FOR TYPES OF AGRICULTURE WITH PREDOMINANT OLIVE GROWING IN SOUTHERN SPAIN - /A CASE STUDY [1]/

B. Hofmeister
Technical University of Berlin
/West-Berlin/

Olive trees in excess of 50 hectares are grown in 34 out of 48 Spanish provinces. While the peninsula's northwestern portion is too humid and too cool for the tree the largest acreages are found in the southern, central and eastern provinces. There are, however, remarkable regional variations as to the role of olive production for the individual farms as well as for the whole socio-economic setting of each of the four regions /Fig. 1/.

The first and most important of the olive growing regions comprises the central portion of the provinces of Jaén and adjacent areas of the province of Cordoba in Andalusia with some of their municipalities having up to 80 % of the cultivated area in olive trees. Since 53 % of the cultivated land in Jaén is in farm units under 100 hectares /Fig. 2/, a moderate size farm of 32 hectares and an irrigated unit of one hectare were chosen as samples. The respective farm guides /Tables 1 and 2/ reveal the high degree of dependence of both the rhythm of labour demand

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and total farm production from a single crop. Jaén ranks first among Spain's olive growing provinces with almost 60 % of her farm income being derived from the olive crop /Fig. 3/. The capacity of the oil mills is greatest in Jaén, Cordoba, and Seville /Fig. 4/. On the other hand the climate of this portion of Andalusia is rather favourable for olive trees, the degree of variability in yields coming close to the national average /Fig. 5/. Despite the economic wealth vested in the vast number of olive trees the social conditions for the majority of the rural population in this area of olive monoculture have been extremely poor as is revealed by their social structure: up to 82 % of the rural labour force are hired hands on a daily basis with seasonal employment during the winter months with the harvest of the olive crop, the pruning of the trees, and the first plowing of the fields /Figs. 6 and 7/. A correlation between larger farm sizes and small numbers of cooperatives in the south except for the province of Jaén is obvious. Because of the large number of moderate size farms in Jaén there is an above-average membership in cooperatives as far as olive grove ownerhip and oil mills are concerned /Fig. 8/. Some irrigated groves in southwestern Jaén require around twice the input of labour costs and water while yielding about 5.5 times as much fruit per unit area.

Special problems in this area are the low level of income and the high amount of seasonal unemployment leading to an out-migration of the population by a rate of 10,000 per year during the early 1950 s, 20,000 per year in the late 1950 s, and some 40,000 per year in the early 1960 s. The younger people under 30 years of age make for the greatest percentage of emigrants. As to the rate of illiteracy Jaén ranked first among the Spanish provinces in 1960. Since 1953 a government-sponsored regional deve-

lopment plan, the "Plan de Obras, Colonizacion, Industrializacion y Electrificacion de la Provincia de Jaén", which in 1964 became part of the first national four-year plan, has helped to improve the situation by creating large irrigation districts in the Upper Guadalquivir Valley and offering incentives to industrial plants processing local agricultural and mineral products while partly working on a seasonal basis - but during the summer season. The syndicates organized school programmes for the retraining of agricultural labourers /Formacion Profesional Acelerada/.

Close to 75 % of all table olives are grown in a few municipalities east and west of the city of Seville, being known as the Aljarafe Area. Because of their outstanding quality those table olives to be exported to foreign countries almost exclusively originate in this area. Here many trees have been inoculated with shoots of the favourable species of manzanilla and gordal. The young plants are protected by cones of clay against wind and drought and the groves require approximately 1.5 times as much cost as compared to olives grown for oil production while yielding about four fold. Since more than 70 % of the cultivated land of the Aljarafe municipalities are in large farm units over 100 hectares the farm guide of a farm of 582 hectares is presented /Figs. 9 and 10, Table 3./. In recent years more and more olive groves have been converted in to table olive production. Despite the high yields a considerable number of trees even in the Aljarafe Area is also grown for oil production, and a considerable percentage of the farm land is taken by other crops so that the enterprises are to be considered mixed farms. There are at least two reasons for the table olive not having taken over the area completely: table olive species have only been cultivated for some 40 years which means a rather short period for the farmers to acquire the knowledge necessary for the

crop and to explore the market situation; secondly the farmers are strongly opposed to the risks of a monoculture.

The third region encompasses portions of the south central provinces of Ciudad Real, Toledo, and Badajoz with intercropping of the olive tree and grapes or wheat being widespread /cultivo asociado/. Some time ago there has been a selective process of leaving the slopes /lomas/ to the olive tree while concentrating the deep-rooting grapes on the level lands. Since there has been an overproduction of regular wines for consumption on the internal market the government made an attempt to restrict vineyards in the Mancha provinces. On the other hand oil consumption in Spain is about to increase by 25 % during the decade 1965-1975. The government having a definite interest in stimulating the olive oil production has permitted the cultivation of grapes on new fields under the condition that olive trees be planted on the same lot. This has been a great incentive for intercropping in the Mancha region. Olive trees are planted at intervals twice as great as usual with an average of 40 trees per hectare as compared with 100 or more trees in the regular grove. An olive tree takes the place of every fourth grape /el cuarteo/. As the tree needs approximately 15 years for full production while giving no yields at all during the first six or seven years the intercropping system allows for some income during the period of development of a new grove. Moreover, one-year crops like wheat or forage crops in the grove give the farmer some additional income in those years when he is especially short of cash. In the Mancha region forage crops are badly needed for the integration of tillage and animal husbandry.

The total yields per area unit are usually higher than those from fields in a single crop system, and the intercropping also makes for a smoothing of the unemployment curve over larger parts of the year as is revealed by the farm guide /Fig. 11, Table 4/. While the income per hectare from grapes is highest under present prince conditions the income from mixed cultures of grapes and olive trees lies between that of wine and that of olives respectively. The labour demand per area unit in a mixed grove is about twice as high as in the regular olive grove and about 1.5 times as high as in the vineyard /48 : 24 : 36 hours/hectare/.

Since the days of the Military Orders of Calatrava, San Juan, and Santiago large estates have been prevailing, and at present around 62 % of the cultivated land is in farms of more than 100 hectares. The sample farm got around 700 hectares. In this particular case only 11 % of the labour force are not permanent and mainly employed during the months of June through August, October, December and January for the harvest of wheat or oats, grapes, and olives respectively. The farm guide also underlines Dumont's recommendation to convert some olive groves in Andalusia to fields for other crops and instead expand olive growth on favourable soils of the Mancha region.

The fourth region comprising the interior portions of the Catalan and Levante provinces is, with the only exception of the province of Tarragona, the least important with regard to the olive tree which is grown here under marginal conditions. Within the drier portions of the interior competition with the almond tree is keen because of the higher prince for the same amount of fruit and lesser labour costs

for the harvest. Very often the trees have been highly neglected. Little labour has been put into the groves so that olive growing has much contributed to the seasonal movement of farm labourers between the drier interior and the irrigated coastal plains of the Levante provinces as well as to emigration to other parts of Spain or to foreign countries. Many agro-technical adjustments to drought and rough terrain were necessary such as certain water conservation methods /regadios eventuales/, irrigation with ground water or from reservoirs, and terracing. Yields are very much depending upon the accumulative precipitation during the period from October through April in the arid southeast of Spain. Annual variations of precipitation are higher than in any other part of the country. The weather station at Santiago de la Ribera /Murcia/ reported 576 mm of rainfall in 1954 against 84 mm in 1961 while the amount of 302 mm in 1947 came close to the long term average. The province of Murcia is among the two Spanish provinces with the highest variations in yields of the olive crop.

Under such extreme conditions only large enterprises can survive, such as our sample farm of 1260 hectares /Fig. 12, Table 5/. The farm guide shows no olive crop for the year 1948 while in the following year the farm harvested 406,000 kg. In 1950 the yields dropped to 13,000 kg. It is, therefore, impossible to draw any conclusion on farm income from one year only. Despite the very irregular yields the large estates maintain an oil mill of their own to avoid dependence from distant agents and their low offers for the perishable fruit that can only be stored for a very limited period of time. There are neither commercial oil mills nor cooperative mills in the area.

In 1951 the government initiated a replantation programme for the levante provinces which in the province of Murcia led to a considerable increase of the acreage in almond trees /20,600 hectares/ as compared to an increase of 2,000 hectares of olive trees during the first decade. After 1964 the planting of almond trees was no longer subsidized. One might draw the conclusion, however, that the marginal climatic conditions do not justify subsidies for any kind of fruit tree in this region, and that the subsidies should rather be granted to farmers in the Mancha region.

With the exception of the harvest and pruning from November through March olive growing in Spain is of low labour intensity and thus lacking the major characteristic by which horticulture and fruit growing use to be distinguished from the cultivation of forage, grain and root crops in Central Europe. By correcting irregular rows of trees in older groves or replanting trees at larger intervals farmers have been enabled to make better use of the tractor in recent years, and even the most time-consuming task in the grove, the harvest of the fruit, has become mechanized in some areas with the introduction of the so-called "shaker" since 1963 and a fruit collecting machine of Italian origin. The changes make desirable a re-evaluation of the government's concept to keep a labour force reserve in the olive growing regions adequate to the peak of labour demand during the time of harvest and pruning. The government's retraining programme certainly has its meris as a social measure since it enables former farm labourers to earn money in industrial jobs. However, only few of the retrainees were able to find positions within the confines

of their native provinces so that the workshops are not really an integral part of the provincial development schemes. Since 1965 when the field work for the present study was completed the government's policy has undergone some profound changes which may be considered symptomatic for the rapid overall changes of the socio-economic structure in the country in general, and in the four olive growing regions in particular.

Table 1

Farm Guide of Finca M., Province of Cordoba /Spain/

1 Natural setting				
11	Altitude /m/	450		
12	Landforms	undulating		
13	Soil-group	grey-reddish serosem		
14	Precipitation /mm/	800		
15	Average annual temp. /C°/	17		
2 Location factors				
21	Distance to railroad /km/	10		
22	Distance to oil mill /km/	8 /Cabra/		
23	Internal distances	single farm, 3 parcels		
3 Land use pattern				
31	Size of farm /ha/	32		
32	Arable land /ha/	30		
33	Land in olive trees /ha/	30 /monoculture/		
331	Density of trees/ha	80		
332	Average yield/ha /kg/	1360		
34	Fertilizer	manure and nitrogen /one fourth of area every year/		
35	Irrigation	none		
4 Livestock and machinery				
41	Livestock in AU and AU/100 ha	2 mules	1.6	5.4
		1 pig	.2	.7
42	Machinery	none		
421	ha/tractor	—		

5 labour input

51 Total labor force /AK/ 4.06

52 Seasonal labor /AK/ .3

53 Labor demand per year /h/ 10440

54 Labor demand per month

/h and tasks/			
	Jan.	1680	harvest
	Feb.	2048	harvest, plowing, fertilizing
	Mar.	1440	pruning, plowing, hoeing
	Apr.	1080	second plowing, hoeing
	May	120	third plowing
	June	1032	plowing, harrowing
	July	256	harrowing
	Aug.	72	harrowing
	Sep.	72	
	Oct.	960	
	Nov.	- -	
	Dec.	1680	harvest

6 Financial situation

61 Olives ptas/ha	1360 kg á 5.--	6800.--
	minus inputs	3419.--
	net income	3381.--
62 Olives ptas/AK	25 358.--	
63 Total production ptas/ha	3 381.--	
64 Total production ptas/AK	25 358.--	

Table 2

Farm Guide of Finca X., Province of Jaén /Spain/

1 Natural setting		
11	Altitude /m/	570
12	Landforms	rolling
13	Soil group	grey serosem
14	Precipitation /mm/	630
15	Average annual temp. / °C /	16.5
2 Location factors		
21	Distance to railroad /km/	5
22	Distance to oil mill /km/	5 /Jaén/
23	Internal distances	1 parcel
3 Land use pattern		
31	Size of farm /ha/	1
32	Arable land /ha/	1
33	Land in olive trees /ha/	1 /monoculture/
331	Density of trees /ha	130
332	Average yield/ha /kg/	7500
34	Fertilizer	yes; amount not known
35	Irrigation	yes; in July and August
4 Livestock and machinery		
41	Livestock in AU and AU/100 ha	2 mules 1.6 /on part-time basis/
42	Machinery	none
421	ha/tractor	- -

5 Labor input

51	Total labor force /AK/	.41
52	Seasonal labor /AK/	- - -
53	Labor demand per year /ha/	1024
54	Labor demand per month /h/ /and tasks/	

Jan.	312	harvest, pruning
Feb.	---	
Mar.	56	plowing, pesticides
Apr.	---	
May	---	
June	---	
July	80	irrigation
Aug.	80	irrigation
Sep.	---	
Oct.	---	
Nov.	24	plowing
Dec.	440	harvest, weeding

6 Financial situation

61	Olives ptas/ha	7500 kg á 3.46	25 950.--
		minus inputs	7 500.--
		net income	18 450.--
62	Olives ptas/AK	45 010.--	
63	Total production ptas/ha	18 450.--	
64	Total production ptas/AK	45 010.--	

Table 3

Farm Guide of Finca R., Province of Seville /Spain/

1 Natural setting		
11	Altitude /m/	100
12	Landforms	almost plain
13	Soil group	deep sandy serosem
14	Precipitation /mm/	640 /average 1955-60 only/
15	Average annual temp. /°C/	18 /lacking metabolism/
2 Location factors		
21	Distance to railroad /km/	11
22	Distance to oil mill /km/	private mill; 3 km to factory for table olives
23	Internal distances	single farm with land on either side of highway Seville-Pilas
3 Land use pattern		
31	Size of farm /ha/	582
32	Arable land /ha/	578
33	Land in olive trees /ha/	280 table olives, 50 oil olives: 77 ha newly converted to table olive production 1962-64
331	Average yield/ha /kg/	800-1350, depending on variety
34	Fertilizer	20 t/ha manure in new grove, various chemical fertilizers
35	Irrigation	yes, in orange grove of 8 ha

4 Livestock and machinery

41	Livestock in AU and AU/100 ha	poultry		
		2oo pigs	35	6.1
		30 cows	3o	5.2
		14 mules	11.2	2.o
		8 horses	8	1.4
		4 donkeys	1.4	.2
42	Machinery	3 tractors, 1 combine		
421	ha/tractor	193		

5 Labor input

51 Total labor force /AK/ 52.4

52 Seasonal labor /AK/ 4o.4 /1964: 32.4/

53 Labor demand por year /ha/ 133 578

54 Labor demand per month /ha/

Jan.	8897	July	8939
Feb.	763o	Aug.	12271
Mar.	13895	Sep.	15981
Apr.	14231	Oct.	15337
May	9744	Nov.	8768
June	1o822	Dec.	7o63

6 Financial situation

61 Olives ptas/ha /gross/ 9oo kg á 3o.- 27 ooo.-- /Gordal/
8oo kg á 15.- 12 ooo.-- /Manzanilla/

62 Total production ptas/ha 1 561.--

63 Total production ptas/AK 17 224.--

Table 4

Farm Guide of Finca D.L., Province of Ciudad Real /Spain/

1 Natural setting		
11	Altitude /m/	680
12	Landforms	plain to undulating
13	Soil group	grey-reddish burosem /?/
14	Precipitation /mm/	400 /irregular; drought hazard/
15	Average annual temp. /°C/	15
2 Location factors		
21	Distance to railroad /km/	6
22	Distance to oil mill /km/	11 /Miguelturra/
23	Internal distances	single farm with land on either side of highway Ciudad Real-Toledo
3 Land use pattern		
31	Size of farm /ha/	700
32	Arable land /ha/	651
33	Land in olive trees /ha/	70 olives trees and grapes 30 olive trees and forage crops
331	Density of trees/ha	40 - 80 /grapes or forage resp./
332	Average yield/ha /kg/	1200-2400 respectively
34	Fertilizer	yes; amount not known
35	Irrigation	yes; 1 ha of alfalfa

4 Livestock and machinery

41	Livestock in AU and AU/100 ha	4000 pigs	700	107.5
		500 sheep	50	7.6
		17 horses	17	2.6
42	Machinery	4 tractors, 1 combine, 3 cultivators		
421	ha/tractor	175		

5 Labor input

51	Total labor force /AK/	73 /28 in charge of livestock/
52	Seasonal labor /AK/	8
53	Labor demand per year /h/	not known
54	Labor demand per month /h/	not known; peak demands during Dec. and Jan. for olive harvest, June, July, Aug. for grain harvest, Oct. for vintage

6 Financial situation

61 Olives ptas/ha

on field with olive trees and grapes:

1200 kg olives á 6.50	7 800.--
6000 kg grapes á 2.--	12 000.--
gross income	19 800.--

on field with olives and forage crop:

2400 kg olives á 6.50	15 600.--
1200 kg barly á 4.80	5 760.--
gross income	21 360.--

62 Total production ptas/ha data not available

Table 5

Farm Guide of Finca L.P., Province of Murcia /Spain/

1 Natural setting		
11	Altitude /m/	5o
12	Landforms	almost plain /artificial terraces/
13	Soil group	serosem /?/
14	Precipitation /mm/	327 /average 1947-61; very great variations/
15	Average annual temp. /°C/	16.4
2 Location factors		
21	Distance to railroad /km/	3 /no regular stop/
22	Distance to oil mill /km/	private mill
23	Internal distances	single farm
3 Land use pattern		
31	Size of farm /ha/	1259.5
32	Arable land /ha/	124o /78o ha of rough pasture leased to other operator/
33	Land in olive trees /ha/	22o
331	Density of trees/ha	ca 8o
332	Average yield/ha /kg/	o - 1846 /1947-61/; high variation
34	Fertilizer	yes; amount not known
35	Irrigation	no; but water conservation methods /regadios eventuales/; deep well in preparation

4 Livestock and machinery

41	Livestock in AU and AU/10⁰ ha	12 mules poultry	9.6	.8
42	Machinery	3 tractors		
421	ha/tractor	153		

5 Labor input

51	Total labor force /AK/	13
52	Seasonal labor /AK/	1
53	Labor demand per year /h/	data not available
54	Labor demand per month /h/	data not available

6 Financial situation

61 Olives ptas/ha

data of one particular year not significant because of high variations of yields; significant correlattion of olive yields and amounts of precipitation from October through April of the following year / r = .72/

year	t olives	prec.mm	year	t Olives	prec.mm
1947	157,o	21o,9	1955	19,o	196,o
1948	o,o	215,4	1956	3o2,o	412,8
1949	4o6,o	5o5,3	1957	67,o	175,8
195o	13,o	26o,o	1958	66,o	267,6
1951	15,5	171,5	1959	6,o	3o4,8
1952	31,o	2o5,2	196o	84,o	141,o
1953	151,o	574,1	1961	o,o	1o5,2
1954	6,5	166,3			

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F i g u r e s

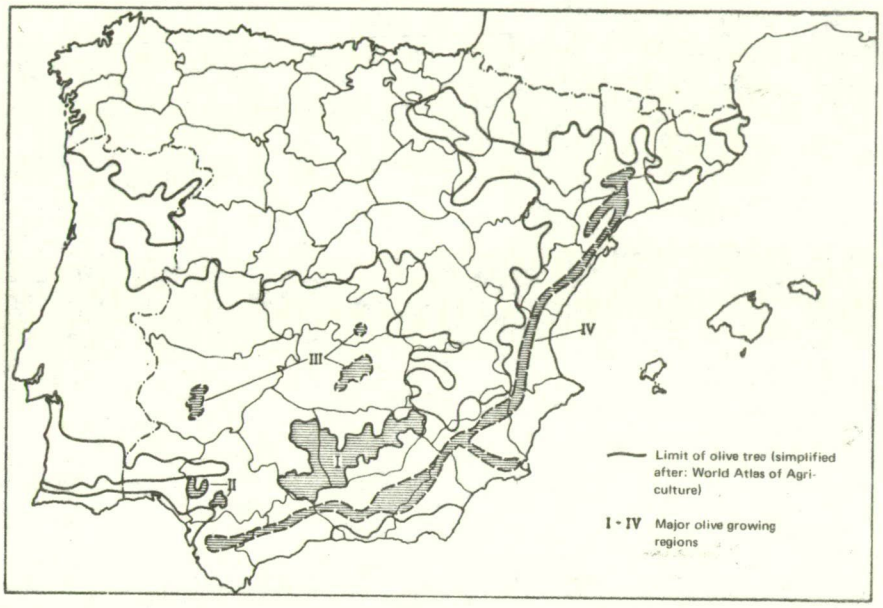
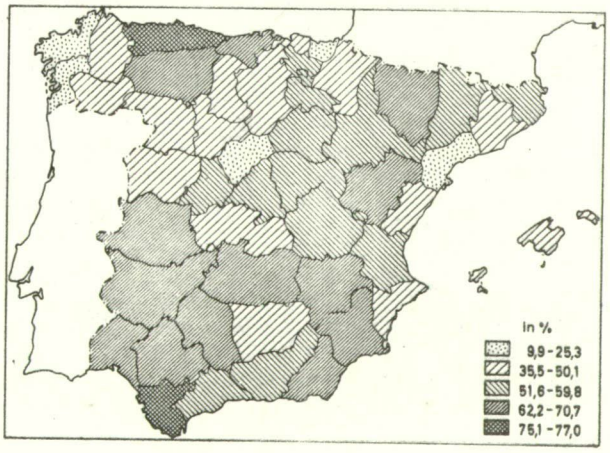

IV
III
I
II
Limit of olive tree (simplified after: World Atlas of Agriculture)
I - IV Major olive growing regions

Fig. 1.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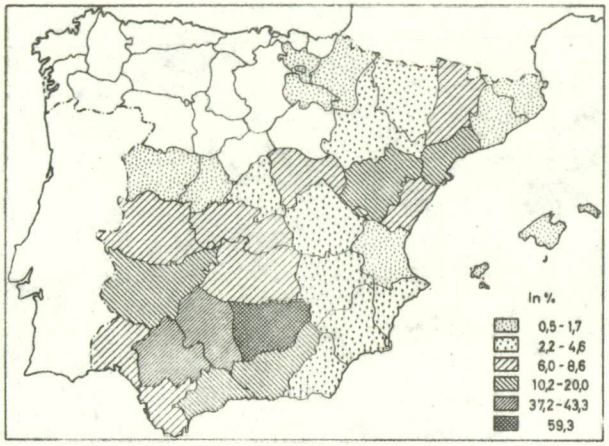
35,5 - 50,1
51,6 - 59,8
62,2 - 70,7
75,1 - 77,0

Fig. 2.


In %
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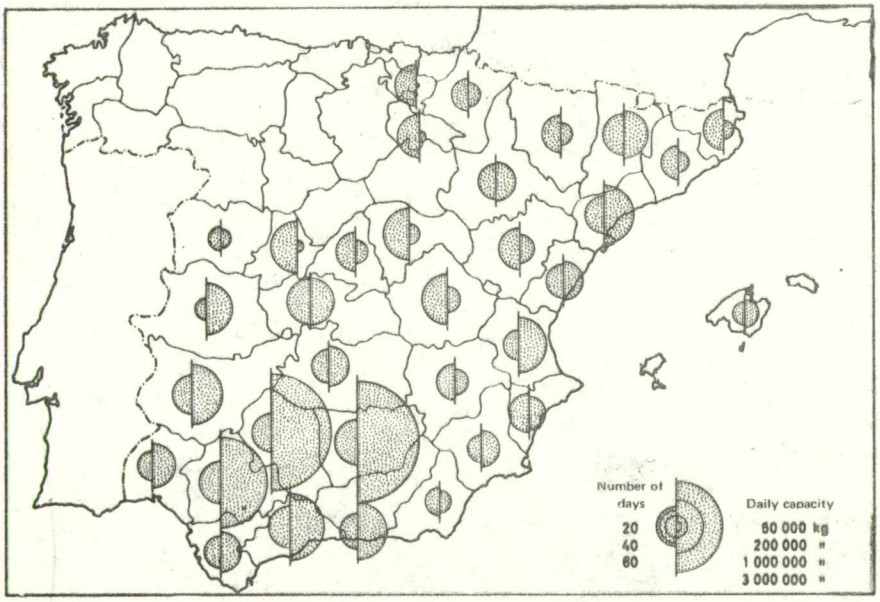
2,2 - 4,6
6,0 - 8,6
10,2 - 20,0
37,2 - 43,3
59,3

Fig. 3.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20
40
60
Daily capacity
60 000 kg
200 000 "
1 000 000 "
3 000 000 "

Fig. 4.

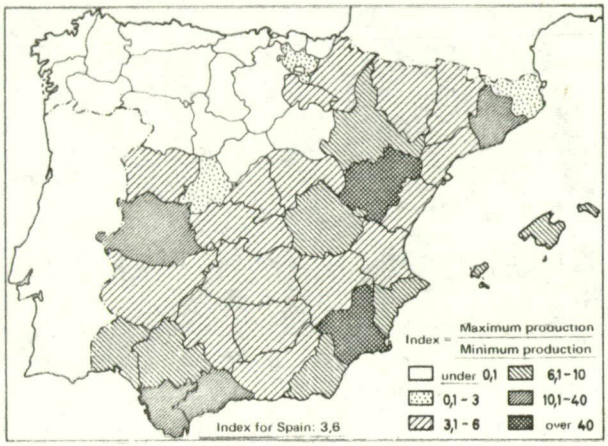
Index = Maximum production / Minimum production
under 0,1
0,1 - 3
3,1 - 6
6,1 - 10
10,1 - 40
over 40
Index for Spain: 3,6

Fig. 5.

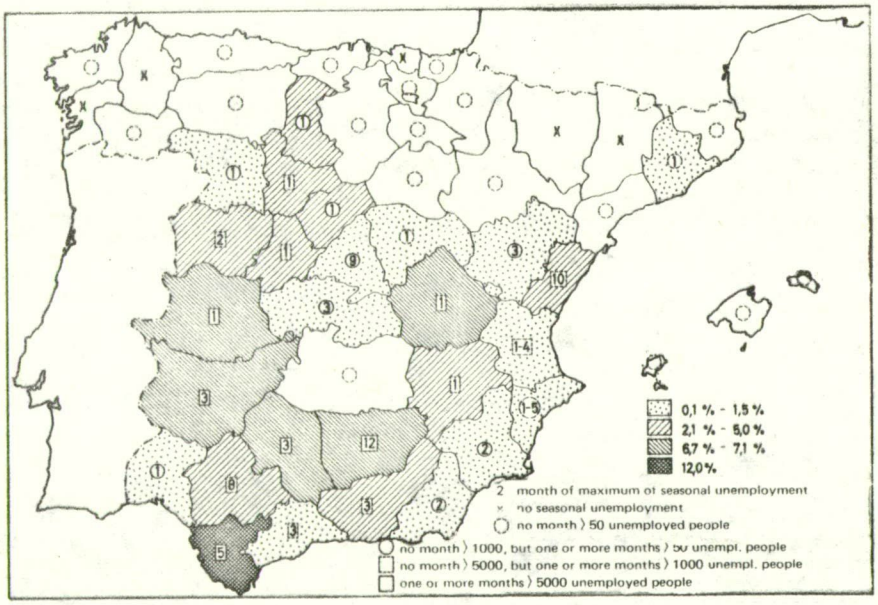
0,1 % - 1,5 %
2,1 % - 6,0 %
6,7 % - 7,1 %
12,0 %
month of maximum of seasonal unemployment
no seasonal unemployment
no month > 50 unemployed people
no month > 1000, but one or more months > 50 unempl. people
no month > 5000, but one or more months > 1000 unempl. people
one or more months > 5000 unemployed people

Fig. 6.

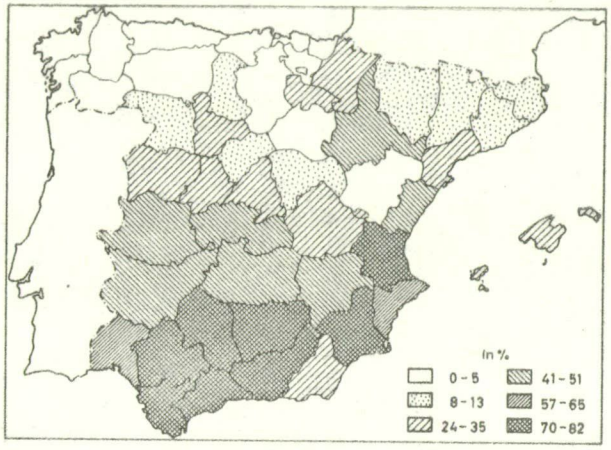
in %
0 - 5
8 - 13
24 - 35
41 - 51
57 - 65
70 - 82

Fig. 7.

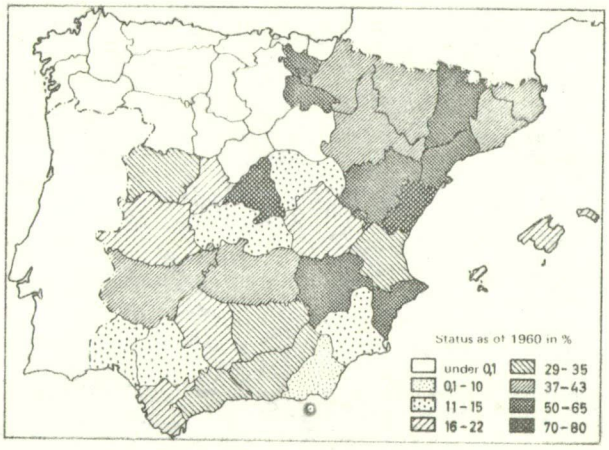
Status as of 1960 in %
under 0,1
0,1 - 10
11 - 15
16 - 22
29 - 35
37 - 43
50 - 65
70 - 80

Fig. 8.

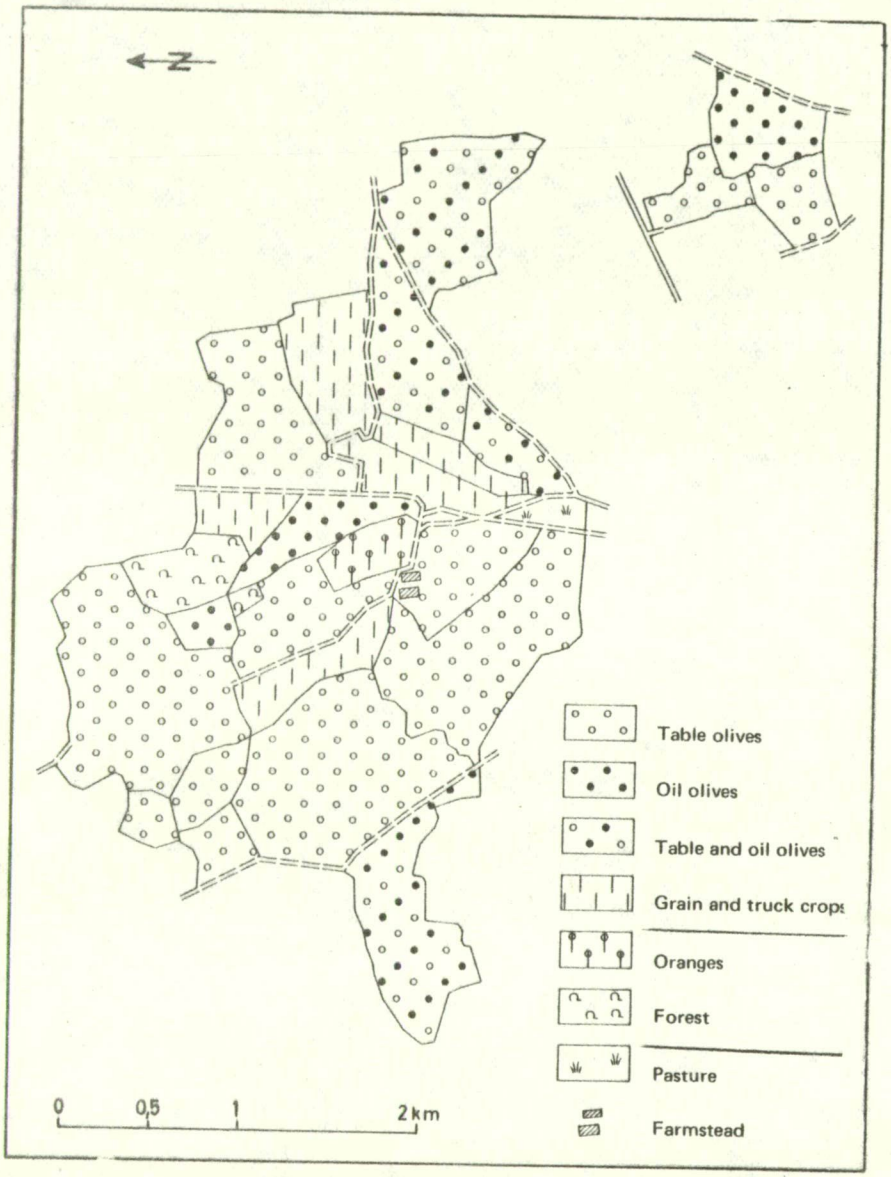
N
Table olives
Oil olives
Table and oil olives
Grain and truck crops
Oranges
Forest
Pasture
Farmstead
0
0,5
1
2 km

Fig. 9.

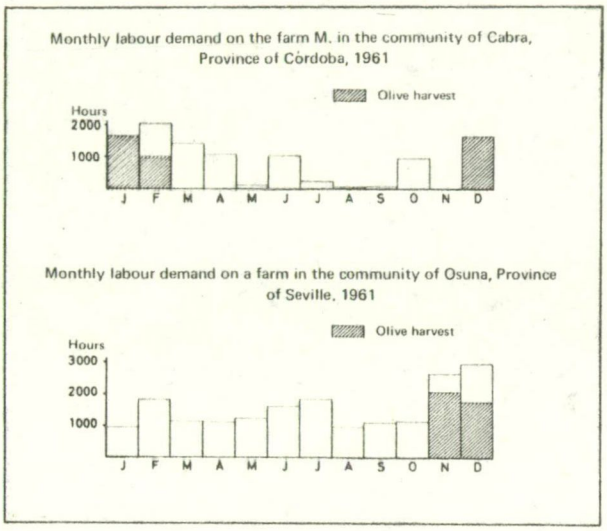
Monthly labour demand on the farm M. in the community of Cabra, Province of Córdoba, 1961
Olive harvest
Hours
2000
1000
J F M A M J J A S O N D
Monthly labour demand on a farm in the community of Osuna, Province of Seville, 1961
Olive harvest
Hours
3000
2000
1000
J F M A M J J A S O N D

Fig. 10.

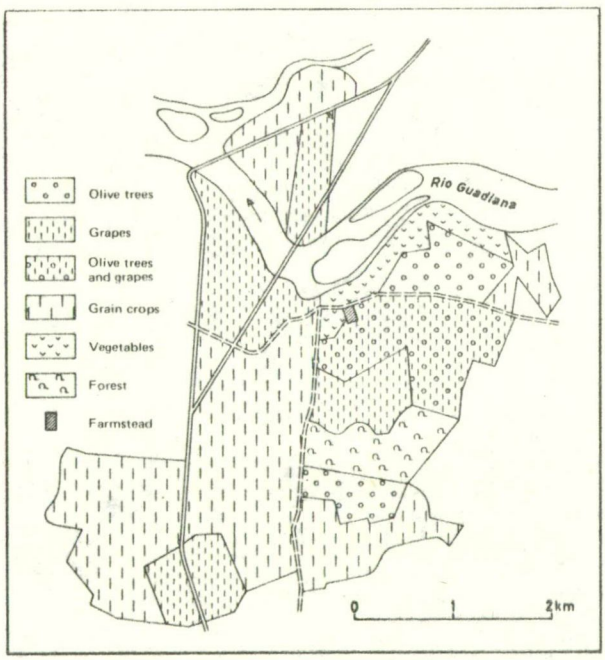
Olive trees
Grapes
Olive trees and grapes
Grain crops
Vegetables
Forest
Farmstead
Río Guadiana
0
1
2km

Fig. 11.

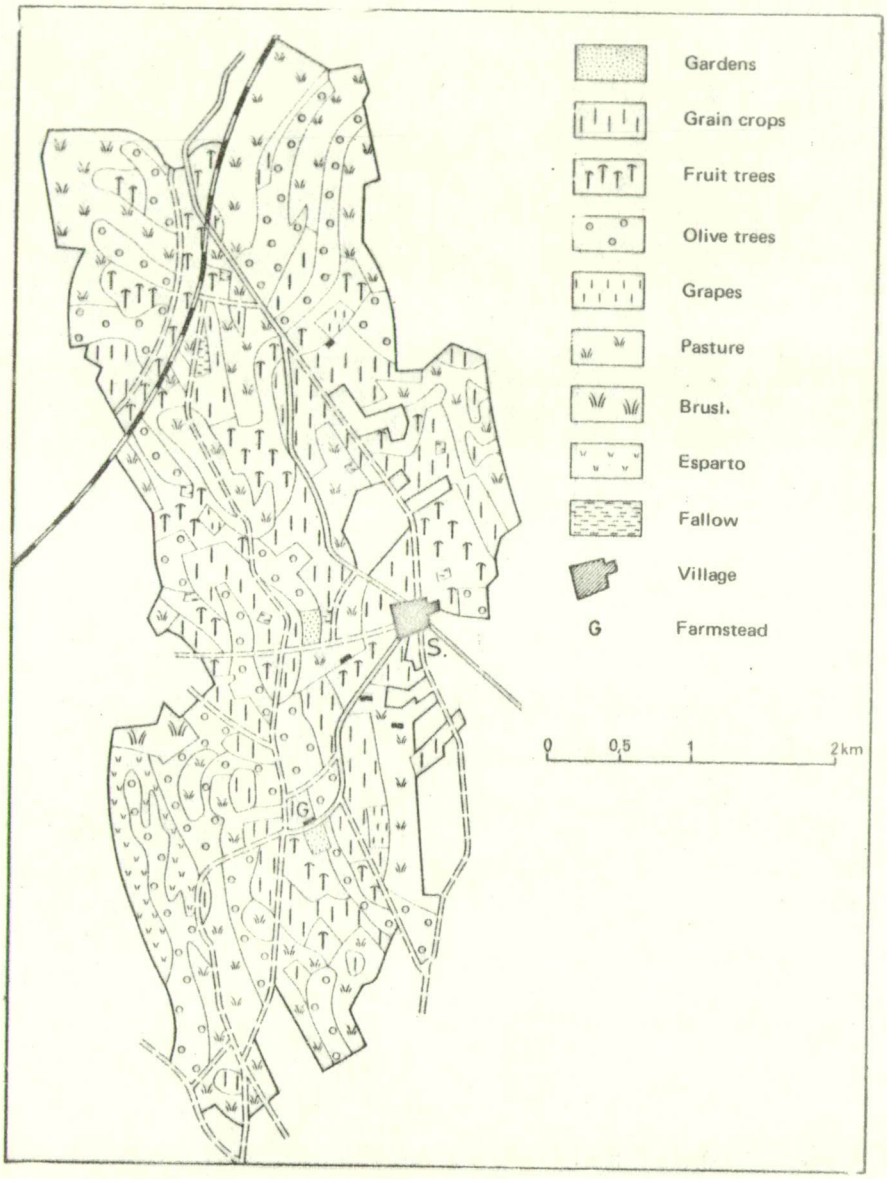
Gardens
Grain crops
Fruit trees
Olive trees
Grapes
Pasture
Brush.
Esparto
Fallow
Village
G
Farmstead
S.
G
0
0,5
1
2km

Fig. 12.