Don Guindo, Tendral and De Roma. Until recently De Roma pears were exported.

For rootstocks farmers generally prefer pear seedlings, although quince seedlings are commonly used now because of the difficulty of obtaining pear seeds from France. Pear rootstocks are preferred to quince, because quince rootstocks often produce chlorotic effects in the scion when grown on soil with a high lime content and also because of the incompatibility of quince with certain pear varieties.

PEACHES

Peaches are grown throughout the country. Commercial culture in general is, however, limited to the comparatively dry regions of the peninsula where irrigation water is available. The bulk of the peach orchards are in the irrigated areas of the province of Barcelona, where one-third of the total number of the peach trees are to be found. Approximately 50 per cent of the total number of peach trees are planted in single-crop orchards, whereas the rest are in mixed-crop cultures (Fig. 20).

The peaches produced are absorbed almost wholly by the local market. Only a small amount is exported, although before the recent Civil War larger quantities were exported.

Varieties

The number of varieties being grown in commercial plantings is markedly high, undoubtedly due to the use of peach seedlings for
propagation in the past. Recently a collection has been started of peach varieties found in Spain at the Estación Experimental de Aula Dei to study and standardize them. Up to the present time more than 150 varieties have been found, most of them with Spanish names.

The most popular varieties for the Spanish taste are yellow-fleshed clingstones, such as Campiel, Zaragozano and Gallur.

Peach seedlings are commonly used as rootstocks, while in more arid areas almond seedlings are also used. Neither of these kinds of rootstock is entirely satisfactory. Being seedlings, they are not uniform and peach rootstocks often produce chlorotic effects. Almond rootstocks are often incompatible and are also difficult to transplant.

APRICOTS, PLUMS AND CHERRIES

Apricots, plums and cherries have respectively about the same importance in Spanish fruit growing, both in total number of trees and in the value of their crops. They are grown more or less throughout the whole country.

Many varieties of apricot, plum and cherry are very typical of certain regions, and are designated by the name of the producing area and not as a specially named variety.

Most of the apricot plantings are in the provinces on the Mediterranean and in the province of Zaragoza. The greatest density of distribution is in the province of Murcia, where the variety Blanco de Murcia is popular. Other varieties much grown are Moniquí, Paviot and Bulida.

For apricots the most popular rootstocks are apricot seedlings. Myrobolan seedlings are also used to a small extent. They are, however, not so satisfactory, as they produce incompatibility at the union with some apricot varieties. Fresh and dried apricots and apricot pulp are exported in small quantities.

The principal centre of production for plums is the province of Barcelona, where the greatest number of plum trees are to be found. Besides European, Japanese plums are also very widely grown. Of the varieties of the European plum Reine Claude (greengage) is very extensively cultivated. Popular Japanese plums are Golden Japan, Burbank and Santa Rosa.

Myrobolan seedlings are widely used as rootstocks for plum.

The greatest concentration of cherry plantings is in the province of Cáceres, where the variety Picota de Cáceres is very popular. Other varieties are Garafal de Lerida, De Monzón, De la Piedra and Corazon de Pichon.
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Mahaleb is commonly used by nurseriesmen as a rootstock for cherries. In certain areas mazzard is chiefly used.

POMEGRANATES

Pomegranate plantings are mainly situated in two sections: the Mediterranean coast around Alicante and Murcia, and Andalusia in southern Spain centring around Cordoba.

The pomegranates produced are absorbed almost wholly by the local market. Limited quantities are exported.

OTHER TREE FRUITS

Other tree fruits of some importance are quince with a total number of 668,000 trees, loquats with 258,000 trees, and dates with 310,000 palms. Quince and loquats are scattered over almost the whole country.

Date palm plantations on a commercial scale are limited to the province of Alicante, the production centring in Elche (Fig. 17). Propagation is mainly by seedlings or sprouts. Due to the use of seedlings for the plantations a considerable number of varieties are being grown which are not well defined. Nevertheless, different varieties are recognized, such as De Adobo, Candies, Tenadas and Tiernas.

A unique feature of the Spanish date palm industry is the production of bleached palm leaves for the religious ceremonies on Palm Sunday. Every year the leaves of the male date palms are tied together over their growing points in the summer, only to be loosened just before Easter the following year. The leaves growing under the tied ones develop in darkness and therefore are chlorophyll free and pale in colour (Fig. 22). The preparation of these leaves represents a very important industry for the people of the province of Alicante.