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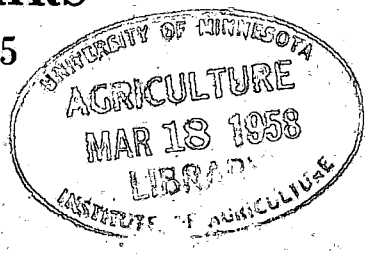

Agriculture and Forestry: Competition or Coexistence?

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GREECE

SINCE agriculture and forestry have so much in common, it is natural that the question of competition or coexistence between them should arise. When the differences in their requirements as well as in their products are considered, however, it can be seen that their relationship depends on the soil and climate of a country as well as on its demographic and financial conditions. In a country such as Greece, which has been inhabited for thousands of years and which has never ceased to be a theatre of war, and where the soil is naturally cultivated, there is bound to be a certain interrelationship between agriculture and forestry.

Geographic, climatic and soil conditions

The Greek peninsula is formed by the Pindus mountain range which runs from the Balkan Peninsula to the Mediterranean—between 80 and 85 per cent. of the country being mountainous. Smaller mountain ranges stretch to the extreme points of the country and in between are small plains. The highest peaks reach 2–3,000 metres.[1] There are no large plains, the largest being those of Thessaly and Central Macedonia, each covering an area of from 200 to 250,000 ha.[2] There are others scattered in various parts of the country, but all are less than 50,000 ha., and it is estimated that the total area of plains does not exceed 2,000,000 ha. Neither are there any big rivers. There are some in northern Greece which rise in the Balkan interior, but all those in central and southern Greece rise within the country. As a result of the topography, however, there are a great many torrents which, as we shall see later, create considerable damage.

The climate is Mediterranean, having a mild and rainy winter and autumn, a dry spring and a hot summer. The lowest temperature in winter reaches from 15 to 19° C. below zero in the north and zero in the south, while the highest summer temperature reaches 35 or 40° C.

With regard to precipitation there are three zones: (*a*) western Greece with an annual rainfall of 600–1,200 mm. (about 25–50 in.), (*b*) eastern Greece, 400–600 mm. (15–25 in.), (*c*) the semi-arid south-

[1] 1 metre = 3·28 ft.

[2] 1 ha. = 2·47 acres.

eastern part with 200–400 mm. (8–15 in.). About 70 per cent. of the rain falls during the months October to March inclusive. In winter snow covers large areas of northern Greece and also the mountainous part of southern Greece.

From a geological point of view the main rocks are calcareous, crystalline, flysch, neogenic and igneous. These alternate fairly frequently both vertically and horizontally in such a way as to increase the country's multiformity. It is from these rocks, most of which are easily disintegrated, that the country's soil is derived, thus presenting different characteristics for each area.

Mountain and plain

A picture of the relief formation can be obtained by examining the distribution of areas according to zones of altitude. Thus, of the total area of 13,256,140 ha. there are:

Altitude (m.)	*Hectares*	*Per cent.*
Below 200	4,400,000	33·2
200–500	3,500,000	26·4
500–1,000	3,680,000	27·7
1,000–1,500	1,286,000	9·7
Over 1,500	390,140	3·0

The rural population assumes an almost identical pattern. Thus the distribution of the 5,900 small towns and communities is as follows:

Altitude (m.)	*No. of communities*	*Per cent.*
Up to 200	2,250	38·1
200–500	1,650	28·0
500–1,000	1,700	28·8
1,000–1,500	299	5·1
Over 1,500	1	..

As regards land use, the distribution is as follows:

	Hectares	*Per cent.*
Cultivated area	3,500,000	26·4
Forests	1,958,100	14·8
Mountainous and semi-mountainous bush areas. . . .	5,224,240	39·4
Barren areas	2,312,800	17·4
Built-up areas, lakes, &c. . .	261,000	2·0

Sixty per cent. of the cultivated area is found in the plains while the

rest is in semi-mountainous and mountainous regions, where some of the sloping ground is more or less levelled either by improvised banks or by masonry. Moreover, 80 per cent. of the cultivated area is in tree-less fields, intended for annual cultivation. This includes most of the cultivated area in the mountainous and semi-mountainous regions.

The forests are found mainly in the mountainous parts of the country. Except for a few places, with a total area of no more than 10,000 ha., there are hardly any forests in the plains. There are, however, many trees thinly planted there for the protection of the cultivated land against excessive water and wind, or for the production of timber or resin. During the agricultural census of 1950, therefore, some 230,000 ha. were stated to be covered with forests or else as having forest trees on them. Most of the forests are found at a height of from 700 to 1,800 metres. Brush lands are scattered all over the country independently of position or height, for instance in the semi-mountainous and mountainous areas as well as in rocky places unsuitable for cultivation in the plain areas. The alpine and sub-alpine zones are occupied by bushes and grassy plats. The brush lands are pastures of medium to poor quality, amounting to about 1,200,000 ha. and providing firewood for farmers as well as pasture.

Agricultural production (*vegetable and animal*)

Owing to the undeveloped state of the economy, agriculture predominates, employing 60 per cent. of the population and providing 40 per cent. of the national income. Vegetable production represents from 32 to 35 per cent. and livestock breeding from 5 to 7 per cent.

The cultivated area, only 26·4 per cent. of the total, is small in relation to population, the present density being 228·5 persons per square kilometre.[1] There are only 3·5 ha. for each of the 1,000,000 rural families. The greater number, however, have a considerably smaller area than this. Thus 276,718 families have only 0·82 ha. on average, and 573,198 families 2·67 ha. These small properties are scattered throughout the country but are particularly common in southern and western Greece and the Islands where the average area is smaller than for the country as a whole. Thus in the Peloponnese the average is 3·1 ha., in Epirus 2·4 ha. and on the Islands 2 ha. When it is realized that this area is not intensively cultivated but is devoted to winter grain, it is obvious that it is inadequate for supporting a family.

[1] 1 square kilometre = 247·1 acres.

The cultivated area is divided as follows:

	Hectares	*Per cent.*
Open areas for annual cultivation .	2,800,000	80
Olive trees	350,000	10
Vines	230,000	6
Fruit trees	120,000	3·5

Of the area cultivated annually, 1,500,000 ha. are devoted to winter grain, 150,000 to pulses and 700,000 ha. to spring grain and industrial plants. In addition about 450,000 ha. remain fallow every year.

Irrigation is uncommon owing to lack of water. Thus at present only 285,000 ha. are irrigated, for 70,000 of which the water is pumped. Of the irrigated area 45,000 ha. are occupied by vegetables, 55,000 ha. by tree crops and 185,000 ha. by agricultural crops.

In the mountainous and semi-mountainous areas cultivation has spread to poor and unsuitable fields, which explains why the output is low, barely exceeding 50 or 60 kg.[1] of grain every two years, the alternate year being in fallow. There are no accurate figures of these areas, but they are estimated to be from 10 to 15 per cent. of the total open area. Livestock breeding is extensive except for cattle kept in barns near urban centres for the production of fresh milk and butter. Owing to the extensive semi-mountainous and mountainous areas which make natural pastures, goat and sheep breeding constitute the main branches of livestock production. At present there are 8,500,000 sheep and 4,500,000 goats which are bred by farmers either as domestic or nomadic animals. Of the sheep about 18·6 per cent. are nomadic and of the goats about 14 per cent. It is only because of the sheep and goats that many of the pastures have any value at all. The pasture areas are as follows:

	ha.
Mountainous and semi-mountainous areas . . .	5,224,000
Pastures and forests	1,350,000
Land available for grazing after the winter grain harvest (one-third of 1,500,000 ha.)	500,000
Areas remaining fallow	450,000
Total	7,524,000

This provides about 0·6 ha. per animal for the 13,000,000 goats and sheep, compared with from 0·8 to 1 ha. of medium-quality pasture which is theoretically required for them. In consequence the pasture areas are inadequate to support the population of sheep and goats, at

[1] 1 kg. = 2·2 lb.

least under the present method of exploitation. In addition there are the following other animals:

Horses	315,000	Buffaloes	71,700
Mules	200,000	Pigs	603,000
Donkeys	492,000	Poultry	11,613,000
Bulls	894,000	Rabbits	310,000

For all livestock 80 per cent. of the total food requirements are obtained from natural vegetation and 20 per cent. from harvested fodder. But for sheep and goats 95 per cent. of total requirements are obtained from pasture.

The agricultural income of rural families is on average small, and for a great many of them it is inadequate. For 1953 it has been estimated that the total agricultural income was $540 million, or an average of $540 per family or $110 per member.[1] Of the total rural population, however, 11 per cent. have incomes higher than average, and satisfactory for living, while 47 per cent. have incomes around the average, and 42 per cent. below it. Livestock breeding constitutes 20 per cent. of the total agricultural income, namely $110 million. Apart from livestock breeding, agriculture provides 90 per cent. of national requirements of agricultural products and 80 per cent. of total exports.

Forest production

As mentioned earlier, the forests cover 14·8 per cent. of the country, and are constituted as follows:

	Hectares	*Per cent.*
Coniferous	750,000	38·2
Broad-leaved deciduous trees (beech, chestnut, oak)	908,100	46·4
Broad-leaved evergreen	300,000	15·4
Total	1,958,100	100·0

Output amounts to 4,000,000 cu. m.[2] of lumber of all kinds, or 2 cu. m. per ha. as against 6 or 8 cu. m. in other countries. Of the total, 220,000 cu. m. are construction lumber, while the rest is mainly used for firewood. It is estimated that farmers fell yearly 2,500,000 cu. m. of firewood from forests, and another 500,000 cu. m. from brush land without permission of the forest authority. Moreover, as already mentioned, 1,350,000 ha. are used for the pasturing of sheep and goats. In the remaining forest area grazing is periodically prohibited for the following reasons:

[1] 1953 exchange rate £1 = $2·81.
[2] 1 cu. m. = 35·31 cu. ft.

Natural regeneration of forests	49 per cent.
Protection	16 ,,
Reafforestation	4 ,,
Fire	31 ,,

Total forest income constitutes from 1·5 to 2 per cent. of the national income and is estimated at between 30 and 32 million dollars, i.e. it does not exceed $15 per ha. of forest area. Of the requirements for building timber, home production provides only 14 per cent.

Relation between agriculture and forestry from an economic and social point of view

As mentioned earlier, the undeveloped state of the economy means that agriculture constitutes the most important branch of production. The soil of Greece has been providing food and other useful products for the population for the whole period of the country's 3,000 years' history. Since the liberation in 1821, however, the naturally increasing rural population has kept on subdividing the land because of the undeveloped state of industry and the lack of opportunity. In consequence, the size of holding has decreased and the density of population increased, as follows:

Population per sq. kilometre of the total area

1821	15·86	1928	47·66
1848	20·77	1934	51·81
1878	33·45	1951	61·40
1907	41·64		

The rural population increased over the period, but showed a declining percentage in the total population, as follows:

	Rural population	*Per cent. of total*
1879	1,374,544	82
1889	1,722,500	79
1907	2,200,392	76
1928	4,140,000	67
1951	4,780,000	60

In addition to the increase in the native population, 1,300,000 refugees from Asia Minor and Thrace have been added since 1921, 50 per cent. of them being settled in rural areas. For these reasons, efforts have been made to increase the cultivated areas and to increase output by intensifying systems of production. New fields have been sought, firstly through reclamation and protection work and, secondly, through the extension of cultivation to areas occupied by forests or

bushes. As a result of reclamation since 1928, 150,000 ha. have been brought into cultivation, mainly in central Macedonia. As regards the extension of cultivation into forest and bush areas, the Forest Code of 1924 permitted the clearing and cultivating of suitable forest areas. At present cultivation of suitable brush land is widely practised provided the forestry authority give their permission. The area made available to agriculture in these ways is not known, but the total cultivated area has increased considerably. Thus, while in 1923 the area of annual cultivation amounted to 1,269,000 ha., by 1953 it had risen to 2,462,300 ha. Moreover, in all parts of the country the extension of cultivation to areas which are unsuitable, barren or exposed to the dangers of erosion owing to their topography is quite obvious. Efforts have been made also to intensify cultivation and an increase is noticeable in the irrigated cultivation of cotton, rice, horticulture and tree crops, all of which give a much greater agricultural and social income.

The income of farmers and of the country in general has increased in consequence. According to the pre-war estimate of Professor Ch. Evelpidis the various systems of cultivation gave the following income per ha.

	Gross income (drachmae)	*Net income (drachmae)*
Horticulture . .	18,830	13,800
Arboriculture . .	11,450	11,070
Ploughing . .	5,730	4,650
Pastoral . . .	1,440	1,380
Forest . . .	760	740

Agriculture thus provides a much larger income than forestry, but agricultural income, despite the improvements which have been made, is still inadequate. There is considerable under-employment of the rural population, which thus earns not much more than half as much as it might. This is a further reason leading to the cultivation of barren lands.

The forest areas, apart from the exceptions noted above, are confined to places which are unsuitable for agriculture. The percentage of land in forests (14·8 per cent.) is indeed small for such a mountainous country and is the lowest in continental Europe. Any extension of forestry to land suitable for cultivation is out of the question under present conditions. There are, however, many uncovered mountainous and semi-mountainous areas, namely those described as brush

land (39·4 per cent.) and barren (21 per cent.), where the torrents find their source. These areas, some of which have rich vegetation and yield satisfactory pastures, are used for grazing sheep and goats, but the income which they provide in this way must be less than $10 per ha. None the less this cannot be ignored for it is distributed to mountain people who own small tillable areas and have very low incomes. In fact, it is on the exploitation of these lands as well as of the forest areas that their economy is based, either through lumbering or livestock breeding. Where this is done properly, there is an harmonious coexistence between agriculture and forestry.

The use of these areas in any other way is difficult and almost impossible owing to their geophysical and climatic conditions. It is imperative, however, that they be improved and the grazing regulated in a way to secure their reproduction. This has already been done on a small scale during the last few years. Part of these areas, which are located in suitable regions, may be turned over to forestry. There are people who believe that forests should be extended to an area of about 1,500,000 ha., but this figure seems to hark back to a bygone time when opportunities for saving were greater, and when conditions generally were different. Reduction of sheep and goat numbers is not easy since even the small income that they bring cannot be replaced from elsewhere at once, nor are such relatively long-term and low-yielding investments as forestry offers acceptable. The value of these areas can be enhanced, however, through the execution of a sound programme, combining improvement of mountain pastures with extension of forests for producing both timber and grazing for livestock, and what is even more important, for covering the ground to protect it against floods and erosion. At present, however, efforts are being made whenever possible to extend forests, mainly by replanting those destroyed during the last war through shortage of firewood and lumber. Moreover, in areas where reclamation projects are being carried out, forest trees are being planted, especially near rivers, to protect the embankments.

The decrease of forests and the clearing of mountain areas of trees either during the war or to secure firewood or pastures resulted in serious consequences for agriculture owing to erosion by torrents. So far as is known during 3,000 years of history no measures have been taken to protect the soil, an omission due both to technical reasons and to lack of administration. As a result, and because of the hot dry climate and heavy winter rain, all fertilizing elements and organic

compounds have been washed out of the soil which has also suffered intense erosion. One hundred years ago the German chemist, Liebig, perceived the situation and made a pessimistic prediction when he wrote, 'Greece, Palestine and Spain, having wasted their forest wealth and having left their mountains bare, will not be able to regain their old prosperity'. Without discussing Liebig's prediction it is certain that he correctly estimated the condition many years ago. At present, owing to mountainous areas having been stripped of their trees, there are 500 torrents which have a watershed of 3,600,000 ha. or 27·5 per cent. of the whole country. These torrents cause considerable damage every year both to the country in general and to agriculture in particular. Moreover, in all parts of the country there are obvious traces of destruction and soil erosion, both on the surface and deep beneath it, owing to the easy disintegration and corrosion of the rocks. According to the estimates of a forester, Mr. Metaxas, torrents carry away annually 100,000,000 tons of earth, containing 660,000 tons of fertilizing elements, corresponding to a loss of 20,000 ha. of productive soil every year. This phenomenon is neither new nor temporary. Greece was only liberated 126 years ago and became a free country, able then to take measures for the protection of its forests, and indirectly of its soil, similar to those taken for the improvement of agriculture. During the first years of liberation there was no state intervention for the protection of forests. It would have impeded the flourishing pastoral sheep and goat breeding as well as the wood-cutting of the farmers. Of late years, however, various measures have been taken to prevent arbitrary timber selling from forests, while since 1937 the pasturing of goats in forest areas has been prohibited or reduced. This has resulted in a decrease in the number of goats. Moreover, the firing of brush land in the mountainous and semi-mountainous areas in order to cultivate one or two grain crops until the soil is exhausted has been prohibited. This was a frequent practice in Epirus, the Peloponnese and in other places, and was called *Rogisma.*

Other technical measures to protect the soil against erosion are being taken. The safest way, however, is the reafforestation of mountainous and semi-mountainous areas and the complete covering of the surface with natural vegetation. The beneficial effect of forest formation on agriculture is also agreed. Forest trees undoubtedly induce wholesome influences in the shape of organic and inorganic matter, and in the creation of soil and climate, both in the actual zone concerned and in the neighbourhood. If we accept the investigations

made in other countries, the destruction of a forest causes an increase by so much as seven or eight times in the amount of earth washed away, whereas the existence of a regular forest reduces the rain waters which flow out of a mountainous watershed by one-third to one-half. This is of special importance in a country where, as mentioned previously, 75 per cent. of the rain falls in the autumn and winter in the form of heavy showers, and where spring waters are precious owing to the prolonged drought in spring and summer. In addition the favourable influence of forests on agriculture, owing to their effects on rainfall, atmospheric and ground temperature, humidity and wind, should not be overlooked.

Agriculture, being the more efficient from an economic point of view, has been charged with the responsibility of securing the country's survival, while forestry is contributing by withdrawing from those areas where the soil can be used more productively. Because of the shortage of cultivated land, any forest areas suitable for cultivation will not remain in forest for long. On the other hand, there are considerable mountainous and semi-mountainous areas where forestry can be developed both for its immediate value as well as for the benefits accruing as a result of erosion control. It may be said in consequence that there is at present no competition between agriculture and forestry.