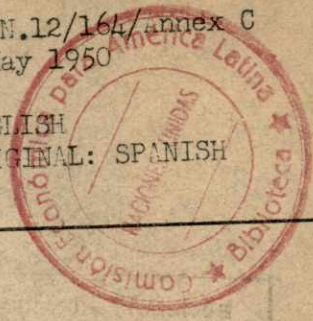




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ECONOMIC COMMISSION FOR LATIN AMERICA

ECONOMIC SURVEY OF LATIN AMERICA 1949

ANNEX C
AGRICULTURAL DEVELOPMENT IN CHILE

<u>TABLE OF CONTENTS</u>	Page
SECTION 1. AGRICULTURAL CONDITIONS	1
SECTION 2. THE SYSTEM OF LAND TENURE	23
SECTION 3. AGRICULTURAL DEVELOPMENT FROM 1925 TO 1950.	44
SECTION 4. ECONOMIC ASPECTS OF AGRICULTURAL PRODUCTION	71



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CORRIGENDUM

Annexes 1, 2A and 2B should be attached at the end of section 1.
Annexes 1 and 2 referred to on pages 5 and 12 (Section 1) are
attached at the end of the study.

On page 72 instead of "Table No.1" please read "Annex 1".
On page 77 instead of "Table No.13" please read "Annex 2".
On page 80 instead of "Table No.14" please read "Annex 3".
On page 85 instead of "See Tables 15 to 18" read "Annex 4".
On page 88 instead of ".... fertilizers". please read "...fertilizers
(Annex 6)."
On page 90 instead of "Table 22" please read "Annex 7".
On page 97 instead of "...the 1936 Census", please read "... the
1936 Census (Annex 9)".
On page 99 instead of "...eloquent. While.." please read "...eloquent
(Annex 10). While..."
On page 100 instead of "Table 29" please read "Annex 11".
On page 100 instead of "Table 30" please read "Annex 12".
On page 101 instead of "Table 31" please read "Annex 13".

All the annexes mentioned above are attached to this corrigendum.

The numbering of the pages containing the annexes is consecutive
to the text of Agriculture in Chile (Annex C).

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CHAPTER XV. AGRICULTURAL DEVELOPMENT IN CHILE

SECTION I. AGRICULTURAL CONDITIONS.

The special nature of the territory of Chile, its topography, climates and soils, give rise to agricultural conditions which are very varied, and which, while they restrict on the one hand the areas which can be cultivated, create on the other hand interesting possibilities for the development of diversified production.

The productive land, that is, land which can be used for agriculture, forestry, or stockbreeding, is divided into economic regions. (See Table 1)

Table 1: Farm lands divided into economic regions

Economic Region	Area a/ (in millions of hectares)	Productive land (In percentage)	
<u>GREAT NORTH REGION:</u> Provinces of Tarapacá and Antofagasta	17.84	0.8	4.5
<u>SMALL NORTH REGION:</u> Provinces of Atacama and Coquimbo	11.98	2.5	20.8
<u>CENTRAL REGION:</u> Provinces of Aconcagua to Muble inclusive	9.30	7.8	75.2
<u>CONCEPCION AND THE FRONTIER:</u> Provinces of Concepcion to Cautin inclusive	5.44	4.2	77.2
<u>LARGE REGION:</u> Provinces of Valdivia to Llanquihue inclusive	4.84	3.5	72.3
<u>CANAL REGION:</u> Provinces of Chiloe to Magallanes inclusive	24.78	11.0	44.4
TOTAL	74.18	29.0	39.1

a/ Excluding Chilean territory in the Antarctic.

Source: Corporación de Fomento de la Producción: Geografía Económica de Chile (about to be published).

/Although so

Although so far no systematic study has been carried out which permits an exact determination of the specific aptitudes of the different classes of land ^{1/} the approximate distribution, according to its present use, is shown in Table 2.

Table 2: Classification of farm lands

	Millions of Hectares	Percentage
Land in crops, in rotation	5.9	20.3
Natural woods and forests	16.3	56.2
Natural pastures	6.8	23.5
TOTAL	29.0	100.0

Source: United Nations Economic Commission for Latin America.

It can be seen that according to present knowledge only four tenths of the area of Chile is of agricultural value, tilled lands, areas used for livestock, and forests all being included in this figure. These range from the areas of seasonal natural pasture and the thickets where wood is exploited, to the irrigated, deep and fertile soils of the central valley.

^{1/} Through differences in classifying the wooded areas and the natural pastures in lands not given over to crops, the total area occupied by Chilean agriculture varies considerably according to different authors. Thus, Opazo (1939) and Trivelli (1941) estimate this at 33,821,000 and 31,846,652 hectares respectively; but the forestry inventory carried out by the U.S.D.A. Forest Service (1943) has thrown a certain amount of light upon an area difficult to estimate.

In any case our estimate is considerably higher than that resulting from the 1936 Census, which indicated only 21,393,700 hectares of agricultural and forest land.

I. Cultivated Area.

Less than 8 per cent of the country is cultivated under a system of crop rotation.

Nevertheless, this small proportion provides 71.8 per cent of the total value of the country's agricultural, stockbreeding and forestry production, ^{1/} supplies a population of 5,677,000 inhabitants (1949) with essential food products (with the exception of a certain percentage of meat, oils fibres and all sugar); and in addition produces certain surpluses which are exported.

In other words, the present productivity of this area, which, as will be seen later on, is not taken full advantage of, is equivalent to a ratio of 1.04 hectares of agricultural land per inhabitant.

The approximate distribution of agricultural lands in crop rotation is as follows:

Table 3: Classification of land in rotation

	Thousands of Hectares		Percentage
a) <u>Annual crops</u>			
Cereals	1,100		
Legumes	131		
Potatoes	51		
Industrial crops	55.5		
Vegetables	27.4	1,364.9	23.1
b) <u>Orchards and Vineyards</u>			
Orchards	74.0		
Vineyards	86.5	160.5	2.7
c) <u>Cultivated pasture lands</u>			
Alfalfa	100.0		
Clover	287.5		
Grass and other types	695.33	1,082.8	11.3
d) <u>Fallow land upturned</u>		595.0	10.1
e) <u>Cultivated land, lying fallow</u>			
<u>with natural grasses</u>		2,700.0	45.8
		5,903.2	100.0

Source: United Nations, Economic Commission for Latin America

^{1/} The commercial value of the country's agricultural, stockbreeding and forestry production for the agricultural year 1946/47 was estimated at 14,450 million Chilean pesos, based on the data used to construct the index of production, data from the Dirección General de Estadística (General Administration of Statistics) and the Departamento de Economía Rural (Department of Rural Economy) March 1948.

/It is

It is immediately evident that only 23.1 per cent of this total corresponds to annual crops and 21.0 per cent to semi-permanent crops (cultivated pastures) and crops of a more definite nature such as orchards and vineyards, while 55.9 per cent corresponds to natural grasses on lands either resting or in preparation (fallow).

In other words, it appears that on the whole not much advantage is being taken of the arable land, since half of this area is left to natural pasture for practically two consecutive years.

Certainly the crop rotation on the irrigated lands is more intensive and varied than in the unirrigated lands. Nevertheless, according to a recent survey by the Dirección General de Agricultura (Directorate-General of Agriculture) ^{1/}, of the 1,300,000 hectares of irrigated land which are estimated to exist in the country and which are included in the cultivated lands, 427,000 hectares are covered with natural grasses.

It is true that of this area, about 207,000 hectares correspond to the so-called "semi-irrigated lands", or lands which are infrequently irrigated in years when water is abundant. Nevertheless, there is no justification for keeping the other 220,000 hectares, which have the necessary water within rotation with natural grasses, especially when it is considered that these agricultural lands are among those which are relatively most fertile and costly.

^{1/} Dirección General de Agricultura: Informaciones para un plan de habilitación de Nuevos Terrenos, Santiago, February 1950 (mimeographed) (Reports for a plan for habilitating new lands).

As may be observed, the cultivation of cereals predominates among the annual crops (wheat, barley, oats, rice, maize and rye), which cover 80 per cent of the area sown each year, while legumes (beans, peas, lentils and chickpeas) only represent 10 per cent. However, the only important tuber crop, the potato, does not reach 4 per cent, and another 4 per cent is covered by the four industrial crops together (sunflower, flax, hemp and tobacco).

This composition of annual crops shows on the one hand that Chilean agriculture is mainly devoted to cereals, which are destined essentially towards the satisfaction of domestic requirements, while on the other hand it indicates the slight importance until now of crops destined to supply raw materials for certain industries, particularly fibres and oils.

As regards the surface occupied by orchards and vineyards, there are insufficient data available to determine the area of the first, but it is very possibly around 74,000 hectares. ^{1/} The vineyards, on the other hand, which are rigorously controlled by the Dirección General de Impuestos Internos (General Administration of Land Revenue) gradually expanded until 1939 (104,000 hectares); but the Ley de Alcoholes (Law of Alcohols) which was passed that year, limiting production, caused a considerable contraction in the area planted with vineyards in the succeeding years. (See Annex 1).

^{1/} The area occupied by the orchards shows a profound fluctuation in the years indicated, which bears no relation to the facts, since this activity has increased constantly. The Census of 1929/30 and 1935/36 give totally inadequate figures and most probably the true extent is nearer the estimate for 1948/49.

The fields cultivated with forage crops show a considerable increase between 1925 and 1949, but the figure for the year 1935/36 should be discarded, since presumably it only included clover or alfalfa, while the estimate for 1942/43, which was revised subsequent to its publication in the Plan Agrario, was excessive. However, in spite of the intensification of cultivated meadows, the country's herds did not increase at a parallel rate; in fact, according to statistical estimates, they diminish from 1938 onwards. If the figures for pastures and cattle are accepted, the possible explanation would be that the annual number of cattle slaughtered is greater than production and that the cultivated pastures have served fundamentally to increase the production of milk and the hay industry.

The increase in the total agricultural lands in cultivation or rotation, cannot be properly appreciated from the available data. On the one hand there would appear to be an increase between 1929 and 1935 of 2,300,000 hectares, which is undoubtedly exaggerated. On the other, it seems that between 1935 and 1948 some 81,500 hectares were incorporated, which would be equivalent to 6,200 hectares annually, a quantity considered to be closer to the truth.

In support of this, it should be observed that the area sown with annual crops, in the same period, increased by 131,400 hectares, that is, around 10,000 hectares per annum, but on the other hand, the irrigated area (which accounted for most of the extension of the annual crops) increased by 87,000 hectares, within the area of agricultural lands in rotation. Consequently, the expansion of agricultural lands, principally as a result of deforestation in the southern region of the country, cannot have been more than about 5,000 hectares a year.

II. Woods and Forests.

The inventory of the surface covered with forests and woods as given in 1943 by the North American Forestry Mission contains the following details:

Table 4: Area of Woodland, plantation and forest

	(in thousand hectares)	
Woodland:		
Lower slope dry zone	1,837.8	
Subalpine	2,548.3	
Lower slope humid zone	<u>4,568.3</u>	8,954.4
Forest Plantations		143.5
Natural Forests		<u>4,373.3</u>
Partially cut forests	261.2	
Natural second growth	<u>204.2</u>	<u>465.4</u>
Deforested burn		
Deforested cutover	<u>161.5</u>	<u>603.2</u>
Rocky, non-commercial forest	1,694.6	1,694.6
Total woods and forests		<u>16,234.4</u>

Source: Irving T. Haig and others: Forest Resources of Chile, U.S.D.A. Forest Service, December 1946.

Within Chilean agriculture, no absolute distinction can be made between the exploitation of crops, livestock and forestry, since this last is an important complementary activity. The production of wood and charcoal and of timber absorbs, during certain periods of the year an appreciable percentage of the agricultural working population. At the same time deforestation, which takes place both on the forest lands and in impoverished agricultural lands, constitutes an important activity.

/III. Natural pasture-lands

III. Natural pasture-lands and other areas devoted to Livestock:

Natural pasture-lands which are not included in the system of crop rotation and which represent 6.8 million hectares, are equivalent to 23.5 per cent of the total area of productive land.

Nevertheless, the practical value of these lands varies considerably from one region to another, both on account of seasonal characteristics and their capacity to feed livestock. These meadows are to a great extent located on the plateau in the extreme north of the country, in the summer and winter pastures of the Northern sector or of the Cordillera in the Central Zone and the South, and finally in the extensive steppe-like formations of the extreme south, which are principally devoted to sheep farming.

The total area devoted to livestock covers a much greater surface, than that corresponding to the pasture-lands proper. It has already been seen that within the territory devoted to crops, there are some 3.8 million hectares of which 1.1 million represent cultivated pastures and the rest meadows.

On the other hand, within the territory considered as forest land, there are some 8.9 million hectares covered with low shrubs, ^{1/} which, while they are exploited for their wood, also constitute an important source of fodder for livestock, as a result of their permanent or seasonal grass.

In summary, it may be considered that the total area available for Chilean livestock, covers some 20 million hectares. When it is considered that the total livestock is composed of 2.3 million cattle, 6.4 million

^{1/} The North American Forestry Mission has considered as such all these areas with shrub formations with a density of plant covering over 51 per cent.

/sheep, 0.6 million

sheep, 0.6 million goats and 0.5 million horses, its density in relation to the area available, is evidently slight.

IV. Stability and Productivity of Agriculture.

Although the systems at present used to farm the area under cultivation are far from adequate or intensive, 1/ it is none the less true that there is good reason to consider seriously the problem of the availability of land in order to satisfy the growing requirements for food and raw materials, both for domestic consumption and for foreign trade. Incidentally, the population increase is in the region of 95,000 inhabitants per year.

During the five years from 1935-40, 263.9 hectares were cultivated with cereals, vegetables and sunflower for each thousand inhabitants 2/ the production of this area satisfies the requirements both of the domestic market and exports. Applying this ratio to the probable population of 1950, it would be necessary to cultivate about 1,465,000 hectares in 1949/50 with these same crops. According to the data available to date, the area will not, in fact, exceed 1,300,000 hectares. Undoubtedly the volume of these products will supply domestic requirements, but the exportable surpluses will be considerably lower than those registered during the five year period 1935-40. At the same time that period showed the highest ratio between livestock and population (547.1 head of cattle per 1,000 inhabitants). During this period, practically no cattle were imported from Argentina, and domestic production satisfied internal requirements. In order to maintain that

1/ See also the chapter on the "Land Tenure"

2/ Wilhelm, G.R. "Retrospecto de la producción Agropecuaria del País" (Revista Simiente, Vol. XVII, No. 3, Santiago, 1947).

/ratio and

ratio and consumption per capita, the country in 1950 must have some 2,062,000 head of cattle, against the 2,344,200 which the Dirección General de Estadística estimates for 1949. During the five years from 1944-48 an average of 185,500 head a year were imported, in order to meet the deficit of domestic resources.

The increase of the country's population therefore, requires a parallel increase of food supplies. Both this increase and the production of a surplus for foreign markets, which are a stimulus to agricultural activities, require a greater output and consequently the necessary land.

V. Crop Yields.

The analysis of agricultural yields sheds further light on the problem.

The studies carried out concerning the tendency of crop yields ^{1/} are, to a certain extent, contradictory, due to the fact that they cover different periods, but they all show a certain tendency to decline. Nevertheless, a certain recovery of productivity is apparent during the last ten years compared to the previous decade.

In the following table the average yields per five year period from 1910-11 until 1949-50, are shown:

^{1/} See Plan Agrario, Ministerio de Agricultura, Santiago, 1945 and Informe Anual de Chile a la FAO, Año 1949 (Chile's Annual Report to the F.A.O., year 1949) Part II, "Planes y Programas" (Santiago, April 1949 Mimeograph).

Rechamato *concha*
Table 5: Yields of the principal crops

(Five-yearly averages, Metric Quintals per Hectare)

	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	a/ 1945-49
<i>trigo</i> Wheat	12.8	11.6	12.0	11.8	10.4	10.8	11.2	12.2
<i>cebada</i> Barley	18.0	18.4	17.7	16.1	16.1	14.2	15.2	17.0
<i>avena</i> Oats	15.4	14.7	13.4	12.4	10.8	9.9	9.7	8.2
<i>arroz</i> Rice	-	-	-	-	-	38.9	38.1	28.5
<i>maiz</i> Maize	15.9	14.0	14.5	15.7	14.9	14.2	13.0	14.4 b/
<i>poroto</i> Beans	12.2	11.5	10.6	11.1	9.3	9.1	8.5	8.7
<i>arveja</i> Peas	10.6	9.3	9.2	9.5	8.6	7.8	7.8	7.4
<i>garbanos</i> Chickpeas	5.9	4.7	5.8	7.0	7.5	4.5	4.4	5.3
<i>lenteja</i> Lentils	10.8	10.0	8.3	9.0	7.4	5.9	7.0	7.6
<i>patatas</i> Potatoes	80.0	90.4	95.0	97.8	96.7	86.7	86.8	106.0
<i>maizillo</i> Sunflower	-	-	-	-	-	-	12.8	12.0

a/ Average for 4 years (1945-48)

b/ Average for 3 years (1945-47)

Source: Dirección General de Estadística y Dirección General de Agricultura

In general terms, it may be observed that until the period 1935-39, there was a slow reduction in yields, a fact which in our opinion is due more to the loss of fertility than to the incorporation of marginal lands to cultivation. Moreover, this latter cause could be compensated by the development of the irrigated area in the same period, since these lands generally show a higher index of fertility. Particularly significant is the reduction in the yield of wheat, barley, oats, beans and lentils.

On the other hand, since the five year period 1935-39, until the present time, some crops have maintained their yield, while others have recovered their previous level. Rice is an exception, its fluctuations being due to special causes derived from the type of lands in which it was sown since it has been cultivated on a commercial scale.

/The case of

The case of wheat is particularly significant as this crop occupies more than 60 per cent of the cultivated area. Its average yield fell, between 1910-1914 and 1930-34 from 12.8 to 10.4 metric quintals per hectare, that is, 18.7 per cent in the space of 20 years; it recovered during the subsequent fifteen years to an average of 12.2 metric quintals, that is, slightly lower than the average for the period from 1910-1914. The recovery of barley and potatoes is equally remarkable.

The quantity of fertilizers consumed is known fairly accurately since 1929-30, although no statistics are kept of the area fertilised nor of the quantity of each type of fertilizer used in each crop.

The zones of the country which use certain types of fertiliser and the crops to which they are preferentially applied, is only ascertained by experience.

A careful study of this subject would be of great interest. To provide an indication of the general influence of fertilizers on the harvest results, the Table 2 was prepared, which relates the total area under annual crops with the volume of each type of fertiliser, according to the predominant fertilizing element. It may be objected that the volume should have been reduced to units of fertilizers; but for the purpose required, the theoretical ratio resulting from this estimate is sufficient. On the whole it is evident that the volume of fertilizers per unit of cultivated area has increased considerably since 1929 and especially since 1935, when statistics on the subject are more complete. Thus in the last 15 years, the volume per surface unit has practically trebled. Since, according to all opinions, fertilizers were

/used very

used very sparingly in the preceding period, it may be concluded that the improved yields of the last decade should be attributed mainly to them.

The available facts, however, do not permit generalisations concerning a total and effective recovery of the fertility of the agricultural lands in cultivation, since the yields only improve or are maintained in certain zones and for certain crops, while in other localities, they continue to decline.

The Chilean agrarian structure, the system of land tenure and the considerable difference in the technical level of exploitation, are the principal factors which explain why the high unit yields in certain exploitations or localities are neutralised in other agricultural sectors by the impoverishment of the soils and the uncontrollable process of erosion, all of which is leading sooner or later, to a change in the top-soil.

Many authors have indicated the enormous advance of erosion of Chile's soils. Elgueta and Jirkal 1/, and Rodriguez and Suarez 2/ studying this subject carefully, reach the conclusion that this phenomenon is progressively destroying not only the lands under cultivation but also the the pasture and forest lands, threatening alike the stability of the topsoil and the potentiality of agriculture.

1/ Elgueta G.H. and Jirkal H.J. Erosión de los suelos de Chile - Santiago 1943.

2/ Rodriguez S.H. and Suarez F.J. - La conservación de los suelos en Chile Santiago 1946.

According to the first, no less than 4 million hectares of agricultural soils are affected by an erosive process which varies from sheet to gully erosion. 1/

The dunes, which arise from wind erosion, cover some 500,000 hectares in the country, according to Rodriguez and Suarez. These authors also indicate that the excessive subdivision of property and the system of exhaustive exploitation to which the land is subjected, are the principal causes of the washing and leaching of these soils.

In the Chapter on the System of Land Tenure the predominance of smallholding in Chile is amply demonstrated. In the unirrigated sectors of the provinces from Santiago to Concepción, which are principally located in the Coastal region, there exist, according to the last Census, 15,215 properties of 5 to 50 hectares, covering 252,633 hectares; from Arauco to Llanquihue there are 369,000 hectares divided into properties from 5 to 50 hectares, and in the Island of Chiloe, 135,000 hectares under the same conditions. These figures give an idea of the extent of this social-economic problem and its consequence in the preservation of soils. 2/

Particularly serious is the loss of fertility in the cultivated lands in the central-south zone of the country, the Provinces of Concepción, Bío-Bío and Malleco, these last two having been considered a few decades ago as the granary of the country. The interesting and

1/ The area affected covers some 2.5 million of hectares in the coastal region, between Valparaíso and Concepción, equivalent to 33 per cent of its territorial area. In the region from Arauco to Cautin, the erosion extends towards the central region, reaching to the very spurs of the Cordillera of the Andes, and comprising about 1.5 million hectares, that is, 31 per cent of the territorial surface of those four Provinces.

2/ Rodriguez and Suarez (op. cit.)

useful survey of soils which is being carried out by the Departamento de Investigación Agrícola of the Ministry of Agriculture, covering some 1,500,000 hectares of agricultural land, gives the following concrete results on the state of erosion in the Province of Bío-Bío, in an area of 364,120 hectares which correspond to the most important agricultural sector of the Province:

62,500 hectares (17.2 per cent) show no sign of erosion

51,870 hectares (14.2 per cent) show grades 2 and 3 of erosion

(light or moderate sheet erosion, without gullies).

117,190 hectares (32.2 per cent) suffer from erosion of 3-4 and

7-8 intensity (moderate to severe top-soil, with frequent gullies seriously affecting the fertility of the soil).

132,560 hectares (36.4 per cent) present wind erosion, that is

movement of sand with local formations of dunes and hillocks.

This significant balance in one of the most typically agricultural provinces of the region, shows the magnitude of the problem, which certainly extends to the province of Malleco, where this survey is being continued, but no definite results are yet known. In the province of Concepción, which also suffers very severely from the erosive process, a considerable change in exploitation is resulting, since crops are being located mainly on lands which are flatter and of average fertility, while the hilly lands, with poor soil, are undergoing intense reforestation, a practice which is also being extended to the neighbouring provinces of Arauco, Bío-Bío, Malleco and Ñuble. 1/

1/ Wilhelm G.R. - La Agricultura en la Región de Concepción y la Frontera
Santiago June 1949 (mimeograph)

VI. The expansion of land suitable for agriculture.

If one subtracts from the total productive agricultural land (29 million hectares) the area at present under crop rotation (5.9 million hectares) and the area occupied by natural and artificial forests (7.4 million hectares), there is a balance of 15.7 million hectares, corresponding to seasonal pastures, which are not included in the system of crops, and thickets.

This vast extent, equivalent to 54 per cent of the area which could potentially be used for agriculture, is to a certain degree the unknown quantity in the country's possible future agricultural expansion. Only a systematic survey of these soils can determine their true potentiality and the correct way to take advantage of them. It is, of course, evident that, as a result of topography, situation, climatic conditions and the quality of the soils, the aptitudes of these lands are very limited. Quite possibly an important sector would have to be declared exclusively for forest purposes, and should for that reason be replanted in the face of the well-known process of erosion which is already evident in certain areas where the shrub growth has been destroyed and the pasture subjected to over-grazing. Another important sector, especially those lands with a low gradient, cannot have any other rational use than pasture, but their quality and the density of the pasture can be improved by means of the introduction of the proper types of grasses. Finally, there is the small sector which can be incorporated into cultivation, but usually these marginal soils are of somewhat ordinary quality. Perhaps their irrigation, above all those soils situated in the central-northern zone of the country, would permit an important change in their actual utilisation.

/In fact

In fact, agricultural expansion, is in itself a complex problem. The destruction of the forest wealth, in order indiscriminately to obtain land for cultivation or pasture, is particularly serious. It has already been seen that some 7.4 million hectares of the forests complete the agricultural land of the country, and as a result in an important sector of the southern zone of the country these woods form part of the exploitation of the farms, especially among those which are very large.

The balance of the forestry situation which existed in 1943, according to the North American Forestry Mission already mentioned, was as follows:

Table 6: Forest Resources

	Millions of cubic metres	
Total present timber stand	1,842.2	
Annual depletion	5.5	
Fire	19.3	
Windfall, disease and other	13.0	37.8
(Annual growth)		20.6
(Annual net drain)		17.2

Source: U.S.D.A. Forest Service: "Forest Resources of Chile" 1946.

Unless strong measures are taken to protect the forests against fires and if the actual rate of exploitation continues, the Chilean forests will be exhausted in 107 years. In the event of protective measures being adopted, together with replanting of exploited forests, the present rate of exhaustion would be changed into a net increase of the volume of growing wood. In other words, it is necessary to use great caution as regards the possible expansion of the cultivated area.

/According to a

According to a survey carried out by the Dirección General de Agricultura in 1947 ^{1/} and other later estimates, possibilities do exist of extending the present area of lands suitable for crops or for pasture. This area, which stretches from the Rio Maule to the Province of Llanquihue inclusive, amounts to approximately 800,000 hectares, while in the Provinces of Chiloé and Aysen there are about 1,500,000 hectares which would be used preferably for pastures. These lands would be obtained principally through the clearance of those sectors covered with woods and shrubs, which, because of their topography, would not be exposed to erosion. This report does not indicate what proportion of those lands could be tilled and which would be useful exclusively for grazing purposes; but it is evident that the greater percentage would correspond to the latter. The report under reference also indicates other possible ways of providing agricultural soils through the carrying out of the following work:

- | | | |
|---|---------|----------|
| 1) Combination of drainage and irrigation | 34,600 | hectares |
| 2) Drainage only | 73,800 | " |
| 3) Drainage and de-forestation | 83,800 | " |
| 4) Clearance and irrigation | 103,700 | " |

Finally, let us examine the possibilities of irrigation. According to the surveys carried out by the Departamento de Riego of the Ministerio de Obras Públicas y Vías de Comunicación (Department of Irrigation of the Ministry of Highways and Public Works) the future possibilities of

^{1/} Dirección General de Agricultura: Incorporación de nuevos terrenos para la agricultura - Santiago, November 1947 (mimeographed).

developing gravitational irrigation amount to 582,000 hectares, of which 520,000 hectares would correspond to the irrigation of new soils and 62,000 hectares to improvements in present irrigation 1/.

There are no estimates in existence concerning the total area of soils which could be irrigated by pumping, although this represents one of the most interesting possibilities in connection with the plan for the electrification of the country, which is progressing actively. Until now, the Corporación de Fomento de la Producción (Production Development Corporation) which has studied this aspect, has surveys and projects in hand, some of which are being carried out, for the irrigation by this means of 140,299 hectares 2/.

Summing up, it can be said that interesting possibilities exist for the incorporation of new areas into exploitation, or for the substantial improvement of certain sectors by means of irrigation. Such an increase would mean the increase of lands suitable for the exploitation of crops and those suitable for stockbreeding, of approximately 50 per cent of the present area. Within the cultivated area, the possibilities of irrigation, according to the present knowledge of plans and projects, would permit an extension of the irrigated surface of more or less 56 per cent, without taking into consideration improvements in the sectors which are at present defectively irrigated.

1/ Report of the ECLA - FAO Joint Working Party Appendix C - Irrigation in Latin America.

2/ Corporación de Fomento de la Producción: Esquema de diez años de labor Santiago May, 1949.

The incorporation of new agricultural lands or the improvement of those at present in use by the means indicated nevertheless requires two fundamental conditions:

- 1) A detailed survey of these new soils, on the lines of that now being carried out by the Departamento de Investigaciones Agrícolas, in order to determine the structure, fertility and capacity for use of these soils, with special emphasis on their preservation.
- 2) Capital investment in accordance with their profitability and the future direction of Chilean agriculture.

It is fundamental to promote first those measures which tend to assure a more intensive and rational utilisation of the lands which are already exploited, since it is evident that there exists an appreciable margin for improving their present productivity and profitability.

VII. Summary

- 1) Only a small portion of Chilean territory (39.5 per cent) is used for cultivation, pastures and forests; its aptitudes vary in accordance with natural or acquired conditions.

One quarter of this area is subjected to crop rotation, another quarter is covered with natural forests and the remaining half corresponds to woods, shrubs and natural pastures. This distribution results from the nature of the territory, the physiographic and ecological conditions of which subject it to severe limitations.

- 2) Despite the scarcity of statistical data, it may be presumed that during the period under review (1925-1950), there has been no significant expansion of arable lands and only the irrigated area which they enclose shows any important development.

3) As regards

3) As regards the uses of the cultivated area, Chilean agriculture is distinguished by its predominantly cereal-livestock nature, whereas those types of agriculture which would be more suited to the aptitudes and conditions of the natural resources have not been developed.

The area devoted to annual crops, in relation to the total arable land, shows a deficient utilisation, totally deficient in certain cases, and against all technical and conservation precepts. The crops most indispensable for the satisfaction of the prime necessities of the population predominate, and there is no incentive towards diversification in order to extract a greater economic profit from the land.

4) More than 50 per cent of the land suitable for agriculture consists of woods, shrubs and natural pastures. The topography and climate of these areas, nevertheless made it possible to consider them as a potential source for the increase of cultivated lands, but it is indispensable that first of all a detailed study of their capacity for use should be carried out.

5) Both the arable lands and those devoted to livestock, and also the forest lands are suffering as a whole from a more or less intense degeneracy of their natural fertility. The system of exploitation, derived in turn from the structure of landed property, and the lack of efficient measures on the scale required to conserve the country's natural resources, are all causes of this phenomenon. The loss of fertility of the soils under cultivation, the diminution of the forage capacity of the pastures and the destruction of the natural forests, are all leading to a change and an increase in the cost of production, while at the same time there is an ever-increasing limitation of the possible expansion of agriculture.

/6) In view of

6) In view of the scanty possibilities of a substantial extension of the agricultural area, Chilean agriculture should, with the object of satisfying the growing needs of the population, envisage the prospect of a profound reform of the present uses of the land. The execution of irrigation, cleansing and clearance projects, once the soils have been surveyed with a view to their preservation and profitability; the localising and diversifying of the crops, the development of livestock; and above all, the improvement of yields by means of the methodical extension and application of modern technique, are all measures which can compensate Chile's relatively small agricultural resources.

SECTION 2. THE SYSTEM OF LAND TENURE

The system of land tenure in Chile and the forms of ownership have a marked influence on agrarian structure, production and expansion.

On the one hand these are a cause of the deficient use of natural resources and difficulties in improving the technical and economic factors of exploitation, and on the other, result in the weak social structure and low income per capita of the rural population.

I. Number and area of farms

According to the last Agricultural Census of 1936, there were 202,000 properties comprising a total area of 27,633.700 hectares.^{1/}

The analysis of agricultural farms classified according to their extent and valuation, on the basis of the results of this census, establishes that:

a) 64 per cent of agricultural farms with an area up to 20 hectares (129,200 farms) occupy only 2.2 per cent of the censused area. These properties were valued at 752 millions of pesos, that is, 11.9 per cent of the total.

^{1/} The outside census of the Dirección General de Estadística gave the following results:

1925: 112,600 properties with 25,647,300 hectares

1930: 187,700 properties with 27,313,000 hectares

These figures differ from the data of the Dirección General de Impuestos Internos which indicate 210,736 rural properties for 1929, 263,462 for 1939, and 275,859 farms in 1946.

Apparently the explanation of the difference between the amounts shown by Impuestos Internos and the two last censuses lies in the fact that while the latter considered rural properties from the agricultural viewpoint, Impuestos Internos bases its classification on the tax concept.

/b) 1,400 farms of

b) 1,400 farms of over 2,000 hectares, or 0.7 of the total number, cover an extent equivalent to 61.6 per cent of the censuses area, with a valuation of 1,615 million pesos, that is 25.5 per cent of the total (Table 1).

These characteristics of the system of agricultural property became more and more marked until 1936; the comparative analysis of the Census for that year and those for 1925 and 1930 (Table 2 shows the following evolution:

a) There is a marked tendency towards the formation of the small holding (up to 5 hectares), the number of which increased by 83.6 per cent between 1925 and 1936. The number of farms from 5 to 20 hectares increased by 45.2 per cent, the farms of from 20 to 50 hectares by 49 per cent and those from 50 to 200 hectares, by 42.8 per cent. Altogether, between 1925 and 1936 the farms up to 200 hectares increased from 103,200 to 168,500, that is, by 63.3 per cent. On the other hand, the area over which they extended (2,171,000 hectares in 1925 - 3,036,900 hectares in 1936) only represents an increase of 39.9 per cent.

b) On the other hand, the number of farms during that period of from 200 to 1,000 hectares, increased by 7 per cent, while the total area which this group comprised increased by 0.6 per cent, so that this category of farms has not altered to any great extent; if they have contributed towards forming smaller farms, through sub-division, their number has been maintained by the creation of other farms from the group with an area greater than 1,000 hectares. Their average area only diminished by 455 to 424 hectares.

/c) The number of farms

Table 1. Area and value of farms

Classification of farms hectares	Thousands of farms	Area		Value		
		Total thousands of hectares	Average hectares	Total Millones of pesos	Average per farm (thousands of pesos)	Average per hectare (pesos)
Less than 5	87.8	139	1.6	359	4.2	2,601
5 - 20	41.4	469	11	393	9.8	871
20 - 50	21.3	692	32	399	19.5	602
50 - 100	11.0	772	70	422	40.3	575
100 - 200	7.0	965	139	558	83.3	601
200 - 500	5.3	1,678	315	977	191.3	607
500 - 1000	2.2	1,525	687	647	304.8	444
1000 - 2000	1.3	1,823	1,359	623	478.2	352
2000 - 5000	0.8	2,542	3,034	564	694.9	229
5000 and over	0.6	14, 6	23,141	1,051	1,734.4	75
Unclassified		178.7	25,091	5,993		
		23.1	2,542	332		
Total	201.8	27,633	137.6	6,325	34,772	253

Source: Agricultural Census, 1936

Table 2. Distribution of farms by size according to the
Census 1925, 1930 and 1936

Percentages

Classification	1925		1930		1936 ^{a/}	
	Number	Area	Number	Area	Number	Area
Less than 5	42.3	0.3	39.2	0.3	49.2	0.6
5 - 50	38.7	3.1	43.1	4.2	35.1	4.6
50 - 200	11.2	5.1	11.0	6.0	10.0	6.9
200 - 1,000	6.2	12.4	4.9	11.6	4.2	12.8
1,000 - 5,000	1.8	16.6	1.4	15.9	1.2	17.4
over 5,000	0.5	62.5	0.4	62.0	0.3	57.7
	100	100	100	100	100	100

^{a/} Only 187,700 properties and 25,091,300 hectares were considered.

Average area per farm in hectares

Classification (hectares)	1925	1930	1936
Less than 5	1.56	1.57	1.59
5 - 50	18.4	18.0	18.5
50 - 200	103.6	101.1	96.7
200 - 1,000	455.0	445.0	424.0
1,000 - 5,000	2,145.0	2,123.0	2,002.0
over 5,000	27,185.0	29,797.0	23,141.0
Average	231	187	134

Source: Agricultural Census 1936.

c) The number of farms from 1,000 to 5,000 hectares increased by 5 per cent and their total area covered by 2.6 per cent. It should be noted, however, that their average size was reduced from 2,145 hectares to 2,002 hectares.

d) Finally, the farms with an area exceeding 5,000 hectares, while remaining more or less the same in number, showed a reduction in total area of 1,552,800 hectares, or 9.7 per cent less than in 1925.

The average extent of this group decreased from 27,185 hectares to 23,141 hectares. It may be inferred that the sub-division of these great estates gave rise to the formation of others with an area from 1,000 to 5,000 hectares, since the total area covered by the categories exceeding 1,000 hectares in 1925 (18,292,290 hectares) remained roughly the same in 1935 (18,852,000 hectares).^{1/}

In summary, it may be said that in spite of a considerable increase in small farms, the number of very large farms was not materially altered.

II. Land use according to size of farms

As has already been seen in the preceding chapter, the country's widely differing natural conditions, such as climate, topography and vegetation, determine the particular aptitudes and exploitations according to the geographic zone, a circumstance which in turn influences the degree of sub-division of the land.

^{1/} It should be clearly established that the Census of 1936 showed 19,600 farms without indicating their area, which was estimated at 2,242,200 hectares, equivalent to an average of 130 hectares, against 134 as shown in the average of the farms which did indicate area, so that their exclusion did not materially alter the results of the preceding commentary.

The agricultural census of 1936 illustrates this aspect as follows:

Zones	Thousands of properties	Area		Uses (thousands of hectares)		
		Total agri- cultural land 000 hectares	Average per farm Hectares	Arable land a/	Woods forests pastures	Barren
North	39.5	4,597	122.0	433	2,736	1,428
Centre	91.3	6,964	77.4	2,488	3,173	1,303
South	55.4	7,676	142.5	2,804	4,304	568
Austral	1.0	5,854	5,854.6	31	5,425	398
Total	187.2	25,091	134.0	5,756	15,638	3,697

a/ Includes orchards and vineyards.

If the country is considered as a whole and the farms included in the census are classified according to area (See Table 3) it can be seen that not only the total area but also that considered as agricultural, bears a certain relationship in all categories of farms up to 2,000 hectares, and these as a whole, comprising 32.3 per cent of the total area show only 20 per cent of barren land, while the properties exceeding 2,000 hectares, which amount to 67.7 per cent of the total area, comprised altogether 80 per cent of the barren area. This situation justifies to a certain extent the vast estates of the central zone which are located partly on the flat irrigated lands of the valley itself and extend to the rugged, barren lands of the spurs of the Cordillera. Nevertheless, as will be seen later, many of these properties cultivate their arable area, less intensively than farms of a smaller size.

If the figures of this table are expressed in percentages, with 100 per cent corresponding to the total area of each category of farm, it will be seen that the small property up to 5 hectares grows cereals and market garden produce on 32 per cent of its arable land, while another

/14.6 per cent of

Table 3. Per cent distribution of the various types of
land according to size of farms

DISTRIBUTION OF AGRICULTURAL AREA										
Classifi- cation per area	Total area			A r a b l e					Or-	Forests
	Agricultural			Area cultivated with cereals and market garden crops					chards and Vine-	natural second growth and natural pastures
	Irri- Bar-								yards	
	Total	gated	ren	Total	Total	Total	Total	Cere- als	market gardens	Hectares
Total area thousands of hectares	21,394	1,213	3,697	23,091	5,564	1,174	939	232	192	15,638
..... In percentages										
Less than 5 hectares	0.6	3.4	0.3	0.6	1.6	2.5	1.8	5.5	9.9	0.1
5 - 20 Hs.	2.0	3.4	1.2	1.9	4.9	6.0	5.1	9.6	10.7	0.8
20 - 50 "	2.9	3.6	1.9	2.8	7.3	7.8	7.6	10.5	1.2	1.2
50 - 100 "	3.3	4.3	2.0	2.1	7.7	8.1	8.2	7.7	9.7	1.6
100 - 200 "	4.1	7.9	2.2	3.8	9.4	10.5	10.6	9.9	10.2	2.2
200 - 500 "	7.1	18.6	4.0	6.7	15.8	17.8	18.1	17.0	17.3	3.9
500 - 1000 "	6.5	16.4	3.8	6.1	12.7	13.4	13.5	12.6	11.4	4.2
1000 - 2000 "	7.7	15.6	4.6	7.3	13.7	13.7	13.9	12.5	9.3	5.6
2000 - 5000 "	10.5	11.3	8.1	10.1	13.0	10.8	11.5	8.5	6.0	9.7
5000 and over	55.3	15.5	71.9	57.6	13.9	9.4	9.7	8.2	5.0	70.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Agricultural Census 1936.

14.6 per cent of its total agricultural area is devoted to fruit orchards and vineyards. Even though it may be a technical mistake for properties of this small extent to devote an important portion of their land to extensive crops such as cereals (it should be remembered that the average area of the farms of 0.1 to 4.9 hectares is 1.6 hectares, and their value per hectare is 2,601 pesos against 607 pesos per hectare in the properties of from 200 to 500 hectares in 1935), nevertheless their land is used to considerably better advantage than in the farms of greater extent. Thus properties of 5 to 2,000 hectares cultivate only between 21.2 and 25.7 per cent of their arable land, properties from 2,000 to 5,000 hectares, 17.7 per cent, and those of greater area, only 14.2 per cent of their total arable land. In absolute terms, the farms of over 2,000 hectares have a total of 1,492,869 hectares of arable land available (26.8 per cent) and they grow cereals and market garden crops on only 237,355 hectares (20.2 per cent).

Undoubtedly, an analysis of the country as a whole, in which the same category includes farms where the natural conditions differ considerably according to their location, could cause distortion in the basic conclusions drawn. Resorting to the 1936 Census, Table 4 has been compiled to show the use of the arable land in the central and southern zones of the country. The first, which comprised the provinces from Santiago to Concepción inclusive, encloses 42.4 per cent of the arable land and 74.7 per cent of the irrigated area of the country. The southern zone, from Arauco to Chiloé inclusive, comprises 49.5 per cent of the arable land, but only 6.7 per cent of the irrigated area.

/Although the central zone

Table 4. Destination of the arable landA. Central Zone (Provinces of Santiago to Concepcion inclusive)

Classification per area in hectares	Arable land	Cultivated in 1935/36				Arable land			
		Irri- gated	Cereals and Market Gardens	Orchards and vineyards	Total	Irri- gated	Culti- vated		
(In thousands of hectares)								(Percentage)	
Less than 5	53	21	16	12	28	39.6	52.8		
5 - 20	135	26	33	14	47	19.3	34.8		
20 - 100	329	69	68	26	94	21.0	28.6		
100 - 500	569	263	139	38	177	46.2	31.1		
500 - 2000	649	311	144	26	170	47.9	26.2		
2000 - 5000	323	105	58	6	64	32.5	19.8		
Over 5000	303	111	55	5	60	36.6	19.8		
Total or average	2,361	900	513	127	640	38.4	27.1		

Table 4. Destination of the arable landB. Southern Zone (Provinces of Arauco to Chiloé inclusive)

Classification per area in hectares	Arable area	Cultivated in 1935/6			Arable area		
		Irri- gated area	Cereals and market gardens	Orchards and Vineyards	Total	Irrigated	Culti- vated
(In thousands of hectares)							
Less than 5	18	- ^{a/}	6	1	7	-	38.9
5 - 20	122	1	31	4	35	0.8	28.7
20 - 100	478	5	108	10	118	1.0	24.7
100 - 500	776	16	175	12	187	2.1	24.1
500 - 2000	750	37	157	12	169	4.9	22.5
2000 - 5000	323	9	56	5	61	2.8	18.9
Over 5000	289	14	28	1	29	4.8	10.0
Total or Average	2,756	82	561	45	606	3.0	22.0

Source: Agricultural Census 1936

^{a/} Irrigated area 111 hectares

Although the central zone enjoys the most favourable conditions of climate and irrigates 38.4 per cent of its arable land thus permitting a diversified and more stable production, it only cultivates as a whole, with cereals, market garden produce and orchards, 27.1 per cent of its arable area. The southern zone, where only 3 per cent of its arable land is irrigated and where climatic conditions limit the variety of crops, grows these crops on 22 per cent of its arable land.

In the small farms (up to 100 hectares) of the central zone, which have a relatively smaller percentage of irrigated land (except those from 0 - 5 hectares) the cultivated area is greater than the irrigated area, which means that they extend their crops to the unirrigated land. On the other hand, in farms of 100 to over 2,000 hectares with a high percentage of irrigation, the cultivated area is smaller than the irrigated area, and it is supposed that these farms also possess unirrigated land suitable for sowing.

It could be objected that the properties exceeding 100 hectares use the remainder of their irrigated land for cultivated pastures, but, according to the Census in this whole region the area planted with forrage crops (presumably alfalfa and clover), does not exceed 99,000 hectares, while the irrigated land not cultivated with cereals, market garden produce, orchards and vineyards totals 319,000 hectares. Statistics also show 10,000 hectares in this zone as growing industrial crops and vegetables, but it may be supposed that these last are found preferably on the small sized farms. Unfortunately the Census under review does not give the distribution of forrage, industrial and vegetable crops, according to categories of farms.

/The fact that

The fact that an important part of the arable land of this zone is not suitably exploited, though it has the water for irrigation, was clearly demonstrated by the survey of the Dirección General de Agricultura.^{1/}

III. Production and its value, according to the size of the farms

An attempt has been made to approach this subject in Table 5, without trying to establish the absolute profitability of the different categories of farms; several important branches of production are not included in this analysis, such as vegetables, fruits, vines, milk, wool, etc., on which the Census gives no indication of distribution by categories of farms.

Nevertheless, it is interesting to note in the first place the high average price of land of the small farms, up to 5 hectares, which may be attributed either to the high percentage of irrigated land, to their location near populated areas or the surcharge in regard to the buildings on the small area which they cover. Their average value per hectare is three times greater than in the following category from 5 to 20 hectares per farm.

Similarly it can also be seen that the greatest value of production (cereals, market garden crops and cattle) is concentrated in farms from 200 to 500 hectares. It has already been indicated that this category of farms in the irrigated zone of the country, while having one of the highest percentages of irrigated land in relation to arable area (50.8 per cent) showed in turn, within the type of medium sized properties, the greatest percentage of cultivated area in relation to arable area.

^{1/} "Informaciones para un plan de habilitación de nuevos terrenos" (See page 5 of the Chapter "Agricultural Conditions")

/The value

Table 5. Value of production according to size of farms

Classification according to area (in hectares)	Average price per hectare	Value of production per hectare ^{a/}			Total value per hectare		Ratio between value of production per hectare and its average price percentage
		Cereals	Market garden	Cattle ^{b/}	Arable	Total agri-cultural land ^{c/}	
Values in pesos							
Less than 5	2,601	641	81	106	202	214	8.2
5 - 20	871	563	105	53	327	147	16.9
20 - 50	602	558	90	59	187	122	20.2
50 - 100	575	614	94	63	197	122	21.2
100 - 200	601	698	100	77	236	140	23.2
200 - 500	607	753	98	61	212	139	22.9
500 - 1000	444	752	99	72	233	119	26.8
1000 - 2000	352	733	97	67	218	100	28.4
2000 - 5000	229	716	97	64	186	60	26.2
over 5000	75	699	105	75	173	11	14.7

Source: Agricultural Census 1936

a/ Cereal production: wheat, rye, barley, oats, and maize in 1935/36, at the wholesale price for that year.

Market garden crops: beans, peas, chickpeas, lentils and potatoes in 1935/36, at the wholesale prices for that year.

Livestock: Heads of calves by categories of farms, appraised as young bulls and heifers for sale, according to average prices for that year.

b/ Includes the sector of arable land lying fallow and not used for cereal or market garden crops.

c/ Excludes the barren area.

The value of production per cultivated hectare, shows that the medium and large farms are those which derive the highest gross income from cereal crops. This is due to the fact that they obtain the best average yield per hectare.

The total value of production per hectare in the three branches of cereals, market garden crops and cattle, by category of farms, shows gross incomes which generally tend to decline as the area of the farms increases. It is significant that among the farms from 5 to 20 hectares and those of over 5,000 hectares, this value per arable hectare declines by almost 50 per cent.

On the other hand, the ratio between what has been called gross income and the average appraisal per hectare, shows that the cultivation of cereals, market gardening crops and cattle in the small farms give a low percentage which improves considerably as the size of the farm increases, up to the farms of 5,000 hectares. In those which are larger still, this percentage is once more reduced. The explanation is obvious. The production of cereals and livestock is only technically satisfactory and economically justifiable in small sized farms, in countries where intensive agriculture is developed to the maximum, which is not the case in Chile.

It was stated at the beginning that the outline of production in Table 6 was incomplete, through the omission of other crops.

Thus the gross profitability of the farms exceeding 5,000 hectares, which correspond to a large extent to the "estancias", (Large farms) of the southern and austral zones, appears to be less, since an important part
/of production

of production represents the exploitation of timber or sheep breeding, which are not shown in that table.

On the other hand it is logical to suppose that the growing of greens and vegetables, as well as the cultivation of fruit and vines, constitutes an important contribution to the income of the small and medium farms. In this connection, the following detail of the number of vineyards and their extent in 1937, according to data supplied by Dirección General de Impuestos Internos, should be inserted:

Vineyards up to	1 hectare	23,550
" " "	2 "	4,059
" " "	5 "	3,393
" " "	10 "	1,560
" " "	20 "	782
" " "	50 "	428
" " "	100 "	120
" " "	200 "	27
" over	200 hectares	10

In some parts of the country the small farms concentrate solely on the cultivation of the vine.

IV. Yields according to categories of farms

The manifest increase in the yield of crops according to the increase in the area of the farms (Table 6) is due to the following two fundamental facts:

- A. In the small sized farms, rotation is small and the land is worked intensively. As was seen before, farms from 5 to 20 hectares show the highest percentage of area devoted to the cultivation of cereals and market garden produce in relation to the arable area, these being 32 and 25.7 per cent respectively. On the other hand, the larger farms

/which have a

which have a proportionately greater arable area lying fallow may practise a more rational rotation with a larger number of crops.

- B. On the whole, management and organization are better in the medium sized than in the small farms and the former are also in a better position economically to acquire the means of production, such as fertilizers, machinery, seed, etc.

V. Evolution of the system of land tenure since 1936

As there are no recent statistics, it is not possible to appreciate the changes which may have taken place, but there are fundamental reasons for estimating that the situation which existed 13 years ago has not changed substantially.^{1/} This can be supported by the following facts.

a) Government action concerning colonization or distribution of public lands has been discreet. The Caja de Colonización Agrícola, which acquires agricultural farms for their habilitation and formation into colonies, has lacked funds and therefore has not been able to continue the rate of work which marked the first years of its existence.

b) On the other hand, the Dirección General de Tierras y Colonización, which is in charge of public lands and which either rents them or allots them to applicants free of charge, carries out its

^{1/} The data for the fiscal evaluation of the Dirección General de Impuestos Internos is most valuable material for undertaking an interesting research in a reasonable time. The study could be concentrated on certain key agricultural provinces, using these to determine the actual system and state of productivity, value of the farms, profitability, etc.

Table 6. Yields of the Principal Crops

(Metric quintals per hectare)

Classification according to area in hectares	Wheat	Oats	Barley	Maize	Beans	Lentils	Potatoes
Less than 5	8.9	9.4	10.6	10.6	7.4	5.6	55.6
5 - 20	8.8	9.4	12.2	9.4	6.9	6.1	63.5
20 - 50	9.1	9.3	12.4	8.7	7.2	6.4	60.9
50 - 100	10.0	10.7	14.3	9.3	8.3	6.7	69.9
100 - 200	11.2	11.8	18.2	10.2	8.6	7.4	86.9
200 - 500	11.9	11.5	19.0	14.1	10.1	6.9	97.0
500 - 1000	12.2	12.1	16.8	12.4	9.9	7.7	99.8
1000 - 2000	11.8	12.1	15.5	14.3	10.9	7.4	105.3
2000 - 5000	11.4	11.2	16.5	15.8	10.0		
over 5000	11.2	11.3	14.0	16.2	10.3	6.2	112.5
Average for 1935/36	11.1	11.3	16.2	12.5	9.4	6.8	80.2

Source: Agricultural Census 1935/36

functions principally in the extreme south of the country - provinces of Aysen and Magallanes - a zone which does not contribute crops and : the main possibilities of which lie in cattle and sheep farming in Aysen and sheep farming in Magallanes. This region also has important timber reserves.

It is for this reason that in this region the subdivision of property is subject to its natural capacity and possibilities, with large and medium sized properties predominating.

c) The excessive sub-division of agricultural properties, particularly in the zones near the great centres of consumption, caused the Government to introduce legal measures to try to prevent the formation of new farms of uneconomic size on the one hand, and the use of agricultural land for other purposes. For this purpose, Law 7747, of December 1943, article 43, establishes: that the sub-division of agricultural properties into farms of less than 15 hectares in extent would have to be subject to the approval of the President of the Republic.

The corresponding authorisation is granted by decree, following an examination by the technical bodies of the Dirección General de Agricultura.

The decrees on this subject issued from 1944 to 1949 inclusive have been studied, as they were considered particularly interesting.

During the period of 6 years in which the Law has been in force, it has been possible to control the sub-division of some 17,000 hectares of land, the great majority of which had agricultural or forestry

/possibilities, since

possibilities, since even lands destined to the formation of residential or industrial sectors showed agricultural qualities, but being in the urban or suburban areas, their value made it impossible economically to continue their exploitation. It should be stressed that out of a total of 1,214 agricultural plots controlled, more than 80 per cent of the sub-divided land lay in the Province of Santiago, and that the average area of the authorised plots reached an average throughout the country of 2.55 hectares. These were almost entirely very fertile, flat, irrigated lands, often with fruit orchards, and generally situated very near centres of consumption, or within agricultural localities with high yields.

It is interesting to see the popularity of the so-called "forest plots", that is, farms which, through their suitability for such purposes or because of depleted soils, have been planted with forests mainly on the basis of pine, and, to a lesser degree, eucalyptus. This initiative has brought about the parcelling of 11,492 hectares into 10,211 lots, and is generally due to private capitalist enterprises which acquire a piece of land of little value and replant it, offering plots with certain guarantees, such as the care of the plantation during the early years, replanting, etc. There is a certain resistance on the part of technical bodies to authorise this sub-division of the forest lands, for fear that their subsequent exploitation may cause difficulties to the owner, and for this reason, generally, the enterprise has been obliged to form a cooperative among the future proprietors to be responsible for the later care and final exploitation of the plantation.

/d) Finally, reference

d) Finally, reference must be made to the private commercial transactions in agricultural properties. Unfortunately the Dirección General de Estadística shows only the number of sales, auctions or other forms of transfer, and the total sum of operations, without indicating the size of the property. The number of such operations, over the last 10 years has remained very steady and there has been no increase or decrease of such business for economic reasons. On the other hand, it is not known whether such transfers correspond to the whole or a fraction of the farm. Altogether, it should be estimated that in the last few years, there has been sub-division of some important and extensive agricultural properties, particularly in the central zone of the country, sub-divisions originating principally in partitions and dissolution of successions brought about by deaths.

Nevertheless, summing up the partial data available, and the general impressions drawn from this subject, since the 1935-36 Census the rate of subdivision of the great estates has been materially lower than that of the smaller farms and this originates principally from the sub-division of medium properties. This supposition indicates an aggravation of the problem presented by the very small agricultural properties in the country.

VI. Summary

A. During the period from 1925 to 1936 there was a marked tendency towards the formation of small farms, a situation which continues at the present time. On the other hand, the formation of agricultural properties of medium size through the sub-division of the great estates, is slow; these last (over 5,000 hectares) during the

/period 1925/1936

period 1925/1936 at least, remain the same in number, and their average area only decreases by 14 per cent. State intervention in the subdivision of the great private estates or fiscal lands, is negligible.

B. Both the statistical classification of the farms according to extent and valuation, and the study of their economic capacity as production units,^{1/} make it clear that the average area of a very high percentage of the agricultural properties in Chile is insufficient to meet the needs of the owners and their families.

C. The use of the land according to the 1936 Census shows that the very small farms are worked more intensively than the larger ones, but that their cultivation is not adequate from the technical viewpoint, since a high percentage of the arable soil is used for the cultivation of cereals, obtaining yields which are lower than the average for the country.

The exhaustive exploitation of these lands in order to contribute towards the maintenance of these small proprietors and their families,

^{1/} According to Trivelli, "Expansión y Estructura Agraria en Chile", Santiago 1941, analysing the results of the 1935/36 Census from the point of view of value, area, characteristics and production of the properties of each province, 90.2 per cent of the agricultural farms correspond to the category of small property with an arable area equivalent to 14.7 per cent of the agricultural area. This author considers that 142,800 properties (78.5 per cent of the total) are tiny properties, with a total area of 1,739,500 hectares. On the other hand, there were nearly 9.5 million hectares (45.4 per cent of the useful agricultural area) divided into 1,300 properties which according to the value of their lands and their intensity of production, corresponded to agricultural units which were excessively large from the technical and economic aspect. Finally, only 37,400 farms, or 20.7 per cent, with a total area of 9.5 million hectares (46 per cent) corresponded to exploitations adjusted to the economic concepts of small, medium and large property.

/in many cases,

in many cases causes serious erosion.

On the other hand the economic situation of their proprietors makes it difficult for them to improve their working methods, particularly insofar as mechanization is concerned.

D. Obviously the medium or very large property, with better resources, including principally credit, obtains harvests with higher yields and lower costs of production, and consequently competes to advantage with the small proprietors.

An increase in agricultural production which would be feasible on the basis of the large and very large properties, since they have a greater margin of unworked land, would possibly aggravate the situation still further, if it took place without the consideration of any change in the structure of property, in order to solve adequately the problem of the tiny farm.

SECTION 3. AGRICULTURAL DEVELOPMENT FROM 1925 to 1950

I. Historic Background

Various authors who have referred to the history of Chilean agriculture, agree that the period of greatest agricultural expansion and development corresponds to the second half of the XIXth Century.^{1/}

On the one hand, three vast regions were incorporated into the national territory: the territory of Magallanes (1843), Araucania (1883) and the nitrate provinces of the North (1880), which in turn gave impetus to three important activities: sheep breeding, the production of cereals and nitrate.

Simultaneously, important public works covering highways and irrigation were carried out, the latter extended the irrigated area from 440,200 hectares in 1875 to nearly double in 1900.^{2/}

The principal incentives to the expansion of agriculture were the country's economic prosperity, which increased principally as a result of the mining and nitrate boom, together with the rapid development of the population, which practically doubled during the second half of the XIXth Century.

At the same time the opening of foreign markets gave rise to the production of certain surpluses, principally cereals, meat, hides, tallow, fruits, etc.

However, in the last quarter of the past, century, two phenomena operated in conjunction to cause agriculture to reassume the complementary

^{1/} Consult: Correa V.L., "Agricultura Chilena", I, page 121, Santiago, 1938.
Schneider, T., "La Agricultura en Chile en los últimos 50 años",
Santiago, 1940.

^{2/} Correa V.L. (op.cit.)

nature of its early days:

- (a) The exploitation in foreign countries of immense agricultural areas which had remained unproductive owing to their distance from the centres of consumption, and which now thanks to modern highways and means of transport, could deliver their products to world markets;
- (b) The spectacular nitrate boom which became a preponderant factor in national economy.^{1/}

The production of the nitrate fields rose from 250,000 tons in 1880 to 1,080,000 tons in 1890 and to 1,400,000 in 1900, and constituted one of Chile's principal sources of income. This rise in turn stimulated agricultural production, because of the need to supply a numerous population with a strong purchasing power (400,000 inhabitants in 1918).

In the middle of the century, national income increased from 4.3 million pesos at 46d parity (1850) to 100 million pesos at 18d parity in 1900, and foreign trade increased from 24.2 million pesos at 46d parity to 296.2 million pesos at 18d parity at the end of the century.

On the other hand, there was a marked concern during that period to modernise and improve agriculture. This was principally the consequence of the International Exhibition held in Santiago in 1869 which promoted the introduction of agricultural machinery. This change was very opportune, since it made it possible for the country to face the shortage of labour in agriculture, which resulted from the exodus of workers to the mines and to important public works which were carried out in that period, when the total population of Chile did not reach two million inhabitants.

New varieties of seed and new breeds for livestock were introduced

^{1/} Report of the Post-War Agricultural Commission, Santiago 1944.

into the country, and there was interest concerning agricultural techniques; the Instituto Agrícola (Agricultural Institute) which was to be run on a university basis and several schools of practical agriculture were founded in 1872 and 1888 respectively.

The development of industry, backed by the protectionist law of 1897, created new possibilities of work and increased purchasing power; agricultural and forestry production, were stimulated by the demand of industries such as textiles, paper and cardboard, beer, oil, shoes, canned goods, foodstuffs, furniture, etc. Thanks to this industrial process, the country was able to survive the war of 1914 without great privations or sufferings.

Later, the Ministry of Agriculture was created, distribution of property in the extreme south was put into effect in the south of the country (1924), the Caja de Crédito Agrario (Agrarian Credit Institution) was organized, the Cuerpo de Carabineros (Carabineer Corps), was founded and the construction of highways, etc., was speeded up. Together with all this, foreign trade of agricultural products was renewed and extended, after it had slackened in the years following the First World War.^{1/}

In brief, the period under review was characterised by a notable expansion and growth of agriculture which, even though it lacked adequate means of production, was easily able to satisfy not only the rapid growth of domestic consumption, but also to export considerable quantities, with obvious profit for the finances of the nation.

II. The Period from 1925 to 1950

It can be said that this period has certain characteristics which

^{1/} Correa V.L. (op.cit.)

/distinguish it

distinguish it from the previous decades; although the general trend is a slow increase in production, reflected in the extension of the cultivated area, it is considerably less marked than during the preceding years.

Moreover, the fluctuations of agricultural production during the period under consideration are presumably more violent than those registered before. They obey forces of an economic and external nature, rather than to those natural factors which tend to modify the rate of production through changes in production, displacement of crops, climatic conditions, diseases, etc.

Broadly speaking, the following stages may be distinguished within this period:

1925-1932. The prices of agricultural products declined sharply during this period. The price index of cereals dropped from 46.5 in 1925 to 13.6 in 1932, while that of livestock dropped from 48.7 to 31.7. The general price index for agricultural products dropped from 46.0 to 27.3 in this short period.

On the other hand, the volume, judging from official statistical data, shows a considerable increase from 1925 to 1930. The general index which stood at 87.7 in 1925, reached 110.3 in 1930 and was influenced principally by an increase in the production of cereals, legumes and wines, since the index of livestock dropped from 110.9 in 1925 to 104.4 in 1928 and 100.6 in 1930.

The persistent decline of agricultural prices and the unusual expansion of production which being greater than the increase of the population, created surpluses which could not be sold on the domestic market

/ and only

and only with difficulty, on the foreign market, resulted in the most severe collapse which Chilean agriculture has experienced in all its history. Thus, the years 1931 and 1932 mark the lowest levels in agricultural production.

1933-1939. This period is one of recovery and improvement in agriculture, not only in its quantitative aspect but also from the qualitative point of view of production.

The prices of agricultural products recovered rapidly and remained high, and the general index of production, in spite of certain fluctuations, was on the whole considerably higher than during the 1925-1933 period.

An important part of this situation must be attributed to the heavy expansion of exports, which took place particularly for certain crops, especially pulses, oats, barley, and fruit, even though there are no production statistics available for the last-mentioned commodity. In this period, (1935-36) the commercial cultivation of rice was begun, transforming the country within a few years from an importer to an exporter of this crop.

Though agricultural exports represent but a small percentage of total production, the foreign market for Chilean agricultural products has considerably influenced their expansion.

1939-1945. The beginning of the war caused an immediate depression in agricultural production in those commodities which had expanded notably as a result of exports, such as barley, oats and pulses. It should be remembered that Europe in 1938 absorbed 77.5 per cent and in 1939 75.9 per cent of the total value of exports of Chilean agricultural, livestock and forest products. In 1940 it dropped to 52.6 per cent, in 1942 to 21.7

/per cent,

per cent, and in 1944 it represented only 9.6 per cent.^{1/}

The index of cereal production dropped sharply from 138.2 in 1939 to 118.5 in 1940, and to 107.1 in 1941, principally owing to the decrease in the area sown with barley and oats, and in spite of the increase in the cultivation of rice. The volume index of pulses which in the years 1937 and 1938 reached the maximum of 151.8 and 141.6, dropped to 115.3 in 1939, with a recovery in 1940 to 135.5; but from then until the present time, it has declined with fluctuations.

The sharp drop in the production of wine, since 1939, was the result of government decrees, since the Ley de Alcoholes, of that year limited the production and consumption of wines.

It is interesting to note the development during this stage of certain industrial crops. Their general index rose from 101.8 in 1940 to 285.8 in 1943, and 182.5 in 1945. This was due to a heavy demand from abroad (the United States) for hemp fibre, which caused the area of 7.3 thousand hectares in 1938 to expand to 20.3 thousand hectares in 1942; this crop later declined due to the poor quality of the fibre and its high price. On the other hand, sunflower began to be exploited on a commercial scale, the area under cultivation extending rapidly from 1,200 hectares in 1939 to 20.7 thousand hectares in 1944.

Fruit growing, which had been developing considerably, suffered a considerable depression with the closing of the European markets, and underwent a severe crisis; later it was found that the exportable surpluses could be profitably sold on the domestic market, and in this way an

^{1/} Wilhelm G.R. Comercio Exterior Agrícola, Rev. Simiente Vd. XVII #1-2, Santiago, 1947.

appreciable percentage of the volume previously exported was absorbed.

The livestock industry continued to decrease, particularly the production of meat, and their highest index for this stage, 109.7 in 1941, was reduced to 92.9 in 1945.

The prices of agricultural products for internal consumption began to rise sharply particularly after 1942. The general index was almost doubled from 1940 (86.1) to 1945 (164), in spite of the fact that by 1941 there had only been a moderate price increase. It must be remembered that the prices of agricultural products in Chile generally follow those of wheat, which is easily explained by its importance within the whole domestic agricultural production.

1945-1949. The year 1945 marked the beginning of a new period of depression of production in the most important branches, since the general index dropped with no interruptions from 127.6 (the highest in the last 25 years) to 117.1, 114.7 and 112.0 in the following years. Only in 1948 did it rise again to 124.3. The index for industrial crops was the only one to increase, from 140.7 in 1946 to 266.5 in 1949, as a result of the expanding cultivation of sunflower.

The production index for 1949 cannot be calculated yet, as the data for the production of wines and livestock industries are lacking; but, judging by the partial indices available, it would be the same or slightly lower than that for 1948. The index for the current year of 1950, judging from the first data on sowings and harvesting of cereals, appears to indicate a strong contraction of agricultural production, largely caused by the poor yields of a year which suffered from extremely adverse weather conditions.

In our opinion, the depression which Chilean agriculture has
/experienced

experienced during the last five years, must be attributed to deeper and more complex forces than the adverse factors of the climate, such as the period of drought which affected the central-northern and northern zones.

The lack of the necessary means of production, during the last years of the war and the first post-war years, which at first were thought to be the cause of the stagnation of production, has been discounted as the decisive factor. Neither is the availability of agricultural machinery, fertilisers, pesticides, etc., responsible for this state of affairs.

In our opinion, the continuity of agricultural production has been mainly affected by the difficulties of present conditions of foreign trade, insofar as it affects those products destined for export. On the other hand, the serious inflationary process, the restriction of credits, the indiscriminate importation of cattle for food, without any protection being given to the dying national livestock industry, and an obvious speculation with the value of the land, among other things, have contributed towards changing the normal development of those branches destined to domestic consumption.

III. Production and Markets

If the whole of Chilean agricultural production is analysed, it becomes apparent that it is essentially directed towards satisfying the most immediate needs for feeding the population. The latter is small and its purchasing power is low, especially among agricultural labourers, who represent more or less one quarter of the working population of the country, (1940). The 142,000 small holding owners are in a similar position

Finally the contribution of the so-called industrial crops (tobacco,

/flax, hemp

flax, hemp and oilseeds) to national industry is modest, except for sunflower seed and they rather tend to satisfy the limited domestic requirements.

From the foregoing points it may be inferred that Chilean agriculture, on general lines, is not very diversified, is little developed and is adjusted principally to the development of the population.

A rapid review of the trends of the principal crops during the period 1925-50, with relation to the market, makes it possible to appreciate these conclusions better:

(a) Cereals for human consumption. (wheat, rice, rye). The exclusive object of the cultivation of wheat is the satisfaction of the country's requirements, and its expansion has consequently attempted to adjust itself to the development of the population. Foreign trade is dependent only on the convenience of getting rid of certain surpluses which occur in years of bumper crops, just as wheat is imported when the reverse situation takes place. In any case, the foreign trade is not important. In 23 years (1926-48) the total production of wheat was 18,570,000 tons while imports amounted to 538,600 tons and exports to 312,200 tons.^{1/} However, there is a certain tendency to reduce exports, and on the contrary to increase imports.

(Annual average in thousands of tons)

Period	Production	Imports	Exports	Availabilities
1926-30	784.4	9.1	28.0	765.5
1931-35	744.5	26.2	16.3	754.4
1936-40	859.0	9.4	10.9	857.5
1941-45	867.4	36.1	5.2	898.3
1946-48	958.2	44.8	3.4	999.6
1949	1,113.5	6.2	23.7	1,096.0
1950	880.9 a/	...	...	...

a/ According to the calculations of the Dirección General de Agricultura.

^{1/} According to the calculations of the Dirección General de Agricultura.

/The cultivation

The cultivation of rice in Chile is recent and figures were only registered as from 1935 (200 hectares and 9,000 metric quintals). Three important factors determined its cultivation: (a) the excellent unit yields from lands which previously were not properly utilised on account of their texture; (b) its price, which was 24 per cent lower (1940) than the imported product; and (c) the paralysation of imports of rice as a result of the war. In this way the 1940 area of 13,000 hectares was increased in five years to a maximum of 48,000; while production increased from 45,000 tons to 160,000 tons, and exports from 6,200 to 67,000 tons during the same period. However, there were certain drawbacks to this rapid expansion, since this crop invaded other lands which were not suitable for its cultivation, yields declined and exports stagnated. In 1946 the area devoted to rice was reduced by one quarter, and by 1948 to one half of the maximum of 1945. The exportable surpluses in turn dropped to 1,000 and 8,300 in the years 1948 and 1949.

It can be estimated that since this period, the cultivation of rice has become stabilised in those lands which from the first were suitable and that its production is fundamentally destined to satisfy the country's needs.

Finally, rye which also belongs to this group, has no particular importance either in regard to the area under cultivation nor for the domestic demand, which is very limited.

(b) Forage Cereals (barley, oats and maize). The area which is devoted to these three crops taken as a whole is only equivalent to one quarter of that devoted to the bread-making cereals described in the preceding group. Taking this into account, in view of the purpose for which they

/ are used, one

are used, one of the main faults of Chilean agriculture immediately becomes apparent, i.e., the low production of livestock.

In fact, when the total surface covered by these three crops and the corresponding portion of their production which is exported (barley and oats, in grain or transformed into malted barley or crushed oats) is shown graphically, there is an insignificant amount available to satisfy the domestic demands, seeds, the brewing and food industries and consumption of livestock.

Barley and oats are preferably export products, and as such they went through a crisis as a result of the last war, when the sown area contracted considerably, since the potential availability was not diverted to domestic consumption.

It is important to note that barley is cultivated almost exclusively in the irrigated lands of the central zone, and if it has remained in these lands of high value with reduced mechanisation, this is due exclusively to the high unit yields and the prices which industry and foreign markets can pay.

Finally, maize is possibly the grain which is used for animal forage, in higher proportion than the others in this group, either in the manufacture of concentrated foods for fowls and dairy cattle. Its classic use for the feeding of hogs is not made possible on account of its excessively high price that would not permit its transformation into meat on either an industrial or an economic scale.^{1/}

This crop is not exported, but every year a small quantity is imported, which does not amount to more than 3 per cent of national production.

^{1/} According to estimates of the Dirección General de Estadística, only 1/3 of production corresponds to human consumption.

(c) Pulses (beans, peas, lentils and chickpeas). These represent an important branch of agricultural production, not only because they permit a better use of the lands in which the respective crops are located, but also on account of the demand for them abroad.

It may be observed in the corresponding chart that an important part of the area which they occupy corresponds to crops for export, especially during the pre-war period, when the maximum development of these crops was achieved. The war principally affected the production of lentils and peas, the main markets of which were in Europe, but this was not the case with beans, in the latter case the North, Central and South American markets made it possible to maintain production.

The area under cultivation of these four crops was reduced from 228,000 hectares in 1935 to 131,000 hectares in 1948. This situation is attributable, apart from the reduction in foreign markets, to an appreciable decrease in domestic consumption, on account of their high prices. The latter have increased, between 1937 and 1948, in greater proportion than the prices for wheat and rice, and, judging by the calculation of availability per head, these latter are replacing pulses in national consumption.

(d) Potatoes. There is an appreciable development only in the first years under review, when the area was doubled from 1925 to 1932, reaching 56,000 hectares; it has remained practically stabilised at that figure until the present time. Strong fluctuations in yield from year to year are characteristic, and are principally due to climatic conditions. This determines surpluses or scarcity in the domestic market which cause considerable price variations. Only in exceptional circumstances are potatoes exported, and then only in small quantities in relation to the total volume of production.

/ (e) Industrial crops

(e) Industrial crops (tobacco, flax, hemp and sunflower). The first three have had no significant development during the period except for a sporadic increase of hemp resulting from the demand for this fibre during the war years.

Essentially, these crops satisfy domestic requirements, while certain quantities of flax and hemp fibres are marketed abroad. These fibres are of too high a value to have a greater demand within the country, and on the contrary, considerable quantities of jute and henequen (Mexican agave) are imported for the sack and cordage industry.

Sunflower is the only industrial crop which shows any marked changes.

The difficulties in providing the country with oils or oilseeds, contributed towards establishing this crop in the country. Until 1941 the principal source of supply was Peru, with cottonseed, which in 1938 reached a volume of exports into this country of 50,120 tons. In 1942, however, the supply was totally suspended. Imports of oil, principally from Spain and Italy, which reached 3,812 tons in 1938, dropped to less than half in 1939, and to a sixth in 1940. At the same time imports of sunflower seeds from Argentina and Brazil were started.

The foregoing situation linked this crop to the irrigated zone of the country and it developed rapidly from 1,200 hectares in 1939 to 20,700 hectares in 1944, reaching in 1949 the present maximum of 42,000 hectares; thus it has grown to supply 80 per cent of the country's requirements for edible oils. In 1935 the national production of oleaginous plants (olives, hemp, grape pips) only represented 7 per cent of the total consumption of edible oils. This consumption, in turn, has increased from 2 kilogrammes per inhabitant per year in 1935 to 2.7 kilogrammes in 1941, and to 3.7

/kilogrammes in

kilogrammes in 1945.^{1/}

Among factors contributing towards its expansion have been high yields per unit, the choice of suitable varieties and the great facilities of credit, seed and technical assistance which the national oil factories have contributed. The fact of thus having an assured market is producing serious competition between this crop and others (principally maize) which are grown in the irrigated lands of the central zone.

(f) Cultivation of vines and fruit. Both these important branches of production have experienced different development in the last 25 years. The area of vineyards increased progressively until 1926, from 70,300 hectares with a production of wines and "chichas" reaching 206 million litres, to 104,100 hectares and 359.5 million litres in 1938. In 1939, as a result of the Ley de Alcoholes, (Law on Alcohol) which limited domestic consumption to 60 litres per inhabitant per year, and established a heavy tax on new plantations, as well as the annual production surpluses or "frozen wine", new plantations were not only restricted, but the existing plantations decreased, since the Law permits the pulling up of a part of the vineyard so that it may thus be definitely exempt from the annual blockade.

The total area was reduced gradually in the succeeding years, and by 1948 covered 95,600 hectares. An immediate result of these measures was a heavy increase in prices, whose index of 67.9 in 1939, rose to 144.8 in 1941. Nevertheless, production has been maintained in spite of the decrease in the planted area, since the immediate reaction was to pull up vineyards with a low yield or substitute them with stocks giving high yields, with

^{1/} Wilhelm G.R. Comercio Exterior Agrícola (op. cit.)

/ an obvious

an obvious lowering of quality.^{1/}

The export of wines, notwithstanding their good quality, has been developed with great difficulty, and only reached a maximum of 13.3 million litres in the year 1937, principally to European countries, dropping during the war to one tenth. In 1948 some 6 million litres were exported, that is, from 2 to 2.5 per cent of total production, and only in 1949 was it possible to export around 14 million litres. In spite of being an industry of fundamental importance on account of the capital invested in it, the work which it provides, and the conditions which the country offers for the production of pressings of excellent quality, the cultivation of the grape is affected by heavy taxation.

There are no complete statistical data available to permit an understanding of the considerable quantitative and qualitative development of fruit cultivation, which constitutes one of the most important branches of Chilean agriculture. If figures were available concerning its production or even the planted area over a series of years, the general index of the physical volume of agricultural production would certainly show a more satisfactory rate of progress.^{2/}

The development of industrial fruit growing is worthy of being noted since it supplies the important branches of preserved and dried fruits, but also since fruit is exported. The exports of fresh and dried fruits

^{1/} Plan Agrario, page 101 (op. cit.)

^{2/} According to estimates made in 1948, production was of an average of 161,300 tons of fresh orchard fruit and 72,200 tons of garden fruit during the 1941-45 period. The most complete data available concerning the development of a species, covered the citras fruits. The Census of 1936, which is incomplete since it only took into account orchards of over 0.5 hectares, shows 141,012 productive orange trees with a production of 25,581 metric quintals and 40,319 lemon trees producing 9,067 metric quintals of fruit. On the other hand, a careful survey of property effected by the Dirección General de Agricultura in 1944/45 shows the existence of 742,550 orange and 792,486 lemon trees with a crop of 132,700 and 74,750 metric quintals respectively. The development of the plantations of this species is extraordinary and should not be taken as general for Chilean fruit cultivation as a whole.

have, generally speaking, followed a similar course to that observed for other agricultural products. From 6,200 tons in 1925, it increased with certain fluctuations to a maximum of 23,200 tons in 1939, dropping the following year to 11,200 tons, and to a minimum of 6,700 tons in 1943. It recovered in the post-war years to 14,400 tons in 1946, and has remained more or less stable at that figure.

(g) Stockbreeding. This branch of agricultural activity deserves special attention, since its precarious development and difficult situation over many years has deep immediate repercussions on the land tenure system and its rent value, and even deeper ones on the general economy of agriculture and consequently that of the whole country.

According to the opinion of many technicians and authorities on the subject, Chilean agriculture cannot solve its problems nor commence a real plan of development and improvement, if it does not solve entirely the so-called livestock problem. This problem has certain technical aspects which can be solved, but it also has others of an economic nature which are more difficult to overcome.

1) Cattle. Because of the excellent possibilities for the export of cereals which existed in the second half of the last century, Chilean agriculture relegated its livestock to second place, and soon it was necessary to import cattle from Argentina to satisfy the needs of the market, and in spite of the establishment of a tax in 1898, from 1900 to 1907 an average of more or less 50,000 head of cattle were brought into the country. In that year the existence of 2,674,666 heads was recorded, for a population of 3,231,500 inhabitants

Later on this tax was lifted and imports of 102,000 and 126,000 were

/reached

reached in 1908 and 1909 respectively, which brought about the establishment of a new tax on Argentine cattle. As in spite of that, the annual volume brought in remained high, it was decided in 1915 to raise this tax.

In 1918 the tax was again suspended, being re-established once more in 1927, through the promulgation of a law which fixed a variable tax in relation to the price of cattle transactions in the country's fairs.

In 1925 there were 1,918,433 head (48.8 head per 100 inhabitants), and in the five following years an average of 105,000 heads per annum were imported. This permitted the national stockbreeders to improve their stock, for the demand for cattle for processing was not from imports and an important part of annual production was reserved for re-breeding. In this way stocks increased by 1930 to 2,387,940 head (56.6 per 100 inhabitants).

In 1930, the tax in force was finally lifted and the price of meat was controlled - which was inefficient - in order to prevent it from becoming too expensive. This period coincided with the serious economic crisis, and imports during the five years from 1930-34 dropped to an average of 18,000 head, with a minimum of 253 in 1932. The Agricultural Census of 1935-36 shows 2,572,983 head of cattle for a population of 4,485,800 inhabitants.

Since that year, with the exception of certain slight fluctuations, the Dirección General de Estadística has published figures which show a slight decrease of the stock, which amounted to 2,344,200 head in 1949, in the face of growing imports of Argentine cattle, which from 8,000 head in 1935 rose to 70,000 in 1940, to 165,000 in 1943 and to a record of 236,000 in 1945. In the following two years it remained at 200,000 head,

/dropping in 1948

dropping in 1948 to 177,000 as a result of restrictions on foreign exchange.

In other words, with the per capita consumption of beef for which there is the greatest demand, remaining relatively even,^{1/} Chilean agriculture has been unable to satisfy the greater demand resulting from increases in the population, and has been wholly at the mercy of a strong supplier, producing at better economic conditions, such as the neighbouring country.

The contradictory measures in pro or in defence of national stockbreeding over more than half a century, have contributed towards producing discouragement among the farmers who refuse to devote their energies and capital towards exploiting a branch which requires greater investment than cereal production, and whose results are only evident after several years of continuous production.

But the problem of stockbreeding in Chile has more profound repercussions than the simple dependence on a foreign market and its effect on the national economy. We refer to the functional unbalanced state of agricultural enterprises.

The breeding of cattle in Chile is principally localised in the artificial or natural pastures which form part of the arable lands in rotation; some relation between the cultivated area and livestock should exist, while both should bear some relation to the country's population. Nevertheless, statistics show the following results:

^{1/} The consumption of meat in Chile is distributed in the following manner (average 1941-45):

	<u>Kilogrammes per inhabitant per year</u>	<u>Percentage</u>
Cattle	25.9	67.4
Sheep	7.4	19.2
Hogs	4.8	12.5
Goats	0.4	0.9
	<u>38.5</u>	<u>100.0</u>
		/Five Year

Five year period	Cult. hect. per 1000 inhabitants ^{a/}	No. of head of cattle per 1000 inhabitants	Head of cattle per cultivated hectare
1910-14	180	531	2.95
1915-19	194	566	2.92
1920-24	207	524	2.53
1925-29	245	473	1.93
1930-34	256	543	2.12
1935-39	273	525	1.92
1940-44	239	463	1.94
1945-49	227	425	1.87

a/ It should be remembered that in the first three five year periods industrial crops are not included, since the corresponding data do not exist, but from 1925-29 to 1945-49, these only increased by about 2 to 7 hectares for each 1000 inhabitants.

The area of annual crops in relation to the total population develops visibly from 1910-14 to 1935-39, reaching during the latter period its maximum of 273 hectares, which is equivalent to an increase of 51 per cent over the initial period.

On the other hand, the ratio of cattle per 1000 inhabitants is maintained with certain fluctuations from 1910 to 1939, and consequently, during this period the ratio of cattle to cultivated area shows a slow decrease from 2.95 to 1.92 head, making it obvious that cattle are constantly being displaced owing to the expansion of crops.

In the last two five year periods this situation became more acute, for there was a significant decrease in the ratio cultivated hectare-population, and that of cattle-population, while even the ratio of cultivated area-head of cattle reached its lowest point.

The insufficient number of cattle and the consequent depopulation of grazing lands resulted in:

/ 1) Lower profitability

- 1) Lower profitability per surface unit;
- 2) The impoverishment of the lands devoted exclusively to the cultivation of grains, and
- 3) Stagnation of the process of incorporating new lands to development.

Because of its natural conditions the southern zone of the country combines the best conditions for cattle breeding. Any form of incorporating new lands to agricultural production, requires for its normal and correct use, that crops should be alternated with pastures. The latter should in turn count on a sufficient number of heads to permit economic, balanced and permanent exploitation.

- 2) Sheep. Sheep herding in the country presents in its turn other aspects and problems. Naturally, it has developed more rapidly than cattle, and from 1910 until the present time, has practically doubled. The incorporation first of the Territory of Magallanes and later of Aysen to national economy contributed to this, since both have considerable areas and conditions suitable to this type of exploitation. In Magallanes the increases of stock were as follows: ^{1/}

1867.....	240 sheep
1885.....	40,000 "
1889.....	300,000 "
1895.....	900,000 "
1903.....	1,832,000 "
1918.....	2,187,000 "
1931.....	2,625,000 "
1935.....	2,622,000 "
1947.....	2,640,000 " a/

a/ Estimate of the Servicio Provincial de Agricultura.

The Census of 1930 showed 529,600 head of sheep in the Province of Aysen, and the 1936 Census showed 400,000, while the estimate for 1948

^{1/} Calderon A.J. Historia de la Industria Ganadera en el Territorio de Magallanes. Santiago, 1937.

/is 640,000 head.

is 640,000 head.

In summary, both provinces account for 52.5 per cent of the country's stocks of sheep.

The notable development of sheep-raising in Magallanes gave rise to the installation, between 1905 and 1923, of five great freezing plants and other establishments for fats. Thus the export of frozen mutton, tallow and wools came about. The processing of sheep from 1925 to 1946 averaged around one million head yearly, with a maximum of 1,360,000 in 1928 and a minimum of 330,000 in 1931. The export of mutton from this industry reached its highest peak in 1921 with almost 24,000 tons, dropping to less than 10,000 tons in the period from 1934-36. The despatch of mutton the central zone of the country began in 1934, and from 530 tons in 1935 it rose rapidly to 2,000 tons in the following year. For several years it has remained at some 5,000 tons, by Government decree, which fixed this quantity as the quota which the freezers might reserve for domestic supplies. In this way, the export market has been divided and the latest shipments abroad have not exceeded 6 to 7 thousand tons.

In the last few years the Magallanes freezing industry has had to face serious difficulties. An important part of the sheep processed by the Chilean establishments comes from their own farms in Argentina, and the export restrictions and increased prices for sheep imposed by that country, have reduced the slaughterings to 820, head in 1948 and to 625,000 head in 1949, causing one of the five plants to close down.

3) Wool Production. From this estimates made on this important subject it is learned that there has been a visible increase in shearing in the last 25 years, from a minimum of 12,100 tons of 1930 to a maximum of

/18,900 in 1945.

18,900 in 1945. The 1949 figure is around 15,300 tons (figures for unwashed wool). One of the most interesting points is the change which has taken place in the market. The national textile industry which in the 1925-29 period used some 2,000 tons, used more than 8,500 tons per year in the 1944-48 period. Thus the export of some 12,000 tons annually in the five years from 1925-29 has declined, with fluctuations, to less than 8,000 tons in the last three years, but it is still one of the principal export products, on account of its value.

IV. Agricultural Foreign Trade

The analysis of this subject ^{1/} in relation to the development of Chilean agriculture permits the drawing of certain interesting conclusions since, notwithstanding the relatively small importance of agricultural exports, certain sectors of production depend to a large extent on their foreign market.

The development which this trade has shown over the last 25 years may be summed up as follows:

1) The total weight of exports of Chilean products which are included in the foregoing groups, drops rapidly from 1925 to 1932, from 416.4 thousand tons to 164.7 thousand tons, a figures which represents the absolute minimum for

1/ The data of this analysis cover the period 1925 to 1948 and correspond to imports and exports, not only in gross weight but in the respective values of pesos at 6d. parity in the following groups:

- a) Products of water and forests (including the fish industry, which is not important in the total), and which represent principally wood and forest products.
- b) Livestock and livestock products.
- c) Agricultural commodities (principally cereals, legumes, fruits, vegetable foods and stimulants, spices, forages, raw materials such as fibres, oleaginous plants and tobaccos).
- d) Food industries (meats and dried meat, fats, dairy products, edible oils, preserves and sugar).
- e) Beverages and liquors (wines, spirits, etc.).
- f) Manufactured tobaccos.

/the last 25 years.

the last 25 years.

However, in only two years this total volume recovered rapidly, reaching in 1934 the maximum of 442,400 tons, thanks to the recovery of the agricultural products, which represented 80 per cent of this volume (337,900 tons).

Notwithstanding an inflexion in 1936, the period 1934/38 represents the greatest expansion of exports of agricultural surpluses.

During 1939/42 the war paralysed foreign trade in a sharper manner than in the critical period from 1925-32, and in 1942 a minimum of only 165,900 tons, that is, practically the level of 1932, was reached.

Since 1942, exports have not recovered and they have reached approximately 235,800 tons in 1948, that is, 56 per cent of the 1925 consignment and 53 per cent of the volume for 1934.

This course taken by exports is the reflection of the fluctuations experienced by agricultural production in the period under review, and in particular of its state of depression in the post-war years.

2) Agricultural import trade presents on the other hand a different development which confirms our opinion on the stagnation of Chilean agricultural production.

From 249,600 tons, which represented the total weight of imported articles for all groups in 1925, imports increased to 368,000 tons in 1929, dropping 1932 to only 172,600 tons, due principally to the restrictions in importing cattle.

Since this year, however, in spite of the heavy increase of international prices of the principal items imported (sugar, fibres, oleaginous plants, meats), the volume shows a continued tendency to increase, reaching 426,000

/tons in 1945,

tons in 1945, as a result of the ever-increasing imports of live cattle for slaughtering purposes. In 1946 and subsequent years the volume of imports declined somewhat, reaching 367, tons in 1948, that is, almost the 1929 level.

In other words, between 1932 (minimum imports) and 1949, the volume has increased by 106 per cent and the livestock and livestock products increased from 11,500 tons to 110,000 tons, that is to say, by 956 per cent.

3) The value of trade of agricultural commodities is no less significant.

From 1925 to 1932, not only the values of imports but also of exports of the different groups, were adjusted approximately to the variations in volume, registering a violent decline between 1929 and 1932, when imports dropped from 259 million pesos at 6d to 57.6 million, and exports from 247.9 to 80.3 million pesos at 6d.

A slow improvement in the balance of agricultural trade was produced after, as a result of the boom of Chilean agricultural exports, whose value in 1937 reached 174.9 millions, while imports represented only 79.7 millions. In other words, during the period 1932/40 the corresponding exports covered by a considerable margin the country's requirements for foreign agricultural, livestock and forestry products, either unprocessed or processed. In 1937, the balance in favour of foreign agricultural trade reached 95.2 million pesos at 6d.

Between 1941 and 1942, this favourable situation was reversed, and thus in this last year, imports reached the level of 150.8 millions and were surpassed by 36.1 million pesos in excess of exports. In 1946 this difference reached 74.5 millions, and in 1947 a maximum of 165.6 millions. Finally, exports improved somewhat in 1948 and imports were restricted,

/but even so

but even so there was an unfavourable balance of 78.1 million pesos at 6d.

In other words, since 1942 the country's requirements for agricultural products which are either not produced at all or produced insufficiently here, i.e., sugar, tropical fruits, stimulants and spices, vegetable fibres, oleaginous plants and meats, require a disbursement which the exported surpluses of Chile's own agriculture cannot cover, so that the foreign currency obtained from other sources of the national economy have to be diverted to meet the country's food deficits. Between 1941 and 1948 the value of imports increased by 371 per cent and that of exports only by 224 per cent, but these latter have not reached their pre-crisis level.

4) The following food products are those which weigh fundamentally against our foreign trade balance:^{1/}

Values in Millions of \$ 6d.

Products	1937	1943	1947
Sugar	17.1	55.8	143.0
Cattle	10.3	45.2	75.3
Stimulants (tea, coffee, etc.)	15.5	22.4	35.7
Oils and oleaginous plants	9.0	8.8	18.2
Other food products	9.5	11.7	27.3
Total	61.4	143.9	299.5

On the other hand, the food surpluses for export during the same years were:

Values in millions of \$ 6d.

Products	1937	1943	1947
Legumes	35.2	16.4	48.4
Processed rice	-	14.2 a/	3.2
Fruits and vegetables	13.4	11.0	30.9
Frozen meats	7.5	8.8	7.8
Preserves	1.3	6.4	1.7
Other food products	3.4	2.1	8.5
Total	60.8	56.9	100.5

a/ In 1945 and 1946, exports of rice reached 34.8 and 44.9 millions of \$ 6d. respectively.

^{1/} Wilhelm G.R. El abastecimiento de alimentos en Chile y sus posibilidades agrícolas, Santiago, July 1948 (mimeograph).

V. Agricultural production and availability for domestic consumption

Finally it is necessary to refer to this aspect in order to determine to what extent Chile's agricultural production contributes towards meeting the demand for food supplies and what changes and displacements have operated in this sense during the last 23 years.^{1/} These changes are the following:

Wheat and Rye. The average availability for the whole period corresponds to 157.3 kilogrammes and there is a certain tendency towards increased consumption per capita, principally of wheat, since rye represents only one per cent of the total quantity.

Potatoes. Average 82.6 kilogrammes. There are quite considerable fluctuations, principally between 1934/35 and 1945/46. Apparently there is a tendency towards greater consumption beginning in 1937. The fluctuations, as has already been mentioned, were due to varied yields, since the cultivated area maintains a very even course.

Legumes. The availability of the four species (beans, lentils, peas and chickpeas) shows a certain decline from 1929 onwards: this fact is quite significant, since it shows a decrease in consumption. The high prices reached by these products may have contributed to this, and their

^{1/} In order to determine this, calculations were made with the following formula:

$$\frac{\text{Harvest} + \text{imports} - \text{exports} - \text{seed}}{\text{population}}$$

thus obtaining a figure of net availability in kilogrammes per inhabitant per year, which corresponds to the consumption of the population or of certain industries which transform part of these products (barley, oats, maize, etc.). Of all the products shown on the chart, the "imports" item was only taken into account for the calculation of availability of wheat and meat. All the quantities are expressed in the gross product and to determine the volume of exports of certain transformed products (e.g. wheat flour, malted barley, crushed oats, elaborated rice, etc.), the conversion to its natural state was first made. Meat is expressed in "Carcaass weight" and corresponds to beef, mutton and pork.

/corresponding

corresponding displacement by products of less value, such as rice.

Rice. Until 1930 the chart shows a very even annual consumption, below the average, and falling even more in subsequent years. Nevertheless, the establishment of production of this crop in the country, which since 1938 has been produced in appreciable quantities for the domestic market at prices 24 per cent lower than the imported variety (1940) has resulted in a notable increase in its consumption per capita.

In the whole period under review, this is the foodstuff which shows the most significant changes and we consider that it has contributed in displacing legumes, and has possibly affected the composition of the average Chilean diet.

Meat. Two well defined tendencies can be established, the first from 1926 to 1935, in which consumption declines and the second until 1946,^{1/} with a recovery over the average (35.8 kilogrammes).

In the years 1947 and 1948 the consumption of meats declined since an acute scarcity of cattle occurred in the market, causing the rationing of slaughtering and sale of meats. It is worth noting that in the last few years attempts have been made to increase the consumption of fish and shell-fish.

In brief, from the foregoing observations it appears that in the last ten years, at least as far as the products which have been analysed are concerned, and which are the basic ones in the Chilean food supply, the protective foods of high food value and high price have been to some extent displaced by those energy-producing foods, which are cheaper, a phenomenon which some economists consider as a symptom of the economic depression.

^{1/} We attribute the considerable consumption for 1946 which was 26 per cent higher than that of the previous year to an error in the official statistics, which show an unusual yield of meat in relation to the number of animals slaughtered. We consider that this figure should be discarded as unsatisfactory.

SECTION 4. CHILE - ECONOMIC ASPECTS OF AGRICULTURAL PRODUCTION

I. Agricultural population and production

Taking as a basis the data published by the Corporación de Fomento de la Producción ^{1/}, the active population of the country in 1940 reached 1,655,900 persons, i.e. 33.9 per cent of the total population ^{2/}.

The active population devoted to agriculture are estimated at 553,000 inhabitants, represented 33.4 per cent of the active population of the country and was followed in importance by industry, with 16.7 per cent, public utility services with 15.3 per cent, and trade, with 8.1 per cent of the total active population.

The net income per active person in Chile in 1940 was of 10,243 pesos while the per capita income of agricultural worker amounted only to 5,205 pesos.

In 1940, for every 100 persons working in agriculture, there was an average of 216 inactive persons, so that the per capita income for the agricultural population was considerably lowered ^{3/}.

A) Ratio between active agricultural population and production.

On the basis of the population census of 1930, the figures quoted

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- ^{1/} Corporación de Fomento de la Producción: National Income 1940-45, Santiago, 1946.
- ^{2/} Estimated at 4,885,018 inhabitants by F. Levine and J. Crocco in "La Población de Chile", Revista Economía N° 14, Santiago 1944, and J. Crocco: "Ensayos sobre la población Chilena", Santiago 1947, pages 23-24. Moreover, this population figure was published in the Annual of the Dirección General de Informaciones y Cultura (DIC) 1946.
- ^{3/} Ministry of Agriculture: "Plan Agrario" Santiago, 1945.

/previously for

previously for 1940, and the agricultural production statistics for the same year ^{1/} the following calculations on production per active agricultural person during this period can be made: (See Table N° 1)

1) While the total population of the country during this decade increased by 13.9 per cent, the active population engaged in agriculture increased by only ~~by 11.10 per cent~~.

2) The principal agricultural holdings, measured according to the area under cultivation increased in those ten years by 21.3 per cent. The number of hectares per agricultural worker increased from 2.2 to 2.4, (i.e. 9 per cent).

The number of head of cattle did not change while the number of sheep appears to have altered in 1940. Therefore the number of head of cattle per agricultural worker dropped from 4.75 to 4.33 and the number of sheep from 12.5 to 11.12.

3) Production, per active person, only increased by 4.5 per cent for cereals and by 8.8 per cent for legumes, and it suffered a considerable decline in other branches. The scanty increase in cereals and legumes, may be attributed in part to a drop in the average yields between both three year periods (1930-32 and 1940-42), but the lower production of livestock per capita is due to the reduction of stock in relation to working population.^{2/}

^{1/} It should be observed that for both years the averages of a three year period were taken, and both periods were affected by critical general economic conditions; 1930 by the crisis and 1940 by the beginning of the war.

^{2/} Unfortunately there are no figures available regarding the present agricultural population, but it would be interesting to undertake a complete survey on the facts indicated, emphasising the social and legislative aspects of the methods of cultivation.

/4) The foregoing

4) The foregoing situation is all the more significant if the progress of mechanization, through the increase of basic agricultural machinery is taken into account. Thus from 1930 to 1940 the number of hectares cultivated (annual crops) by each available tractor, decreased from 1,527 to 446, and the surface of cereals for each reaper and binder was reduced from 251 to 235 hectares.

In other words, between 1930 and 1940, even if the yield factor is eliminated, not only did productivity per man remain stationary, but it can in fact be estimated to have dropped.

B) Occupation of the working agricultural population

As a result of the methods of cultivation, the number of man-days for a given enterprise is appreciably high. On the basis of data available in the Departamento de Economía Rural of the Ministerio de Agricultura (Rural Economy Department of the Ministry of Agriculture), it has been possible to determine the number of man-days (3 hours) and animal-days (oxen) for the most frequent types of enterprise, which summed up are as follows:^{1/}

Crop	Number of days per Hectare	
	Man	Oxen
Wheat, on irrigated land with simple farm machinery	26.4	28.5
" on unirrigated land with simple farm machinery	31.1	30.7
" on unirrigated land with complete mechanisation	12.2	4.9
Rice, direct sowing	61.8	36.8
Beans, irrigated, central zone	54.0	38.0
Maize " " "	53.4	38.4
Sunflower " " "	39.2	36.4
Potatoes " " "	69.5	34.0
Potatoes, unirrigated, southern zone	59.9	28.6

^{1/} See detail of tasks in adjoining Tables 2 to 12,

/The causes

The causes of this high number of man and animal hours are due to:

a) The numerous operations required by the different crops. The work of preparing the land before sowing, in the case of wheat, for example, requires from 5 to 7 partial operations, while in the cultivation of beans, maize and potatoes, there are up to 11 different tasks.

These preparatory tasks absorb, in the case of wheat, 40 per cent of the man-days and 57.4 per cent of the ox-days; in the case of beans, 29.8 and 74.1 per cent respectively, and in the ordinary cultivation of potatoes, 24.2 and 79.9 per cent respectively of the man-days.

Nevertheless it cannot be stated that these tasks are performed to reach perfection nor that the yields should be attributed to them. We estimate rather that the great number of tasks is the consequence of routine techniques and of cheap laborers.

The sowing and harvesting, which by preference in the case of wheat and of the other crops is performed by hand, demands another appreciable percentage. The very frequent operation of weeding out extensive crops like cereals and the care of the seedbeds to avoid the depredations by birds, although they are preferably carried out by women and children, entail a cost in man wages equivalent to 4 days in the case of wheat and from 6 to 8 days in the case of certain market garden crops (potatoes and beans) and should also be mentioned.

b) The great number of tasks determines the use of draught animals, with the complication that oxen are preferred to horses. Horses and mules are used only in small proportion in the market garden crops of the irrigated zone.

/The slowness

The slowness of oxen, in its turn causes the number of draught-animal-days in Chile to be extremely high. As will be seen later on, the use of oxen is economically justified since its high meat value, makes the cost of its work day insignificant as against that of the horse or mule, which suffers a net depreciation after a period of useful work.

c) The use of farm machinery and implements is confined to the iron plough, and to a small degree, the wooden plough, to the toothed harrow and to a lesser degree the disc harrow, while the use of a harrow made of branches is very common to cover the seed. The planter, the planter-fertiliser and the harvester are scarcely used, while on the other hand it may be estimated that the stationary threshing machine operated by steam or explosion engines is widely used.

An attempt has been made, using the average man-days employed in the principal crops and the cultivated areas during the period 1939-41 to calculate approximately the labour force in agriculture.

Taking as a basis the active agricultural population of 1940, applying for the different zones of the country an average of days worked during the year $\frac{1}{2}$, the total of man-days per year may be estimated at 120.9 million days, produced by 553,000 persons employed, giving an average of 218.6 days per man-year.

The different annual crops, vineyards and orchards, absorb approximately some 55 million days according to the following summary:

1/ Estimated by the Servicios Provinciales of the Dirección General del Trabajo.

Cereals	29.58 million
Legumes	7.70
Potatoes	2.94
Industrial crops	0.93
Vegetables	1.69
Vineyards and orchards	12.23
Total	55.07

In the first place it is apparent that all the foregoing activities occupy only 45.6 per cent of the work year, the balance being devoted to the care of livestock, exploitation of forests, for timber, wood and charcoal, all the usual agricultural maintenance tasks ((cleaning of canals, roads, constructions and repairs), and finally all those subsidiary tasks, such as the first processing operations made on the field, minor industries, the care of fowls and bees etc., and the transportation by the farm hands of the products to the loading or consuming centres. As it is not possible to calculate the labour required by each of these other tasks, it is not possible to estimate to what degree man-days are productive, but it seems evident that in these fundamentally productive tasks, a high percentage of labour force is employed.

A theoretical estimate of the extent to which man-days could be reduced by mechanizing completely the operations related to the cultivation of annual crops, without taking into account limitations of any kind, would mean a saving of 50.2 per cent of the total of 55 million previously noted.

c) Comparative productivity of different countries

It is interesting to determine how Chile stands in regard to other Latin American countries as regards agricultural productivity insofar as the number of man-days and yields per surface unit are concerned.

/On the basis

On the basis of the report made by John A. Hopkins ^{1/} and of the data corresponding to Chile, the adjoining table N° 13 was made, showing the man-days (8 hours) yields and productivity per man-month (200 hours) for wheat, maize and rice in Mexico, the United States and Chile.

The results, which speak for themselves, clearly establish a waste of labour force both in Mexico and Chile in relation to the United States. It is true that not only the technical level of farming, but also the physical and economic conditions prevailing in the first two are far from being efficient and favourable, but it is no less evident that there are real possibilities of achieving a substantial improvement and so increase productivity in both countries.

In fact, if the average yields of these three crops are considered in the three countries mentioned, it appears that Chile is in a more favourable position than either Mexico or the United States insofar as wheat and rice are concerned, and in a slightly worse position than the United States, though in a substantially better one than Mexico for maize.

The fact that fewer days are required in Mexico for the production of maize, rice, and to a certain extent wheat, should be attributed to the smaller number of the tasks for the preparation of the land. This operation, as will be seen later, absorbs a high percentage of labour in Chile. Nevertheless, better yields are conducive to higher productivity per man. That is why 28.2 hours are required to produce 100 kilograms of maize, whereas 35.5 to 39.9 hours are needed in Mexico. Wheat in

^{1/} Hopkins, J.A. Mexican Farm, Wages and Farm Labor Productivity, American Embassy, Mexico D.F., May 13, 1949.

Chile requires 17.1 hours, while in Mexico (unfortunately the average is not indicated) 52.5 hours are required.

Regarding the ratio between Chile and the United States, the high productivity in the latter, especially for wheat and rice, is due exclusively to maximum use of farm machinery, a factor which reduces the number of hours required to produce 1 Metric Quintal of these cereals from 2.9 to 3.3.

Regarding maize, apart from there being a privileged "corn belt", which Chile lacks, the use of hybrid maize has contributed fundamentally towards improving the yields. Only now is Chilean hybrid maize being distributed, as the result of the research carried out over several years by the Departamento de Investigación Agrícola (Agricultural Research Department) of the Ministry of Agriculture. The results obtained show an increase of 30 per cent over ordinary maize grown in the central zone, and notwithstanding that, produces yields of 22.4 Metric Quintals per Hectares (O'Higgins province, 1945-49 average).

In Iowa, the corn belt of the United States, where hybrid maize is grown exclusively, the yields reach 29.7 Metric Quintals per Hectare during the period 1936-45 and 35.7 Metric Quintals in 1946.

In summary, the natural conditions, high degree of mechanization and the techniques of cultivation, allow the United States to produce 100 kilograms of maize in 1.4 hours, as against the 23.2 hours required in Chile.

It would be interesting to study later the ratios between wages in these three countries and the production per capita of their active population engaged in agriculture.

II. Costs of Agricultural Production

Physical conditions in the agricultural area in Chile determine, in general terms, a series of unfavourable factors which work against obtaining easy and economic agricultural production.

The climatic conditions and particularly the inadequate distribution of rainfall, both yearly and territorially, limit the areas of certain crops. The development of a year round livestock production is hampered by the scarcity of natural fodder in summer in the central zone, and during the winter in the southern zone. The scanty rainfall in the central zone makes it necessary to introduce artificial irrigation, which heightens the net cost and complicates the tasks of cultivation.

Physiographic conditions increase transportation distances and limit the use of machinery. The quality of the soils, which decrease in general terms from North to South and from East to West, require the use of fertilisers to raise the yields per unit.

To these factors of a physical nature must be added those of an economic and social nature, and in particular the deficiencies of farm management, and those of the workers as regards technical training, all of which contributes towards the continuance of out-of-date farming techniques and routines and poor utilization of the means of production. Finally, the lack of long-term agricultural credits, to promote improvements and contribute towards the capitalization of the holdings and the lack of agricultural credits for the enterprises, at suitable terms and interest rates adjusted to the profitability of this industry.

The principal aspects of Chilean agriculture having thus been examined, the characteristics of the costs of production will now be

/passed under

passed under review.

a) Variations in costs

As a result of the physical conditions in each agricultural region, of the considerable differences in the methods of cultivation techniques and economic conditions prevailing in all agricultural enterprises, the costs of production in Chilean agriculture are characterised by great variations, and this makes it practically impossible to present really representative averages.

A simple example to show the marked fluctuations of the costs of production of wheat in the different zones where it is cultivated, in relation to its total costs and its yields, the average costs for the crop year 1946/47 are shown in Table N° 14.^{1/}

Even though the data shown in this table are only quoted for reference, since they correspond to a crop year in which the favourable or unfavourable climatic conditions in the different zones considerably affected the yields, the results confirm to a certain extent the empirical observations:

1) The fact that cereals and in particular wheat are cultivated on irrigated or dry lands, determines a considerable difference in the total expenses of the crop, resulting from the number of preparatory tasks, quantity of seed, costs of irrigation and principally on account of the rent of the land.

The different yields which are obtained in these two kinds of land

^{1/} The data which follow were obtained from the surveys carried out by the Departamento de Economía Rural of the Ministerio de Agricultura, which has been estimating agricultural costs according to standards used for more than 10 years, for obtaining not only real costs, but calculated costs.

/are independent

are independent of the system of cultivation, depending only on the distribution of rainfall on the dry lands; nevertheless this difference in the yields between the irrigated and dry land declines as one gets into the central and souther-central zone of the country 1/.

2. The use of fertilizers signifies a greater investment in either cases (irrigated or unirrigated lands), but it reduces the costs of production and thus increases the profitability of the crop. Fertilizers, although they imply considerable expense, constitute an investment which should only be measured in terms of the improved physical yields which may be obtained per surface unit, and consequently their use in each case can reach an economic maximum.

3. Insufficient attention has been given to the cultivation of wheat or other cereals (excepting rice), either alone or in conjunction with fodder crops. These latter have not received the attention which their importance warrants. 1/

The examples given before which are confirmed in practice, clearly show the economic advantage - apart from the point of view of the methods of cultivation and land use - presented by this practice. In fact, this auxiliary intercalated crop considerably reduces the total costs of the cereal, since the tasks of preparing the soil, the cost of fertilizers, irrigation and the rent of the land, factors which add up to a high percentage within the total cost, are proportionately distributed between both crops.

4. The methods of cultivation, that is to say, the use of human energy, draught animals or farm machinery in all tasks, is a very complex problem, but as will be seen later on, it has no visible effect on the ratio between the expenses and the physical yields, which should be attributed

1/ See Costs 1,2,4,5,7 and 10 of Table 14

/to the many

to the many preparatory tasks and the complementary care taken during the development of the crop.

b) Elements of the costs of production

Even greater than the difference of costs for the same crop between one agricultural region and another, is the fluctuation in the composition of the different expenditures which determine the cost of production and it is difficult to generalise on this subject.

However, if an analysis is made of the available material, according to the methods of cultivation which predominate in the country, it may be said that the greater percentage of costs correspond to human labour, which may vary from 35 per cent when all important tasks except threshing (which is carried out by hand) are performed with animal draught power, and less than 15 per cent when all the tasks are carried out by tractor-drawn implements. However, the absolute value of the wages in both cases does not differ substantially, since the wages obtained by tractor operators or mechanics are almost 100 per cent higher than those received by ordinary farm hands.

Another item which is important is seed, which for cereals fluctuates between 15 and more than 20 per cent. Only when crops are grown on dry land in the northern and north-central zones, where lesser seed is needed, is this item substantially reduced.

Animal labour represents a reduced percentage in Chilean production costs, and seldom exceeds 10 per cent of the total. This fact should be underlined as one of the principal reasons why mechanization is not favourably accepted in the country.

/As a result

As a result of the low degree of mechanization, only a small percentage, which is considerably lower than that for the other items, corresponds to expenses for tools, machinery and fuel. On the other hand, this percentage would increase considerably if mechanization were more complete, e. g. if tractors were introduced as the means of traction or if harvesters or combined harvesters were used. Animal labour would of course be correspondingly reduced, but as has already been mentioned, this partial expense is relatively low.

The percentage represented by fertilizers varies according to the quantity and type employed, and may fluctuate from between 3 and 8 per cent in the case of nitrates in the central zone, to over 25 per cent when phosphate and calcium are used, as is common in the southern part of the country.

A factor of considerable importance in the calculation of costs is the theoretical rent of the land, which is deduced from its commercial value or its real rental value. The amount is directly related to the location and quality of the land, and finally by the duration of the crop, which for wheat fluctuates between 6 months in irrigated lands, to 13 months, when it is cultivated on bare fallow land prepared the previous year. Similarly, this item is reduced where an auxiliary crop is grown. Generally the rent of land represents from 8 to 15 per cent of the cost for the cultivation of wheat, according to the above mentioned conditions.

The general expenses included in the cost, that is, those corresponding to exploitation, management, improvements, taxes etc., which are divided proportionately among the different crops and their

/extension within

extension within a holding, present very slight fluctuations and may be estimated as a general rule at between 8 and 10 per cent of the total expenses for a crop.

Finally, the interest on the capital of the enterprise bears a relationship to the total cost of it; it represents a percentage which fluctuates between 1 and 2 per cent of the total expenses and seldom exceeds 3 per cent.

c) Variation in the costs of production

On the basis of the material related to costs available since 1932, an attempt has been made to determine the modifications to costs resulting from changes which may have taken place in methods of cultivation or through fluctuations in the values of the different elements determining the expenses of production.

Unfortunately there are insufficient data to estimate quantitatively the changes in the methods of cultivation, which would have influenced an increase or decrease in the number of days of work performed by men, animals or machines, and which in turn would have been reflected in the final costs.

All that can be observed is a greater use of fertilizers and machinery, principally tractors. However, no fundamental changes which could be translated into a reduction of expenses can be noted in the systems of cultivation.

In regard to fluctuations in the values of the elements determining the cost itself, averages were calculated from 1933 of human labour, of work performed by oxen, of the value of the cultivated land, either

/irrigated or dry

irrigated or dry, of farm machinery and implements, of different types of fertilizers and tools (See Tables N°s 15 to 18.) ^{1/}

From the foregoing, the following conclusions may be drawn:

- 1) The value of the man-day has shown a relatively smaller increase from 1932/33 to 1948/49 than practically any of the other elements of cost (7.36 times).

This will determine the preference for manpower to carry out the different tasks of cultivation, such as sowing and harvesting. In fact the ox as a draught animal, and the planter (average price for machinery in use) increased during the same period 11.4 and 8 times, respectively.

On the other hand, it is interesting to note that the value of human labour in Chilean agriculture showed an absolute cost which was considerably less than the industrial wage per day. In 1937/38, the former amounted to \$8.50, including wages in money, food, social laws, in kind and facilities, while the wages in money paid by industries, amounted to \$12.60 per day.

In 1948 the total agricultural wage averaged \$35.40, and the industrial wage \$94.14, from which it may also be inferred that in the same index for 1937, the first increased in 1948 to 416.5 and the second to 364.4.

- 2) In regard to the ratio between the ox and the tractor as working elements, particularly for traction purposes, the situation is again

1/ It should be pointed out that these refer to the medium values obtained from the different costs for each year, whether these were real or calculated and thus machinery in use shows an average value of appraisal lower than the price of new machinery in the respective year.

in favour of the former. This is due primarily to the fact that the ox does not lose its value, since in the last instance, it is fattened and sold for slaughtering. It may be observed that the prices of oxen as draught animals and for slaughtering maintain a very close relationship and show a considerable even increase in the last 15 years. Only in the case of an excessive increase in the price of meat causing a scarcity of draught animals, would there be a certain replacement of the bullock by the draught horse or mule, and in the last resort, by the tractor.

On the other hand, in terms of capital investment, it appears that 1 tractor of 42 H.P. was equivalent in 1949 to 16.7 yoke of oxen, and while the bullock increased by 67.6 per cent from 1946 to 1949, the new tractor prices increased by 142.4 per cent.

3) So far as cultivated land is concerned, it is interesting to note the marked difference in the increase in value of irrigated and unirrigated land, 10.6 and 8.6 times respectively in the period from 1932-49. This may be attributed to the greater security and possibilities offered by irrigated land, which has increased its value in greater proportion than the dry lands.

4) The price of fertilizers shows special variations in the last 15 years. They remained practically stable from 1933 to 1937, and some like red guano and nitrate until 1941, whereupon their prices rose considerably until 1946 inclusively, in greater proportion than from 1946-49. On the other hand it has already been seen that the consumption of fertilizers from 1934 to 1936 was doubled, and from 1938 to 1945 remained practically the same, increasing once again by almost 90 per cent from 1946 to 1948.

/ 5) Finally other

5) Finally other elements of lesser importance in costs, such as sacks of imported jute, show an increase of 7.8 times in the period under review, while iron ploughs and toothed harrows of national manufacture increased only 6.1 and 6.8 times.

Freight charges for wheat rose between 5 and 5.2 times from 1933 to 1950, while the price of that cereal during the same period increased 6.4 times, which disproves the criticism indicating that increased freight rates brought about the increased costs.

Although the different cost elements showed more or less appreciable fluctuations among themselves, these differences are visibly lessened in the total costs. In fact, applying the medium values of Tables N°s 15 to 17 to estimate a cost of production of wheat over five different years (1932 - 36, 41 - 44 and 47), and maintaining in turn the system of cultivation and form of work, and the same quantity of seeds and fertilizers, the results shown in Annex 5 are obtained.

These conclusions may be summarized as meaning that during the whole period comprised between the agricultural years 1932/33 and 1947/48, there has been no substantial modification of the relative value of each expenditure nor has there been any effective predominance of one element to the detriment of another, and practically the composition of the costs is the same during the whole period.

The greatest visible fluctuation corresponds to human labor, which rose from 30.45 per cent of the total expenditures in 1932, to 33.17 per cent in 1941, falling again in 1947 to 30.01 per cent. An increase in the percentage of land values from 10.52 per cent in 1941 to 12.7 per

/cent in 1947

cent in 1947 should also be mentioned.

The constant proportion between the factors analysed determining the cost of production of wheat, acquire their whole significance if it is observed that the total expenditures for this crop rose from \$492. per Hectare in 1932 to \$3,196.82 in the 1947/48 crop year.

In other words, this corroborates what has been shown until now, in the sense that no visible changes took place in the last 15 years (until 1948) in the economic factors determining the cost of enterprise of the crops.

d) Ratio of the price of products to that of the elements necessary for their production

Considering that wheat is the basic crop of the country and that its price influences that of all the other important annual crops, an estimate was worked out of the number of metric quintals of wheat at the wholesale price required to pay the work-days for acquiring the different elements (land, animals, implements, machinery and chattels, fertilizers).

In general terms the basic elements of work, such as the man-day, land and fertilizers show a greater increase in value in relation to the price of wheat, but the tendency is not constant, nor do these three elements follow the same trend.

With regard to the man-day, there exists a certain increase in its wheat value from 1932 to 1939, and it reaches a relatively high average, but this average is never greater than 30 per cent, during the period 1941 - 1945, and it is later slowly reduced until in 1948/49, it reaches practically the 1932/33 ratio. The value of a yoke of oxen in relation to wheat reached its maximum in 1945/46, increasing by 100 per cent with

/respect to 1932

respect to 1932 and later declining in the same proportion as the ratio per man-day/wheat.

The ox/wheat ratio shows the greatest increase in the period under review, but it should be remembered that animal labour within the cost of production only occupies a small percentage.

The implement most used in Chile, the iron plough, practically maintains its ratio to wheat, particularly since 1942, in which considerable changes were produced in the absolute values of machinery.

Especially interesting are the fluctuations in the value of modern machinery in relation to the price of wheat.

In opposition to the case of the ox/wheat ratio, the value of tractors expressed in terms of this cereal shows a considerable decline from 1940 to 1947/48, (almost 50 per cent) which would indicate a favourable period for the development of agricultural mechanization.

Beginning in 1948 and 1949, the quantity of wheat necessary to acquire this machinery increased once more, but as will be seen in the section corresponding to mechanization, this was due to a violent increase in the price of agricultural machinery, principally due to the exchange situation and to the prices charged in the country for this equipment.

Finally, fertilizers show two different trends.

At the beginning of the period under review their prices were relatively high in relation to wheat, particularly crushed bone and nitrate, but they remained constant over several years, while wheat prices increased, and this reduced the ratio, so that now they cost

/proportionately less

proportionately less. The opposite has occurred with phosphates, which at present cost more in relation to wheat than in the first years of their use.

The observations which may be made from these commentaries tend to confirm the points outlined in other paragraphs of this chapter.

e) Ratio between cost and prices

The average costs of wheat for the central-southern zone have been calculated from 1932 to 1948 on the basis of data of the Departamento de Economía Rural.

The wholesale prices of wheat have also been calculated by subtracting from the Santiago market price the corresponding freight from Chillan, in order to obtain the approximate difference between cost and price per Metric Quintal, unsacked, in the same zone of production. ^{1/}

The tendency expressed in the ratio between cost and price against the development of this crop (sowing, production and yields), Table 22, makes it possible to establish:

- 1) That the cost of production shows a relatively moderate increase between 1933 and 1940, increasing in these 8 years by 100 per cent. The price of wheat, however, during this period shows important fluctuations which to a certain extent are the reflection of the plantings and respective productions. These latter, however, do not show any visible increase. A wheat-price cycle occurs periodically. Between 1941 and 1946 the cost price increased by 68 per cent and the cereal price by 105

^{1/} Transport from the farm to the railway line was not taken into consideration, as this is a variable cost and there are no concrete data over a series of years.

per cent.

Notwithstanding this favourable ratio between cost and price, there was no sustained increase in planting.

In this case prices do not obey the law of supply and demand, since they are officially fixed by the Government, in its desire to stimulate production.

In the last few years the ratio between cost and price improved even more, and in fact in 1948 the area sown in wheat reached a maximum, although this rate was not maintained in 1949, when the area decreased by 3.8 per cent in regard to the previous year.

2) Not only the surface but the production of wheat in Chile, at least in the last 25 years, shows regular five-yearly cycles. ^{1/} This phenomenon has not been sufficiently studied in order to determine its true causes, but at first glance there would appear to be no visible relationship between the costs and the prices of this cereal and its periodic tendencies.

A detailed study of the climatic system would probably help to clarify this phenomenon.

f) The costs of other agricultural products

With regard to the costs of other agricultural or livestock products, the following observations of a general nature may be made.

The costs of other cereals such as barley, oats and rye show characteristics similar to those of wheat, due to the prevalence of the same conditions of cultivation.

^{1/} For more data, see "Períodos cíclicos en la cosecha del trigo"; Rev. Estadística Chilena, Year XIX, N° 4, page 152, Abril 1946.

The relatively high costs of these cereals show that Chile has not yet reached a similar production to that of those countries who have intensive agriculture, such as the European countries, which by means of heavy investments and correct technique, are able to obtain relatively low costs since their yields are more than 100 per cent higher than those of Chile. On the other hand, Chile does not have the physical conditions prevalent in the great cereal producing countries (United States, Argentina, Canada, Australia) which permit the combination of vast extents of land with a reduced labour force and a great deal of machinery; in this case, even when the average yields are lower than Chile's, they are obtained at absolute minimum costs.

Chile's situation may be more favourable with respect to market-garden products, principally beans, since although it requires greater outlay than wheat, its costs cannot be considered high if these are measured in relation to the profit obtained per surface unit. In other words, it would be difficult to find more profitable crops than these in the market-gardening zones of the country.

As to the specific case of maize, which also has its place in rotation among market-garden crops, its production costs are relatively high. However, as the demand is considerable, its area of cultivation limited, and its market protected from foreign competitors, the high prices permit its production at high cost. ^{1/}

The excellent natural conditions enjoyed by Chile's regions of

^{1/} Ahumada C.J. Factores que intervienen en los costos de producción agrícola y forma de abaratarlos Departamento de Economía Rural 1944 (not published)

orchards and vineyards results in relatively low costs, and these enterprises provide satisfactory profits. The expenditures in industrial orchards and vineyards, in relation to their productivity, cannot easily be considerably reduced, since the technique employed is generally good.

Finally, we shall refer to stockbreeding, where sufficient data regarding costs are not available. However, we do not hesitate to state that these costs are extremely high. The negative physical factors are varied, but among the most decisive are the fact that pastures are only available part of the year, which makes it difficult to provide regular and continued fodder.

The ordinary quality of Chile's livestock, together with deficient farm management, bring about low profitability of the lands devoted to this industry. A contributing factor to this is the excessive protection given to agricultural products, such as wheat, causing farmers to turn away from livestock production and take little interest in it, while at the same time bringing about a lack of balance between this and crops, to the obvious prejudice of both branches of agriculture.

III. Farm Machinery

The analysis of the costs of agricultural production, brought to light the large number of tasks carried out by hand. There is an excessive proportion of man-days per crop, further aggravated by the preference given to the draught oxen.

Consequently productivity per man day and real wages are low.

It has been noted that the process of industrial expansion which Chile is undergoing may produce an exodus of agricultural workers towards

/the cities

the cities, although until the present time labour shortage is only noticeable at harvest time or in zones which are very close to the densely populated centres, particularly Santiago, Valparaiso and Concepción, it is evident that this may create a serious problem in the future.

The immediate solution in this case would be the mechanization, which in addition to increasing the production per agricultural worker, would permit an improvement of wages.

a) Development of mechanization

It may be said that the use of modern machinery has always been a subject of interest to Chilean farmers, and the expansion of mechanization is shown by the volume of imports of equipment and by the efforts of domestic industry to produce tools, implements and even more complex machinery, as well as by the ratio between the existence of machinery in use and the cultivated area.

Imports of machinery, tools and other implements (see Tables 23 and 24) show a trend in the last 25 years which is a faithful reflection of the agricultural and economic situation of the country during that period.

The high volume of imports during the period from 1925-28, (around 6.5 thousand tons,) dropped sharply in the critical years which followed, and were practically paralysed in 1932 and 33, recovering to 3.4 thousand tons in 1937 and 4.2 thousand tons in 1941. The impact of the war brought this figure down to a tenth in 1943, but in the following year, 1944, there was a marked tendency to increase, which culminated in 1949 with 6.5 thousand tons. Tractor imports follow a similar tendency. It

/should be borne

should be borne in mind that the volume of 6,500 tons in 1919 corresponds principally to complex machinery, while the 6,900 tons in 1926 included a high percentage of simple tools and implements which are now almost wholly manufactured within the country.

It is interesting to compare the relationship between the existence of basic machinery and the area under cultivation, (Table 25). Unfortunately the only available data on machinery come from the Census of 1930 and 1936, the figures for 1940 and 1948 are therefore approximations based on sales or imports, and taking into account the wear and tear of the machinery which was in use in 1936.

It is evident, therefore, that there has been considerable progress in the use of the tractors and mobile harvesters. The first in relation to cultivated area shows that while in 1930, there was 1 for every 1,527 Hectares, in 1936, 1 for every 825 Hectares, in 1940, 1 for every 446 Hectares, and in 1948, 1 for every 242 Hectares.

The ratio between the number of threshers and the harvested area of cereals and legumes shows no appreciable decline, since this task was already considerably mechanized in 1930. However, the number of mobile-harvesters has increased considerably in the last ten years, while the number of reapers and binders has decreased accordingly, which indicates a tendency towards simplifying to one operation, the harvesting which previously required two operations.

The use of grain planters has not increased in the same proportion as the other basic machinery, since the practice of hand-sowing still predominates in the country, due mainly to topographical limitations.

/In the same way

In the same way mechanized harvesting is confined to those zones with flat or slightly hilly surfaces.

These two stages of cultivation, together with the predominant use of animal traction in preparatory work, cause the number of man-days to be so high, as shown in the section corresponding to production costs.

b) Limitations to use of farm machinery

Notwithstanding the noteworthy progress achieved up to the present time, there are still several complex factors which presuppose serious difficulties for the continuation of the present trend and the achievement of a final goal within a reasonable period of time. The State of Agriculture in Latin America ^{1/} shows that motorised mechanization in Chile covers only 25 per cent of the cultivated area (2,043,000 Hectares) which is higher than the figure for Argentina (18 per cent) and Mexico (15 per cent) and is only surpassed by Venezuela (32,8 per cent) and Uruguay (30 per cent).

Nevertheless this same report shows that the possibilities for increasing mechanization in Chile would only permit its extension by 25 per cent of the cultivated area indicated, while in Argentine and Mexico this possibility reaches 50 per cent. It is understood that these possibilities refer only to those within the physical aspects of the land.

We referred to this limitation when analysing the costs of production, and also pointed out the strong competition of animal traction from the economic viewpoint and the fact that in Chile the farmer does not invest

1/ ECLA. E/CN.12/83. The report of the ECLA/FAO Joint Working Party on Agricultural Requisites.

to a great extent in uncultivated land that is needed for the maintenance of the animals.

On the other hand it has been shown that the relative cost of man-days in agricultural tasks was low.

However it is necessary to trace two important aspects which up till now have not permitted a more wide-spread use of machinery, and which may constitute a serious difficulty in the near future. These are:

1) The system of land tenure

According to the Agricultural Census of 1936, out of 187,261 holdings, 63.9 per cent varied from 0.1 to 20 Hectares. Trivelli, ^{1/} analysing the economic capacity of the country's holdings, concluded that 79.7 per cent of them corresponded to small holdings. The foregoing situation has undergone no substantial modifications to this day, and from it the following facts emerge: on the one hand the small area of these farms does not permit mechanization on an individual basis, and on the other, the purchasing power of a large number of these owners does not permit them to effect such important capital investments.

Another fact which should be taken into account is the average surface of the crops. The only data available are those of the 1936 Census but they are still pertinent since there has been no fundamental change in the distribution of the farms according to their size, and since the average area for annual crops has only increased from 1,285,500 during the 1935-37 period to 1,308,800 during the 1947-49 period.

^{1/} Trivelli F.H., "Expansión y Estructuras Agrarias en Chile" Santiago 1941.

The result is that in 63,500 farms of an area varying from 0.1 to 200 Hectares cereals were cultivated on an average area of 1.1 Hectares in the 0.1 to 100 Hectares farms, and on an average of 18.5 Hectares in those of 100 to 200 Hectares, 312,600 Hectares, almost a third of the total area were devoted to cereals. On the other hand, only in 6,200 farms with an area varying from 200 to 1000 Hectares was another third of the area devoted to cereals, but the average sown area per farm was only 38.5 to 70.7 Hectares. Finally, the rest of the farms where cereals were grown, i.e. 2,100, represented 3 per cent of the total number of farms and included farms of 1000 to 5000 Hectares. The number of hectares sown in these farms was 119 to 227 Hectares according to the size of the farms. The situation in regard to market-gardening was more or less the same.

It can be easily inferred from the foregoing that the number of farms, in which the area cultivated annually with cereals and market gardens justifies an economic investment in expensive agricultural machinery, is relatively small. This is without taking into consideration other limiting factors.

2) Value of imported agricultural machinery

The acquisition of mechanised agricultural equipment constitutes considerable outlay at the present time, not only in total sum, but in relative cost in relation to the other elements of agricultural work.

The most important aspects will be shown below. In the light of these observations it is possible to state that the cost of imported

/agricultural machinery

agricultural machinery is one of the principal factors limiting its greater use.

In the first place the absolute increase in the price of imported machinery between 1940 and 1949 is sufficiently eloquent. While the F.O.B. factory price of a North American tractor rose by 83.7 per cent during this period, the C.I.F. value increased only 78.4 per cent, due to the fact that certain transport costs and insurance underwent a proportionally lower increase.

While the official Chilean exchange for this type of imports was \$25.- per dollar in 1940, it rose to \$31.10 in 1942 and to \$43.10 at the end of 1948. For this reason alone the price of a tractor rose by 206.73 per cent in that period.

Costs of internation and customs duties, despatch, internal transport, etc. brought about a net cost in warehouse in Santiago which rose by 222.5 per cent between 1940 and 1949. Finally, the sales price rose by 300 per cent in relation to 1940.

Another no less significant factor is reflected in the fluctuations, during the same period, of a given piece of North American machinery, weighing 1 ton, whose C.I.F. cost of US\$1,000.00 remained constant from 1940 to 1949, showing in this way the price increase in Chile as a result in the difference in the dollar exchange, import duties and expenses inside the country.

In spite of the foregoing, if the rise in the price of imported equipment is analysed in relation to the prices of agricultural and livestock products in general or of agricultural products in particular,

/it is inferred

it is inferred that from 1940 to 1948 the situation for importing machinery was favourable. This, together with the credit facilities granted by the Corporación de Fomento de la Producción, caused an appreciable number of tractors and machinery to be brought into the country. (Table 29).

However, Chile's situation in relation to other countries, insofar as the ratio of the price of machinery and agricultural products is concerned must still be determined. Unfortunately the available data only permit comparison between the United States and Chile, that is, between a manufacturer of machinery, which also uses it extensively, and an importing country whose mechanization is rudimentary. Nevertheless, the results are interesting. (Table 30).

In the United States, the ratio between the wheat price paid to the farmer and a caterpillar tractor of 32 H.P. was 630 Metric Quintals per machine in 1940, and it dropped progressively to 267 Metric Quintals in 1947. The drop in the price of wheat and the increase in the value of the tractor produced ratios in 1948 and 1949 of 350 and 351 Metric Quintals respectively. In Chile, on the other hand, in 1940 the ratio was 967 Metric Quintals for this same tractor, i.e. 53.5 per cent more than in the United States; in 1947, the ratio is reduced to 596 Metric Quintals, i.e. 123.2 per cent more than in the United States.

The year 1948 shows the best ratio for Chile between wheat and tractor prices, (518 Metric Quintals), but in the following years the considerable increase in the price of the tractor, in spite of the increased price of wheat, caused the ratio to reach 834 Metric Quintals again, i.e. 115.3 per cent more than in the United States.

/Even more serious

Even more serious is the situation in the present year, as a result of the exchange being fixed at \$60.- to dollar. As the price for wheat transactions was already fixed, and is practically the same as for 1949, 1,198 Metric Quintals will be required to obtain the said tractor. Naturally, all other imported machinery, spares and fuel are in the same situation.

It should be borne in mind that the price of wheat in the last few years in Chile has not only approximated the world market price, but has even exceeded it, so that from the point of view of the country's economy, the possibilities of improving the ratio between the value of the machinery and the prices of agricultural products are extremely problematical. This all leads to the conclusion that the demand for agricultural equipment is declining heavily.

Finally, it is convenient to study the influence of the use of modern machinery on the cost of production.

In the case of wheat (Table 31) the total outlay per Hectare and the respective cost have been worked out in three different cases:

- a) Using farm machinery for certain tasks only, which corresponds to the most representative form of wheat cultivation in its principal zone of production.
- b) Using farm machinery for all tasks in the case of the farmer using the services of the mechanized units belonging to the Corporación de Fomento de la Producción. For this last calculation, the tariffs in force during the 1948-49 season were used, employing those average values from the tariff scale which were most common in the wheat zone

/in the southern

in the southern part of the country 1/. It should be observed that this average corresponds approximately to Tariff N° 2 of a scale from 1 to 6, from minimum to maximum.

From this comparison it can be seen that the lowest cost corresponds to simple mechanization, while that of complete mechanization where the farmer owns his own modern machinery comes second. In this case the cost is only 1.7 per cent higher than in the former. On the other hand, in the case of hired equipment, the cost rises by 12.1 per cent with regard to partial mechanization and 10.2 per cent with regard to the use of machinery owned by the farmer. The difference between the first and the last is equivalent in terms of wheat to 2 Metric Quintals out of a crop of 16 Metric Quintals per Hectare 2/

While it is certain that the preceding results cannot be considered absolute, the fact remains that mechanization at the present time does not show any obvious economic advantages, and the use of machinery at the selling prices for 1950 would undoubtedly raise the costs of production.

The fact that farmers show an obvious interest in the State mechanized services, should therefore be attributed to the fact that they can harvest their crops without having to resort to heavy capital investments for the acquisition and maintenance of their own equipment. Moreover, this is due to the rapid performance of the cultivation tasks and the elimination of possible labour difficulties. On the other hand

1/ Rendimiento de los tractores, costos y tarifas del S.E.A.H. Rev. El Tractorista, Year II, N° 7, Santiago, June-September 1949.

2/ The tariffs of S.E.A.H. are high because of the enterprises own administration costs, and because of the fact that they have to be surcharged by 10 per cent of the amount of the transaction.

we think that the farmer in general terms has no fundamental knowledge of his costs of production, so that the decline to a certain extent of the favourable ratio between costs and prices did not constitute a serious problem for him, at any rate during the years 1948-1949.

From the foregoing, it may be seen that there are serious doubts concerning the future use of farm machinery in Chile, in view of the critical situation brought about by the considerable increase in the value of machinery and the ceiling price reached by agricultural products, especially cereals.



Section 1 Appendix 1: Use of agricultural land

(thousands of hectares)

	1925-26 a/	1929-30	1935-36	1942-43	1948-49
1. Annual Crops					
a) Cereals (including maize)	747.0	921.0	981.0	979.0	1,100.0
b) Pulses	97.0	114.0	186.0	135.0	131.0
c) Potatoes	26.0	43.0	43.0	55.0	51.0
d) Industrial crops	4.6	8.4	10.5	38.0	55.5
e) Vegetables	11.2	14.6	13.0	22.5 b/	27.4
Total	865.8	1,101.0	1,233.5	1,229.5	1,364.9
2. Fruits and vines:					
a) Orchards	29.7	22.2	95.9	85.6	74.0
b) Vineyards	70.3	82.3	95.8	101.5	86.5
Total	100.0	104.5	191.7	187.1	160.5
3. Upturned fallow land:	511.7	(included in item 5)		628.4	595.0
4. Cultivated pastures:	574.0	931.3	168.8 c/	1,300.6	1,082.8
5. Fallow land: (included in item 6)		1,359.1	4,202.8	2,897.5	2,700.0
Total area under cultivation		3,495.9	5,796.0	6,243.1	5,903.2
6. Natural pastures not included in crop rotation:	13,086.2	15,008.0	12,025.1	6,786.3	..
7. Thickets and woodland:					
a) Artificial woods	17.2	33.7	90.5	143.5	255.3
b) Natural woods	4,289.1		3,522.4	7,136.5	
c) Thickets and scrub	582.9	5,514.8 (inc. It. 6)		8,954.4	..
Total thickets and woods:	4,889.2	5,547.5 (3,612.9)	16,234.4		..
Agricultural and forest area (1 to 7)	20,026.9	24,051.4	21,434.0	29,263.8	..
Area included by census:	25,647.3	27,313.0	25,091.5	74,176.7 d/	
considered fertile:	5,635.9	2,916.2	3,697.8	44,912.9	..
Fertile agricultural and forest area: e/	20,011.4	24,396.8	21,393.7	29,263.8	..
divided as follows:					
non-irrigated soil:	18,947.0	23,257.3	20,180.7	28,067.1	
irrigated soil:	1,064.4	1,139.5	1,213.0	1,196.7	1,300.0

/ Notes: a/

- Notes: a/ Excluding the department of Tacna, taken over later by Peru.
b/ According to R. Wilhelm, in "Abastecimiento de alimentos en Chile y Posibilidades agrícolas", 1948 (mimeograph).
c/ The corresponding census only includes alfalfa and clover.
d/ Territorial area of the country.
e/ The difference between these figures and the total of 1 to 7 is due to the adjustments made to calculations by the Dirección General de Estadística for 1926 and the 1939 and 1936 censuses, in items 1a, b, c and d, and 2b.

Sources: 1925-6, 1929-30 and 1935-36: corresponding Yearbooks and Censuses, Dirección General de Estadística, 1942-3: Plan Agrario 1945, Ministerio de Agricultura. Mountains and woods: Forest Resources of Chile (United States Department of Agriculture Forest Service, 1946).
1948-49: Dirección General de Estadística and R. Wilhelm, "Posibilidades agrícolas de Concepción y La Frontera," 1949, (mimeograph).

Section 1, Appendix 2. Use of fertilizers and yieldsA. Cultivated area and fertilizers used, a/

Years	Area (thou- sands of hectares)	Total C	Fer- til- izers R	Relation according to types of fertilizers					
				Phos- phates R	Nitrogen R	Potassium Nitrate R	Other Potamies R	Cal- careous R	Inte- gral Fertilizers R
1929	1,086	41.6	33.3	20.7	8.6	--	0.3	8.7	--
1933	1,349	33.3	24.3	12.8	9.1	2.8	--	--	--
1934	1,305	67.0	51.3	22.6	6.2	2.4	0.2	19.4	--
1935	1,220	85.5	70.0	27.1	8.8	3.0	0.7	30.5	--
1936	1,315	120.9	91.9	38.6	10.4	4.3	1.8	36.8	--
1937	1,320	151.8	115.0	49.9	13.6	5.4	3.6	42.4	--
1938	1,375	196.4	142.9	55.0	18.8	5.7	3.3	60.1	--
1939	1,293	189.8	146.8	54.1	17.9	7.0	3.5	64.3	--
1940	1,242	200.7	161.6	71.4	22.3	10.8	0.3	55.8	1.0
1941	1,141	179.8	157.5	69.7	11.6	11.5	4.0	57.5	3.2
1942	1,207	190.7	158.0	53.8	24.3	14.7	1.4	55.9	7.9
1943	1,258	219.0	174.1	74.6	7.2	12.0	1.3	67.5	11.5
1944	1,283	204.6	159.5	71.0	6.0	9.2	1.6	64.3	7.4
1945	1,157	206.7	178.7	77.3	7.2	11.4	1.5	72.0	9.3
1946	1,196	225.3	188.4	73.9	10.7	15.5	1.7	70.6	16.0
1947	1,288	254.3	197.4	76.9	14.2	19.9	2.8	62.4	21.3
1948	1,337	293.3	219.3	90.3	18.0	13.5	2.9	59.8	29.6

a/ C = Total quantity of fertilizers, in thousands of metric tons.

R = Ratio between quantity of fertilizers and total area under cultivation (kilogrammes per hectare).

/B. Average yields

D. Average yields

(metric quintals per hectare)

<u>Years</u>	<u>Wheat</u>	<u>Barley</u>	<u>Oats</u>	<u>Potatoes</u>	<u>Beans</u>
1930	13.1	16.2	12.5	94.4	11.5
1934	11.3	15.4	10.7	113.9	9.1
1935	9.6	13.9	9.0	82.7	8.7
1936	11.2	16.2	11.3	80.2	9.5
1937	10.0	13.4	8.8	87.2	8.8
1938	10.8	16.6	10.0	85.5	8.5
1939	11.7	13.3	11.2	90.1	8.9
1940	10.4	13.7	7.9	89.8	9.4
1941	10.0	14.5	8.5	79.9	7.7
1942	10.7	14.0	6.9	99.6	7.8
1943	11.4	15.7	8.9	93.4	8.1
1944	12.6	16.8	11.2	78.2	9.0
1945	11.5	16.0	9.8	82.9	7.3
1946	12.4	15.8	9.1	111.7	7.9
1947	12.1	17.4	9.4	105.6	8.4
1948	13.1	17.2	8.0	106.0	9.2
1949	12.8	17.1	8.6	101.7	9.2

Sources: Fertilizer consumption: Dirección General de
Agricultura.
Yields: Dirección General de Estadística.

Section 4. Appendix 1. Agricultural population and production

	Unit	1930	1940	% of increase or decrease over 1930
1. Population				
Total	thousands of	4,287	4,885	13.9
Employed in agriculture <u>a/</u> inhabitants		502	553	11.0
<u>Production per Person employed in agriculture <u>b/</u></u>				
Cereals	Metric quintals	18.75	19.59	4.5
Pulses	"	2.15	2.34	8.8
Potatoes	"	8.73	8.00	- 8.4
Wines	"	5.27	4.83	- 8.3
Cattle	Head	0.87	0.79	- 9.2
Sheep	"	4.24	3.90	- 8.0
2. Area under cultivation				
a) Total <u>c/</u>	Thousands of hectares			
Cereals		843	988	17.2
Pulses	"	114	166	45.6
Potatoes	"	43	51	18.6
Industrial crops	"	8	21	162.5
Vineyards	"	86	101	17.4
		1,094	1,327	21.3
b) per person employed in agriculture	hectares	2.2	2.4	9.0
3. Livestock Numbers				
a) Total :				
Cattle <u>d/2</u>	Thousands of	2,388	2,398	0.4
Sheep <u>e/</u>	head	6,264	6,150	-1.8
b) per person employed in agriculture:				
Cattle	head	4.75	4.33	- 8.8
Sheep	"	12.47	11.12	-10.8

Sources and Notes:

- a/ 1930: 1940 population census: "Renta Nacional" Corporación de Fomento de la Producción (Production Development Corporation), 1946.
b/ Average production of three-year periods 1930/1932 and 1940/42
c/ Average area of three-year periods 1929/31 and 1939/41
d/ 1930: 1940 census: average 1939/41
e/ 1930: 1940 census: estimate of Dirección General de Agricultura, 1942.

Section 4. Appendix 2: Comparison between men-days,
yields and productivity

Country and place	System of work	Man-hours per hectare	Yield (metric quintals per hectare)	Hours required to produce 1 metric quintal
<u>M a i z e</u>				
<u>Mexico</u> : Ganajuata		311.4	8.40	35.5
Jalisco		274.3	7.96	39.4
<u>Chile</u> : O'Higgins	tractor and oxen	336.3	22.43	15.0
Average		406.8	14.40	28.2
<u>U.S.A.</u> : Iowa		40.8	29.41	1.4
Georgia		93.2	6.65	14.1
Average		67.5	17.81	3.8
<u>W h e a t</u>				
<u>Mexico</u> : Ensenada-Tijuna	tractor	44.5	8.60	5.1
Ensenada-Tijuna	mules	116.2	8.00	14.7
Laguna		207.6	13.84	15.0
Hermosillo		195.2	4.84	40.9
Puebla-Tlaxcala	mules	205.1	4.84	43.3
Puebla-Tlaxcala	oxen	257.0	4.84	52.5
<u>Chile</u> : Santiago	tractor and oxen	121.4	16.94	7.2
Cautin	tractor and oxen	187.1	10.61	17.6
Valdivia	oxen	249.2	14.93	16.7
Osorno	tractor	97.7	19.64	4.9
Average		212.0	12.39	17.1
<u>U.S.A.</u> : Kansas		11.4	9.14	1.24
Pennsylvania		44.7	13.57	3.3
Average		21.5	10.21	2.9
<u>R i c e (paddy)</u>				
<u>Mexico</u> : Sonora	direct seeding	155.7	15.14	10.3
Morelos	with transplanting	1,305.0	40.00	32.7
<u>Chile</u> : Colchagua	tractor	408.2	35.65	11.4
Average		474.7	28.50	16.6
<u>U.S.A.</u> : Louisiana		81.6	20.13	4.0
California		74.1	33.40	2.2
Average		79.1	23.86	3.3

Sources: Mexico and U.S.A.: John A. Hopkins, Mexican Farm and Farm Labour Productivity, May 1949. (Acres and bushels were converted into hectares and metric quintals).
Chile: Departamento de Economía Rural.

Section 4 Appendix 3: Variations in the cost of production of wheat

Cost number	Agricultural zone and system of cultivation a/	I N D I C E S b/			
		Expenses	Yields	Production costs	Profitabi- lity
<u>Provinces of Coquimbo:</u>					
1	Irrigated, single crop, without fertilizers S.M.	108.5 46.5	111.6 39.8	97.6 113.7	102.8 85.6
2	Non-irrigated, single crop without fertilizers S.M.				
<u>Aconcagua to Talca:</u>					
3	Irrigated, combined with fertilizers, M.M.	98.2	111.6	86.3	113.6
4	Irrigated, single crop, with fertilizers, M.M.	127.3	127.5	100.1	100.2
5	Non-irrigated, single crop, with fertilizers, S.M.	87.1	87.6	98.0	100.6
6	Non-irrigated, single crop, without fertilizers, S.M.	75.6	67.7	108.6	89.6
<u>Linares to Bio-Río:</u>					
7.	Irrigated, single crop, with fertilizers, S.M.	125.3	127.5	98.4	101.7
8	Irrigated, combined crops, with fertilizers, S.M.	98.9	111.6	87.0	112.8
9	Irrigated, combined crops, without fertilizers, S.M.	78.0	83.7	89.3	107.3
10	Non-irrigated, single crop, with fertilizers, S.M.	100.7	99.6	98.3	98.9
11	Non-irrigated, single crop, without fertilizers, S.M.	75.1	87.7	103.8	90.1
<u>Concepción to Cautín:</u>					
12	Single crop, with fertilizers M.M.	112.9	111.6	99.6	98.9
13	Single crop, without ferti- lizers, S.M.	70.9	63.7	107.4	89.8
14	Single crop, with fertilizers C.M.	120.2	119.5	98.2	99.3
<u>Valdivia a Osorno:</u>					
15	Combined crops, with fertilizers S.M.	115.2	111.6	100.8	96.9
16	Single crop, with fertilizers S.M.	133.3	127.5	103.6	95.6
17	Combined crops, with fertilizers S.M.	87.9	79.7	104.3	90.6
18	Combined crops, with fertili- zers, C.M.	135.8	147.4	99.2	108.5
19	Combined crops, without fertilizers, C.M.	102.4	103.6	106.4	101.1

/Source and Notes:

Section 4 Appendix 3 (continued):

Source: Departamento de Economía Rural, Agricultural year 1946-47.

Notes: a/ Explanation: Single crop is that in which the prepared soil only receives the wheat seed.

Combined crops are those in which forage seed such as clover, alfalfa and other pastures, are sown at the same time as wheat or when it is sprouting.

S.M. Simple mechanization: The tilling of the soil is done with animal power; seeding and cutting by hand, and harvesting by means of stationary threshing machines.

M.M. Medium mechanization: The tilling of the soil is done with tractors; seeding and cutting by hand, and harvesting by means of stationary threshing machines.

C.M. Complete mechanization: Tractors are used in the tilling of the soil; seeding is done by grain drill, and harvesting by means of a reaper and threshing with a stationary threshing machine, or with a combine pulled by a tractor or with a self-propelled combine.

b/ Index 100 equal to the average of the corresponding column. Index of productivity (last column), or, in this case, the yield in relation to total investment, corresponding to the product of the reciprocal value of the expense index by the yield indices.

Section 4 Appendix 4: Values of elements of productionA. Human, animal, land and implement values

(average value in pesos)

Agricultural years	Man-days a/	1 work ox	1 hectare of land under cultivation		Implements and accessories		
			Irrigated	Non-irri- gated	Molboard Plough	Tooth Harrow	Jute wheat sack
1932-33	4.81	500	2,400	700	180	220	4.18
1933-34	5.50	550	2,500	740	200	230	4.74
1934-35	5.70	600	2,800	800	230	250	4.49
1935-36	6.00	800	3,000	850	270	300	4.64
1936-37	7.40	950	5,250	960	300	380	4.74
1937-38	8.50	1,100	5,460	1,000	363	424	4.76
1938-39	8.70	1,150	5,500	1,000	365	430	5.24
1939-40	9.20	1,240	5,900	1,250	450	580	6.10
1940-41	11.50	1,350	7,060	1,400	460	580	7.59
1941-42	13.20	1,525	7,800	1,630	480	600	10.82
1942-43	15.70	1,930	8,800	1,900	520	640	11.76
1943-44	18.80	2,300	9,630	2,340	600	680	13.17
1944-45	20.60	2,800	11,500	2,580	650	740	14.12
1945-46	23.60	3,400	13,400	3,300	670	820	14.93
1946-47	26.40	4,000	15,600	3,800	780	1,060	20.98
1947-48	30.80	4,800	22,600	5,100	1,000	1,300	29.34
1948-49	35.40	5,700	25,400	6,000	1,100	1,500	32.66

Source: Departamento de Economía Rural.

a/ This value includes money wages, social laws, meals and facilities (in kind: house, fence, plot of land, animals, wood, etc.)

Section 4, Appendix 4: B. Agricultural Machinery in use
(average values in pesos)

Agricultural years	Grain drills	Stationary threshers	Movable Steam engines	Agricultural tractor 20 HP
1932-33	1,450	14,000	12,000	15,000
1933-34	1,500	15,000	14,000	16,500
1934-35	1,900	15,700	15,000	17,100
1935-36	2,500	18,000	17,000	20,000
1936-37	3,200	25,000	23,000	30,000
1937-38	4,000	29,700	27,200	32,000
1938-39	4,600	30,000	28,000	35,000
1939-40	5,150	37,300	30,900	38,000
1940-41	5,760	39,100	35,400	43,500
1941-42	5,860	42,600	36,800	48,700
1942-43	6,160	44,400	39,000	56,600
1943-44	6,400	46,600	40,500	65,000
1944-45	6,700	49,000	42,000	77,500
1945-46	7,100	55,600	43,200	83,800
1946-47	8,200	60,500	45,000	94,300
1947-48	9,500	70,000	48,600	120,000
1948-49	11,600	82,000	60,000	145,000

Source: Departamento de Economía Rural.

Section 4, Appendix 4: C. Value of fertilizers according to their price in Santiago

(pesos per metric ton)

Years	Quick-lime 42%	Calcium carbonate 85%	Red Manure	Bone meal	Mineral Phosphate 18-21%	Sodium Nitrate
1934 <u>a/</u>	120	90	240	924	...	482
1935	120	80	240	924	...	482
1936	155	95	240	924	476	482
1937	155	95	240	924	476	482
1938	157.9	78.7	240	990	506	482
1939	195	80	240	990	550	482
1940 <u>b/</u>	198	79.4	306	960	552	482
1941	235	118	399.7	1,200	794.5	482
1942	250	174.4	431	1,238	891.5	482
1943	300	215	649.6	1,984	1,257	730
1944	270	225	732	2,046	1,713	910
1945	295	195	732	2,904	1,748	910
1946	295	205	828	2,904	1,880	1,060
1947	325	234	1,080	3,894	2,600	1,360
1948	525	280.5	1,648	5,088	2,880	1,610
1949	600	360	1,830	6,054	3,850	2,010

Sources: a/ Corporación de Ventas de Salitre y Yodo. prices from 1934 to 1939.

b/ Caja de Crédito Agrario, prices from 1940 to 1949.

Section 4. Appendix 5: Production costs of wheat in Central-Southern zone calculated for selected years with the same system of cultivation and labour

(Pesos)

<hr/>					
Agricultural year					
Partial expenses per hectare:	1932/33	1936/37	1941/42	1944/45	1947/48
<hr/>					
Cost of labour	149.83	230.51	411.18	641.69	959.42
Cost of animal work	67.58	95.23	156.67	305.05	479.23
Cost of machinery and implements	30.41	55.07	92.56	113.95	170.43
Cost of seeds	66.66	96.75	142.50	241.55	422.61
Cost of fertilizers	52.00	63.40	125.01	199.92	296.80
General expenses	54.30	95.70	143.00	185.00	367.20
Land rent	56.00	76.40	130.40	264.00	406.00
Interest on capital	15.22	22.14	38.46	61.38	95.13
<hr/>					
Total expenses:	\$ <u>492.00</u>	<u>735.60</u>	<u>1,239.78</u>	<u>2,012.54</u>	<u>3,196.82</u>
<hr/>					
Production cost of metric quintal of wheat, without sack, at the farm <u>a/</u> .	\$ <u>30.75</u>	<u>45.98</u>	<u>77.49</u>	<u>125.78</u>	<u>199.80</u>
<hr/>					

a/ Based on the constant yield of 16 metric quintals per hectare.

Source: Departamento de Economía Rural.

Section 4 Appendix 6: Value of the elements of wheat production
in terms of wheat

A. Elements: man, animal and land

Agricultural years	1 man-day (kilogrammes)	1 pair of oxen (metric quintals)	1 hectare of non-irrigated land under cultivation
1932/33	9.18	19.08	13.36
1933/34	7.60	15.19	10.22
1934/35	9.15	19.26	12.84
1935/36	9.26	24.69	13.12
1936/37	10.07	25.85	13.06
1937/38	8.08	20.91	9.51
1938/39	8.19	21.66	10.36
1939/40	10.92	29.45	14.84
1940/41	13.17	30.93	16.03
1941/42	13.04	30.14	16.11
1942/43	10.19	25.04	12.33
1943/44	11.35	27.78	14.13
1944/45	12.15	33.04	15.22
1945/46	13.24	38.16	18.52
1946/47	12.12	36.73	17.45
1947/48	10.26	31.94	16.97
1948/49	9.48	30.52	16.06

Source: Departamento de Economía Rural.

B. Mechanical elements

Agricultural years	Moldboard plough	1 42 H.P. tractor on tyres	1 4-disc tractor- plough	1 36-disc tractor- harrow	1 6 ft. combine with own motor
(metric quintals)					
1939/40	5.34	..	..	..	..
1940/41	5.27	643.76	155.78	113.40	568.10
1941/42	4.74	622.53	143.28	103.75	513.83
1942/43	3.37	421.80	94.09	68.13	350.42
1943/44	3.62	413.65	92.39	66.42	338.16
1944/45	3.83	404.13	90.26	64.89	330.38
1945/46	3.76	412.46	92.60	62.85	384.40
1946/47	3.58	337.47	75.75	51.42	314.50
1947/48	3.32	322.69	73.18	50.73	269.46
1948/49	3.21	428.38	88.35	64.25	242.30
1949/50	..	480.00	100.53	71.12	384.51

Source: For value of moldboard plough: Departamento de Economía Rural.
For tractor, equipment and combine: a distributor in Santiago.

Section 4, Appendix 6: Ratio between price of wheat and elements
required to produce it

C. Fertilizers

Agricultural years	1 metric ton of:			
	Quick lime 42%	Bone meal	Mineral Phosphates 16-21%	Sodium Nitrate
	(metric quintals)			
1934-35	1.93	14.63	-	7.74
1935-36	1.85	14.26	-	7.44
1936-37	2.11	12.57	6.50	6.56
1937-38	1.47	8.78	4.54	4.58
1938-39	1.48	9.32	4.76	4.54
1939-40	2.32	11.76	6.53	4.72
1940-41	2.27	11.00	6.32	5.52
1941-42	2.32	11.86	7.35	4.76
1942-43	1.62	8.03	5.78	4.74
1943-44	1.81	11.98	7.59	5.50
1944-45	1.59	12.07	10.11	5.37
1945-46	1.66	16.30	9.61	5.11
1946-47	1.35	13.33	8.63	4.87
1947-48	1.08	12.95	8.65	4.52
1948-49	1.41	13.62	7.71	4.31
1949-50	1.51	15.21	9.68	5.05

Source: Sale price of fertilizers in Santiago.

Section 4 Appendix 7: Profitability of wheat

Agricultural years	Yield (metric quintals per hectare)	Cost of Pro- duction of metric quintal <u>a/</u>	Wholesale price of metric quin- tal <u>b/</u>	Proportion: $\frac{\text{Cost}}{\text{Price}} \times 100$
1932-33	13.2	31	65.80	47
1933-34	11.3	38	55.60	68
1934-35	9.5	43 <u>c/</u>	57.10	75
1935-36	11.2	48	65.8	73
1936-37	10.0	55	97.50	56
1937-38	10.8	58	98.50	59
1938-39	11.7	60 <u>c/</u>	79.90	75
1939-40	10.4	62	78.60	79
1940-41	10.0	72	92.40	78
1941-42	10.7	80	140.40	57
1942-43	11.4	98	152.70	64
1943-44	12.6	106	155.80	68
1944-45	11.5	119	162.90	73
1945-46	12.4	121	199.80	60
1946-47	12.1	155	276.10	56
1947-48	13.1	200	340.80	58
1948-49	12.8	226	364.50	62

Source: For yields: Dirección General de Estadística.
 For production costs: Departamento de Economía Rural.

Notes: a/ Based on farm in central-southern region, 100 kilogrammes, without sack.

b/ Wholesale price, placed at railway station, Santiago, discounting the value of rail freight from central-southern zone (Chillán - Santiago), 100 kilogrammes without sack. Price in the year of harvest.

c/ Interpolations according to costs in other wheat zones.

Section 4. Appendix 8: Stocks of basic agricultural machinery
and cultivated area

	1930 <u>a/</u>	1936 <u>a/</u>	1940 <u>b/</u>	1948 <u>c/</u>
	(units)			
<u>1. Machinery</u>				
Agricultural tractors	660	1,557	2,750	5,400
American cultivators	4,530	6,060	7,100	...
American grain drills	3,204	3,315	4,200	...
American balers	3,360	4,551	4,200	3,600
American stationary threshers	4,542	5,073	5,400	5,700
Combines	239	251	470	1,000
(Total threshers)	4,781	5,324	5,870	6,700
<u>2. Area under cultivation</u>				
	(thousands of hectares) <u>d/</u>			
Cereals	843	1,016	988	1,073
Pulser	114	209	166	133
Potatoes	43	48	51	52
Industrial Corps	8	12	21	51
Total annual corps	1,008	1,285	1,226	1,309
<u>3. Proportion:</u>				
	(hectares per unit)			
Cultivated area per tractor	1,527	825	446	242
Cultivated area of cereals per threshing machine	251	223	235	298
Cultivated area of cereals and pulses per threshers	200	230	197	180

Sources: a/ Corresponding agricultural censuses.

b/ Estimates based on domestic sales or imports until 1940, and by depreciating the 1936 stocks according to the length of life of equipment.

c/ Estimates according to 1938-48 imports of tractors and combines. Mowers: 1/3 of 1940 stocks plus 1940-47 imports. Threshers: 1937-1940 sales plus 1941-47 imports plus estimated small domestic production.

d/ Yearly average of corresponding 3-years period.

Section 4, Appendix 9. Distribution of average cultivated area,
according to the size of farms

Classification by area (hectares)		Cereals			Market Gardens		
		Thousands of farms	Thousands of hectares	Average area (hectares)	Thousands of farms	Thousands of hectares	Average area (hectares)
Less than	5	15.0	16.7	1.1	16.0	12.9	0.8
5 to	20	21.4	48.1	2.2	16.1	22.3	1.4
20 to	50	13.7	71.3	5.2	9.0	19.7	2.2
50 to	100	8.0	76.6	9.6	5.2	17.8	3.4
100 to	200	5.4	99.9	18.5	3.8	23.0	6.0
200 to	500	4.4	169.6	38.5	3.1	39.3	12.7
500 to	1,000	1.8	127.2	70.7	1.3	29.1	22.4
1,000 to	2,000	1.1	130.9	119.0	0.8	29.0	36.2
2,000 to	5,000	0.6	107.8	179.7	0.5	19.7	39.4
More than	5,000	0.4	90.8	227.0	0.3	19.0	63.3
Total or average		71.8	938.9	13.0	56.2	231.9	4.1

Source: 1935/36 Agricultural Census.

Section 4 Appendix 10: Changes in price of a tractor
imported from the United States

Years	Export	Price	US\$	Rate of exchange \$: US\$	Domestic price (pesos)			
	FOB	Freight and insurance	CIF		CIF	Custom duties and taxes	Expenses plus profit	Selling price
1940/41	1,645	267	1,912	25.-	47.800	7.310	20.890	76.000
1942/44	1,850	590	2,440	31.10	75.884	10.006	31.110	117.000
1945	1,973	297	2,270	31.10	70.597	17.543	36.160	124.300
1946	2,193	248	2,441	31.10	75.915	13.889	40.731	130.535
1947	2,521	272	2,793	31.10	86.862	19.804	57.834	164.500
1948	2,821.25	270	3,091.25	31.10	96.138	23.606	60.256	180.000
1949	3,107.75	303	3,410.75	43.10	147.003	31.459	125.538	304.000

Increase

1949 over

1940 in %: 88.9 13.5 78.4 72.4 207.5 330.4 500.9 300.0

Source: Data obtained directly from enquiries made to importers.

Section 4 Appendix 11: Price indices of agricultural products and machinery

(Base: 1940 = 100)

Year	General price index a/	Price index of agricultural products b/	42 HP. Tractor on tyres	32 HP. Track-laying tractors	4-disc tractor plough	7 ft. baler	6 ft. combine with own engine
1941	120.	122.4	108.6	100.	106.1	105.4	104.8
1942	153.2	164.3	112.	153.9	106.1	111.5	108.9
1943	165.	168.1	118.1	153.9	111.1	118.7	112.9
1944	173.	170.	118.1	153.9	111.1	118.7	112.9
1945	189.5	188.8	126.7	163.6	113.1	134.9	138.1
1946	247.4	249.3	126.7	171.8	113.1	134.9	138.1
1947	338.8	357.9	(153.4) (181.) c/	216.4	(141.4) (166.6) c/	158.3	163.3
1948	377.	378.2	275.8	236.8	242.4	223.0	182.4
1949	..	404.6	329.3	400.0	285.9	268.3	308.4
1950	..	..	..	582.5 a/	..	..	..

Source: Economic Commission for Latin America.Notes: a/ Including livestock products.

b/ Price of group comprising: cereals, pulses, potatoes, industrial crops and wine.

c/ Change in the price of machinery during the course of the year.

Section 4, Appendix 12: Value of agricultural tractor (track-laying 32 HP)?, in terms of wheat, in the United States and Chile

United States				
Years	Price of wheat a/		Factory price of tractor d/	Number of metric quintals of wheat per tractor
	U.S. \$ per bushel	U.S. \$ per metric quintal		
1940	0,682	2,509	1,580.-	630
1941	0,944	3,473	1,580.-	455
1942	1,100	4,047	1,760.-	435
1943	1,360	5,004	1,760.-	352
1944	1,410	5,188	1,760.-	339
1945	1,500	5,519	1,848.-	335
1946	1,910	7,027	2,052.-	292
1947	2,410	8,867	2,304.-	267
1948	2,050 b/	7,542	2,639.25	350
1949	2,020 c/	7,432	2,902.75	391

Chile			
Years	Price of metric quintal in Central-Southern zone e/	Selling price in Santiago f/	Number of metric quintals of wheat per tractor
1940	78.63	76,000.--	967
1941	92.36	76,000.--	823
1942	140.35	117,000.--	815
1943	152.67	117,000.--	766
1944	155.75	117,000.--	751
1945	162.93	124,300.--	763
1946	199.78	130,535.--	653
1947	276.11	164,000.--	596
1948	340.75	180,000.--	518
1949	364.50	304,000.--	834
1950	369.50 g/	442,700.--	1,198

Source and Notes: Source: Agricultural Statistics, (United States Department of Agriculture), 1948

a/ Average price paid to farmers. Source: Crops and Markets, Vol. 26 page 81 (USDA 1949 Edition)

b/ Average price received by farmers (provisional)
Source: North Carolina Farm Report No. 30 (5 February 1949)

c/ Average price received by farmers at 15th January 1949.

d/ Report of firm importing tractors

e/ Wholesale price of wheat in production zone (average price in Santiago, discounting rail freight).

f/ Selling price of tractor, also given by importers.

g/ Average price fixed by the Instituto de Economía Agrícola for 1950, discounting actual value of rail freight.

Section 4, Appendix 13: Comparative estimate between production costs of wheat based on simple mechanization and the same costs based on complete mechanization - Agricultural Year 1948 - 1949

I T E M S	Simple mechanization a/	Complete mechanization:	
		with new machinery belonging to farmer b/	with machinery be- longing to the Government mechan- ization services c/
Total expenses per Hectare: \$	3,816.34	3,880.86	4,276.90
Yield (Metric quintals per hectare):	16	16	16
Cost of metric quintal without sack on the farm:	238.50	242.55	267.31
<u>Percentage of cost elements:</u>		<u>as % of total</u>	
Human labor:	28.9	10.4	5.2
Animal work:	14.9	0.5	0.5
Machinery and implements:	5.3	39.4	47.4
Seed:	13.6	13.4	12.1
Fertilizers:	11.4	11.2	10.2
General expenses:	10.3	10.1	9.2
Land rent:	12.6	12.4	11.2
Interest on capital:	3.0	2.6	4.2
Total	100.0	100.0	100.0

Notes: a/ Tilling of the soil with oxen, plough and harrow, seeding and cutting by hand, harvesting by means of a stationary thresher.
b/ Tilling the soil with tractor and its equipment, seeding by machine and threshing with combine drawn by tractor. Selling price of all mechanical equipment corresponding to 1948.
c/ All work consisting of first and second ploughing, harrowing and harvesting with machinery belonging to the Service of Mechanized Agricultural Equipment, according to tariffs in force 1948 - 1949.

Source: Departamento de Economía Rural.

