RURAL DEVELOPMENT PLANNING AND LABOUR ABSORPTION: O'HIGGINS AND COLCHAGUA PROVINCES, CENTRAL CHILE

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RURAL DEVELOPMENT PLANNING AND LABOUR ABSORPTION: O'HIGGINS AND COLCHAGUA PROVINCES, CENTRAL CHILE

by

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ABSTRACT

During the last several decades, Chile has experienced development characterized by rapid social and economic changes. In conjunction with economic growth, Chile has experienced rural stagnation, a growing dependence on imported foodstuffs and a migration of rural population to the urban centres. Unemployment and underemployment exist in both the rural and urban sectors.

Economic planning in Chile must be directed in part to improving agricultural production, reducing the dependence on imported foodstuffs, and creating more employment opportunities in the rural sector.

In this paper, the Chilean provinces of O'Higgins and Colchagua are examined with regard to the determinants of labour demand. A measure of rural unemployment (CH), calculated for thirty-two townships is analysed and evaluated as a planning tool. Variations in the demand for labour and the estimated levels of unemployment (CĤ) are analysed with reference to the physiographic characteristics of the townships, land use, and the system of land tenure.

It was found that spatial distribution of the supply of labour is a function of the location of labour demand and that surplus labour tends to move toward the minifundios and the urban areas. Land use and the choice of technique appear to be strongly influenced by land tenure and access to markets in addition to being determined by land capability. The paper concludes with a discussion of the planning and policy implications of the study.

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I. INTRODUCTION

A. Issues

This essay consists of a methodological analysis of the relationship between the agrarian structure of one specific area in a developing country and the labour force employed. The contiguous provinces of O'Higgins and Colchagua in Central Chile are taken as a basis for analysis because they constitute a developed region centred around the exploitation of natural resources.¹ The supply of raw materials to external markets creates a dependency of the region on its natural resources, a characteristic which is quite common in all developing countries.

The Gross Regional Product structure of the region illustrates the high participation in the agriculture and mining sectors (each of which make up 30% of the total G.R.P.), and the low participation in the industrial sector (which generates only 10% of the G.R.P.). Moreover, the primary activities are the main source of employment in the region; 60.5% of the total active population is involved in agricultural activities.

The rural population in O'Higgins and Colchagua has a low life expectancy; the infant mortality rate is 123 per thousand, higher than

¹O'Higgins and Colchagua provinces are designated as a single planning region (Region V), by the National Planning Office.

in most areas of Latin America. Large numbers of people alive today in this region will die prematurely due to malnutrition, a fate that threatens two-thirds of the world's population already suffering from hunger.

The socio-economic backwardness of this region is contrasted with its neighbour Santiago, the Capital City, and the largest investment centre of Chile. Santiago's influence over the region is mainly manifested by its magnetic pull on nearby poor peasants, who are drawn to the city hoping to find jobs, which the city is unable to provide. The mass emigration to cities from the countryside which leads to uncontrolled urban growth is one of the most serious problems confronting Latin American cities today. This uncontrolled urban growth has only a limited relation to industrial development. As an example, at present, the new factories in Santiago have adopted technology in order to save labour costs; each 3% increase of manufactured products demand only a 1% increase in employment.²

The inability of the city to deal with the demand for jobs and accommodations results in an unemployment belt of settlers which actually surrounds the city, pressing in on it and demanding change in the socioeconomic system. In Chile, these settlements are called "Callanpas" or "Problaciones marginales".³

²Politicas de dessarrollo Nacional. ODEPLAN, Santiago, Chile 1969.

³Similarly, such illegal settlers are called "Favelas" in Brasil, "Tugurios" in Colombie, "Ranchos" in Venezuele, "Barriadas" in Peru, etc. etc.

The process of change in the economic structure of the region, in order to decrease employment in the primary sector and shift toward the industrial sector, is long and costly. In the meantime, agricultural activity will be called upon to play an important role in the regional economy as an employment source and for food production.

The stagnation of agricultural activities in Chile in the last few decades has repressed national development. At present, the gross national supply of agricultural products per inhabitant is 10% lower than ten years ago. The agricultural production has been insufficient to cover the need for food and raw materials of the growing population, in spite of the fact that Chile has at its disposal good soil capability and excellent climatic conditions.

Because of the shortage of agricultural products to meet internal demand, the nation must spend a great deal of its foreign currency on food imports. However an evaluation of Chilean Agrarian Reform by PLANDES (the official institution of the Chilean Planning Association), in 1968, has determined that two-thirds of the food imported by the nation could be internally produced without major problems, the remaining one-third consists of tropical products like cotton, tobacco, bananas and coffee, products which the country is not able to produce.⁴ The unfavourable balance of payment in Chile based on the fluctuation of copper prices in international markets, has worsened due to the increasing cost for food

⁴Corvalan, A. "Estagnacion o cambio en la Agricultura Chilena", 31 Boletin Informativo, Sociedad Chilena de Planificacion Enero-Febrew, 1969, pp. 11-25.

imports.5

Moreover, although Chile has excellent natural conditions to be an exporter of agricultural products, the ratio of agricultural exports to total export has dropped considerably in recent years. The O'Higgins and Colchagua region has exceptional advantages for becoming a major exporter of citrus fruits, apples, grapes, and wine. This development, should it occur, would contribute to a shifting away from the dependency on copper (which is an unstable foreign exchange earner because of wide fluctuations in copper prices), towards agricultural exports (which are foreign exchange saving). The fluctuations in copper earnings are due mainly to demand conditions. The earnings in agricultural products are also fluctuating. They are a function, on the supply side of climate conditions, and on the demand side of the final demand for consumer goods. The fluctuations in copper earnings (copper is an industrial input) are not correlated to a significant degree with agricultural products earnings. An average of copper earnings and agricultural earnings will have less fluctuations than either individual series.

Two goals of agricultural development have been clearly established in Chile: to increase agricultural output and to create employment. As a result, the question arises as to whether or not the present way of agricultural production in the O'Higgins and Colchagua region is suitable to reach these objectives. Given the amount of land in the region, there

⁵In the last few years, Chile has expended a yearly average of 155 million dollars in food imports. Alcazar, J. "Contribucion de la Agricultura al desarrollo economico y Social Chileno", 31 Boletin Informativo, Sociedad Chilena de Planificacion Enero-Febrew, 1969, pp. 29-33.

are three ways to meet these goals. One is to use more labour; another is to increase the use of agricultural inputs, such as fertilizer, pesticides and better seed; and the final way is to restructure the whole process of production, including types and patterns of land use, ownership, marketing facilities, and so on.

Facing these alternatives, the task of agricultural planners consists of finding the best combination of the factors of production in order to allow the maximum utilization of the more abundant resources - labour and land - with a minimum use of capital in agricultural activities.

The low rate of increase in urban employment in addition to the agricultural potential of the O'Higgins and Colchagua region seems to indicate that in the short run, the growing rural population should remain engaged in agricultural activities.

This research is restricted to the theoretical issue of the ability of the agricultural sector to absorb increased rural labour and to the practical issue of examining the usefulness of one measure of surplus labour, the CH index as a planning tool.⁶

All the empirical data used in this research paper, and the CH estimates, are taken from research carried out by the National Planning Office in Chile in 1972. A summary of the results of this research is given in Tables 1 and 2. That investigation itself was based on *Metodologia de Investigacion de Recursos Naturales* by Stevam Strauss.⁷

⁶The other issues are important but are not dealt with here because they are not the focus of the research of this paper.

* .

¹Strauss, Stevam. Methodology for the Evaluation of Natural Resources. (ILPES, Latin American Institute of Social and Economic Planning), United Nations, Santiago, Chile, 1970.

TABLE 1

O'HIGGINS PROVINCE SEASONAL INPUT LABOUR FOR AGRICULTURAL LAND USE

•							- 1	970 -								
	l	REA				THO	USANDS	OF MAN	N DAY E	QUIVAL	ENTS					
	Ha	%	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	TOTAL	%
Cereals	28.070,0	2 5,3 4	55,29	63,44	19,93	24,42	30,87	33,12	27,25	38,18	111,72	1,12	0,84	0,84	407,02	7,11
Rice	956,0	0,86	1,44	0,30	0,14	0,54	1,23	3,87	2,20	2,31	1,87	0,57	9,39	2,39	26,25	0,46
Corn	1 1.97 3,0	10,80					57,47	32,33	52,68	112,55	17,98	11,97	9 5,7 8	4 9,0 9	4 29,8 3	7,51
Legumes	7.103,0	6,41	2,34	0,78	1, 84	11,01	15,77	4 2,9 7	71,59	37,36	27,91	69,6 i	4 0,6 2	46,02	3 67,8 2	6,43
Potatoes	2.7 05,0	2,44	34,72	14,69	0, 95	1 5,0 2	4,84	15,80	20,43	21,24	18,94	13,39	2 3, 1 4	67,57	2 50,7 3	4,31
Industrial Crops	4.894,0	4,42	4,96	2,71	5,11	6,89	1 5,4 7	125,09	5 0,85	2 4,9 2	17,89	32,37	4 7,7 1	11,35	3 4 5,3 2	6,0:
Garden Veg.	4.15 0,0	3,74	6,47	7,51	10,21	15,89	24,78	38,55	42,70	78,73	70,55	40,55	5 9, 8 4	13,20	4 0 9,0 6	7,1 !
Fruits and Grape Vines	18.688,7	16,86	132,62	157,24	112,40	154,95	158,79	11134	142,40	131,40	109,84	178,42	35 6,4 0	309,27	2055,07	35,9
Forage	3 2. 276,0	29,13	33,70	20,02	8,37	31,54	19,73	125,02	37,05	1 39,80	141,36	37,62	132,35	170,46	897,02	15,68
TOTAL	110.816,7	100,00	271,54	266,69	158,95	260,26	328,95	528,09	447.15	586,49	5 1 8,0 4	385,62	766,07	670,27	5.188,12	
Man Day Equivalent by 100 Ha	s		245	241	143	235	297	476	403	529	4 6 7	348	691	6 0 5		
1	L2	8.727	Relat	ionshi	p man a	and lar	nd 27	.8	Catt	le rai	sing e	nploym	ent (c)	5	j34 . 22	% 9.3
·· · ·]	L _{dc}	2.101	Emplo	yment	coeffi	cient	72	.8	Tota	il man	day eq	uivale	nt	5	5.722.34	4 100.
ана — Саналана 1999 — Паралана 1999 — Паралана — П	L _{dac} 3	0.828	$P_{\mathbf{x}}$	3	0.943		-		i Tota	in agr. 1 man	activ day eq	ities uivale	nt	5	5.722.32	4

Source: ODEPLAN (National Planning Office), Santiago, Chile 1972.

TABLE 2

COLCHAGUA PROVINCE

SEASONAL INPUT LABOUR FOR AGRICULTURAL LAND USE

- 1970 -

	AF	AREA THOUSANDS OF MAN DAY EQUIVALENTS														
	Ha	%	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	TOTAL	%
Cerals	53.780,0	42,74	65, 61	93,04	43, 55	50,55	57, 54	48,40	36.57	104,33	183,93	19,89	0,53	13, 99	717, 95	16,78
lice	3.036,0	2, 4,1	4,58	0, 94	0,46	1,70	3, 92	12,30	6,98	7, 34	5, 95	1,82	29,81	7, 59	83, 39	1, 95
orn	8.086,0	6, 43	4,29		1,13	2, 02	53,77	40, 51	38,73	20 13	54, 66	7,12	89,10	51,18	3 62, 64	8,48
egumes	7. 713, 0	5,13	13,27	9, 64	2,77	9,33	9,10	21, 14	41, 64	4'7,43	16, 19	43, 35	66.56	46,04	326, 45	7,53
otatoes	1. 980, 0	1 57	25, 40	10,75	0, 69	10, 99	3, 54	11, 56	14,95	15,54	13, 86	9,50	16, 93	49,44	183, 45	4,29
ndustrial Crops	5.121,0	4, 07	7,01	3, 43	1, 49	3.04	4,82	14,94	31,80	18,00	15, 84	13, 36	28, 80	27,24	169,57	3,97
arden Veg.	1.383,1	1,10	1,67	2, 52	7,16	7,57	11, 01	17, 07	17,63	23, 29	i 8,49	16,85	19,21	3, 80	146, 27	3,42
Vines	10 620, 6	8,44	75,29	151,06	96,94	91, 62	5 5, 99	74,33	59, 33	66,06	84, 73	104, 84	187,37	136,46	1.194,02	27, 91
orage	34.109,0	27, 11	37,15	16, 77	8, 50	Z, 09	23,71	83,64	34, 89	94,65	99,92	27,44	93, 59.	129,13	651,48	15,23
DTAL	125828.7	100,00	234 . 27	288,15	162,70	178, 92	233,40	323,89	282, 52	396,77	493,37	244,47	¥ 531, 90	¥ 454,87	3 835,23	
an Day Equivalents by 100 Ha			186	229	129	142	185	2 57	224	315	392	194	423	369		
L _{da}	1 9	.935	Re1	ations	hip mar	n and 1	and	17.2	Cat	tle rai	sing e	mploym	ent (c)		442	.31
L _{dc}	_ 1	.741	Етр	loymen	t coefi	ficient		80 .0	Tota	al man in agri	day eq c. act	uivale ivitie	nt S		4.277	.54
L _{da}	ac 21	.676	Px		22	2.043			Tota	al man	daý e q	uivale	nt		4.519	.82

Source: ODEPLAN (National Planning Office), Santiago, Chile 1972.

The CH index was calculated by the National Planning Office using the methodology proposed by Strauss. The interpretation of the results and, in particular, the analysis of the ability of the rural sector to absorb labour were not carried out as the research was terminated with the change in the Chilean government in 1973.

This research paper takes the empirical data and the CH estimates in order to: (1) examine the shortcomings of the CH index as a measure of surplus labour in the rural sector and as a tool for analysing the potential of the sector to absorb labour, (2) propose an "employment coefficient", different from the one used by Strauss, as an index of seasonal employment. All research beyond Tables 1 and 2 in this paper, with the exception of the data used, has been carried out by the author.

Three factors studied by the Strauss Group in the Chilean National Planning Office will be considered:

- 1. The size of the total regional agricultural labour force in 1965;
- The amount of labour demand generated by agricultural activity in 1965;
- 3. The balance of the demand and supply of labour in 1965.

B. The Region

O'Higgins and Colchagua provinces are located in central Chile with latitude 34° to 35° south and longitude 72° west (Fig. 1). Their boundaries are Santiago province to the north, Curico province to the south, the Pacific Ocean to the west, and the Andean Range to the east, the latter forming a natural border with Argentina. O'Higgins and Colchagua provinces cover an area of 1,529,600 Ha. including the Andean Mountains, the Coast Range



Territory

* ...

. 9 and the Central Valley of Chile (77% of the total area is devoted to agricultural, forests and cattle raising). These physiographic units can be divided into irrigated and non-irrigated areas. Irrigated areas in the Central Valley, with its mild climate and good soils are an important part of the agricultural potential of Chile. The non-irrigated area in the Coast Range and in the littoral plains forms a backwards rural region whose development is restricted by the lack of water. This area has strong soil limitations, scattered inhabitants and predominantly large size holdings. In Colchagua province non-irrigated areas prevail, dedicated to extensive land use. O'Higgins province is located mainly in the irrigated areas, a fact which provides a good basis for agricultural development.

C. The Population

The total population of the region is 418,263 (1970), of which 67% live in the countryside and 43% in small urban towns (Figure 2). The population distribution in O'Higgins and Colchagua provinces is a function of the irrigation possibilities. The two large natural units in the region - irrigated and non-irrigated areas - constitute the basis for the pattern of settlement.

The irrigated area in the Central Valley which cuts through the central townships of both provinces is where most of the regional population is concentrated. The non-irrigated areas, the Coast Range and the Coastal Plains of Colchagua province, have a low population density. Peasants are constantly emigrating from this area to regions with better economic possibilities.





POPULATION DISTRIBUTION IN O'HIGGINS AND COLCHAGUA PROVINCES



"Urban and Rural Distribution of the Population", Chile, (1960 Census), IREN, OEA. Scale 1:1,000,000.

+++Urban Center Scale

Provincial Boundary

Each point represents 100 inhabitants

International Boundary

In Colchagua the cities of San Fernando (population 27,600), and Santa Cruz (population 8,600),make up rural centres whose activities consist mainly of marketing rural products. O'Higgins province has some urban centres such as Rancagua (population 90,000 in 1970) whose economy is mainly dependent on the nearby copper mining centre of El Teniente. Other urban centres with some industrial activities such as Rengo (population 12,400) and Machali (population 5,600) provide O'Higgins province with urban characteristics that Colchagua lacks as it is basically rural.

Due to the inability of the regional rural economy to provide steady employment, and due to the increasing population, in the last few decades there has been a constant flow of population towards the cities. The urban centres in the region generally act as a stopping-ground for a future emigration to Santiago, the capital city. In the meantime, migrant peasants remain in the minifundio areas surrounding the cities. These people are a labour reservoir for both the cities and the rural areas. The network of communications in Central Chile, runs north to south facilitating the movement of people along the Central Valley. Poor eastwest communications contribute to the isolation of non-irrigated areas and their lack of integration with the regional economy.

D. Outline of Paper

This introductory part contains a discussion of rural planning and the problem of labour absorption. A presentation of the general characteristics of the O'Higgins and Colchagua regions is included.

The second part is concerned with an employment coefficient approach. A measure of rural unemployment CH, and a seasonal employment

coefficient are considered.

In part III, the adequacy of the CH variable is discussed with reference to labour supply, labour demand and the relative bias of the CH estimate.

Part IV consists of a theoretical discussion of labour demand related to land use structure, techniques of production, land tenure and price of labour.

The fifth part contains a discussion of $C\hat{H}$ variations within the region. To aid the discussion, a general description of the region is given. The causes of $C\hat{H}$ variations within the region are analysed and the major factors determining CH are discussed.

The final section of the paper, part VI concludes with a discussion of the use of CH as a planning tool and an analysis of some of the policy implications of the study.

II. EMPLOYMENT COEFFICIENT APPROACH

A. Labour Supply and Demand

The labour supply figure was taken from the 1965 agricultural census. It consists of all employed and unemployed rural dwellers involved in agricultural activities. This figure is signified by (L_c) .

The labour demand was derived theoretically in the following manner:

(i) The area of land used for grasslands and forests in 1965 was determined along with the total area of arable land. The arable land use was grouped into nine categories, according to the labour requirements for each crop as following:

- cereals (wheat, barley, rye and oats)
- corn
- rice
- legumes (beans, peas, lentils, and chick peas)
- potatoes
- industrial crops (soybeans, sugar beets, tobacco, sunflowers and "curaguilla")
- garden vegetables and flowers (lettuce, cabbage, carrots, tomatoes, etc.)
- fruits and grape vines
- forage

These categories refer to rotating and permanent crops.⁸

The potentially arable land in the region is 3726 Km^2 but in 1965 only 66% of it, or 2476 Km² was under cultivation.

(ii) The labour requirement for each crop category was calculated upon the basis of the national input tables of CORFO (Corporation to Develop Production), based on a National Survey carried out in 1965. The average labour input was also calculated according to whether the land for each crop was irrigated or non-irrigated. Only in the study of those areas devoted to certain crops (e.g., wheat), was it considered whether animal, manual or mechanical power was used. The average labour input required per hectare in one year was calculated monthly for each category of crops.

(iii) The total labour input required for each category of crops, was added being expressed as thousands of man day equivalents per month in each township.

(iv) The man day equivalent figure was converted to a yearly labour unit measure by looking for the two months showing the highest day equivalent figures. The total labour requirement for these two months was divided by 50, the figure considered to be the average days worked in two months in the region. The result of this calculation corresponds to the minimum labour force required per year to maintain the area under cultivation.

Next, the yearly labour demand for forestry and cattle raising was added. Then, the total direct labour demand is expressed in number of workers per year. (As an example see Tables 1 and 2 for O'Higgins and Colchagua Provinces, pp. 6 and 7.)

(v) To this the indirect labour demand was added, which includes management and the personnel required to operate and use capital infrastructure items, such as maintaining roads, equipment, and irrigation

water facilities. It was assumed that this figure is 10% of the direct labour demand, based on previous studies by the Planning Department of the Agricultural Board.

(vi) The addition of the direct and indirect demand represents the minimum amount of manpower required by the region to maintain the present land-use structure. This figure is signified by (L_d) .

B. Seasonal Employment Coefficient

One of the problems surrounding rural agricultural employment is the seasonal nature of demand and the associated potential for seasonal unemployment. The pattern of peaks and troughs of employment in a region is most directly a function of climatic conditions and crop mix. To measure the seasonal balance of employment, an "employment coefficient" is proposed here. This coefficient measures the average proportion of peak labour force which is employed in non-peak months.

The seasonal patterns of employment and the level of underemployment are important when considering: a) Changes in land use, b) Alternate uses of the unemployed, and c) The effects of migration on output.

To derive the seasonal employment coefficient, let

M t	=	demand	for	labour	in month	t
N	=	$\sum_{t=1}^{12} M_t$	•			

⁹This seasonal employment coefficient is not the same as Strauss' found in Tables 1 and 2.

100

17

 $L_t = \frac{M_t}{N} = \%$ of annual labour months demanded in month t

$$L_1, L_2 = L_t$$
 in peak month => $L_1 = \frac{M_1}{N}$

Coefficient =

$$\frac{\frac{1}{10} (N - M_1 - M_2)}{\frac{1}{2} (M_1 + M_2)} \times 100$$

$$\frac{N - M_1 - M_2}{5(M_1 + M_2)} \times 100$$

$$\frac{1 - \frac{M_1 + M_2}{N}}{5(\frac{M_1 + M_2}{N})} \times 100$$

$$= \frac{1}{5} \frac{1 - (L_1 + L_2)}{(L_1 + L_2)} \times 100$$

$$= \frac{1}{5} \frac{1}{L_1 + L_2} - 1 \times 100$$

As an example for Colchagua Province:

 $M_1 + M_2 = 996.8$

$$N = 3835.2$$

$$\frac{M_1 + M_2}{N} = 26\%$$

Our Coefficient:
$$\frac{1}{-}(\frac{1}{---}-1) \times 100\% = 57\%$$
.

This means in the Colchagua region the employment coefficient is 57%, and the unemployment rate for non-peak months averages 43% = 100 - coef.

Figure 3

OBSERVED AND ESTIMATED SEASONAL EMPLOYMENT IN COLCHAGUA PROVINCE



In conclusion, note that the lower the fluctuation in monthly employment in non-peak months, the more meaningful the employment coefficient is as a measure of labour that could be used for other local tasks.

The underemployment aspects will not be explored any further in this study. The relationship between L_s and L_d , using estimates

calculated on the basis of peak month demand, will now be discussed.

C. CH and Alternative Measures

Relating the labour supply (L_s) and the labour demand (L_d) , the theoretical relationship between man and land in an area can be shown. Three measures of the relationship between labour supply and demand can be used:

(1) Absolute difference

$$DF = L_s - L_d$$

The (DF) figure represents an absolute value which describes the extent of excess labour supply or demand. This figure is not valid for a comparison of the relative level of unemployment in different regions, because it is expressed in absolute terms.

$$CH = \frac{L_s}{L_d}$$

The (CH) coefficient represents the ratio of labour supply to labour demand and is a relative measure which permits comparison between regions or time periods.

(3) Relative differences

$$RD = \frac{L_s - L_d}{L_s}$$

(RD) represents the ratio of the difference between labour supply and demand to the supply. Like (CH), this is a relative measure which readily permits comparison independent of the absolute values of labour supply and demand. The relationship between (RD) and (CH) is given by:

$$RD = 1 - \frac{1}{CH}$$

1 - RD

CH .

The CH coefficient will represent in this research the relation-
ship between
$$L_s$$
 and L_d . It corresponds to the ratio of present supply to
theoretical demand, given current patterns of land use, and existing
techniques of production in the region. The CH form of the variable is
used in this study because it is one form used in planning analysis.
Also, since CH is strictly functionally related to the other two methods
of measurement, with proper attention to mathematics, the CH results
hold for the other methods as well.

III. THE ADEQUACY OF CH VARIABLE

In this section the bias in the estimates of CH, as a result of errors in measurement and as a result of some theoretical consideration, will be examined. It is expected that some systematic errors in CH estimates are related to obstacles in measuring both of its components, L_s and L_d .

A. The Labour Supply Figures

The difference between L_s° and L_s values,¹⁰ comes from limitations in census data. The L_s° values, consist of census estimates of a number of rural workers, employed and unemployed. In a developing country, the census itself has a wide margin of bias, due to traditional techniques employed and in difficulties in assessing poor and isolated rural areas. For areas difficult to assess, census bias consists generally of underestimating real figures because of the difficulty of identifying rural inhabitants. For instance, in the large "latifundios", where the road communication system is poor, only owners are questioned and they may give a lower figure for the number of people living in the holding. This fact occurs because the owner really does not know the number of dwellers or because he refuses to mention them in order to avoid providing certain

¹⁰A hat on a variable denotes the estimated value. No hat indicates the true value.

legal benefits. This example is important because it suggests there should be changes in census taking.

Another source of errors in L_s° figure, is the lack of consideration of the labour mobility between different areas. For instance, peasants from surrounding areas, come to Peralillo township to work every day. Census figures for this township are inaccurate because these workers are not considered. Therefore the L_s° figure underestimates the true figure of labour supply in areas subject to an inflow of migrant workers.

The location of rural areas in relation to urban markets may also affect L_{s}° figures, because some peasants work in the city or are expecting to work there. In this case, the L_{s}° results overestimate real values. For instance, minifundio areas near the city of Rancagua have a concentrated "underemployed" labour force, working in the city for limited periods of time in domestic service or selling seasonal products.

Underemployment refers to people who have extremely low productivity service jobs, which are marginally more productive than not working. Often these people have a psychological barrier against rural activities, because they already have the perception of the city and its advantages. The peasants do not want to lose these advantages, even though they are only possibilities. This feeling corresponds to the same attitudes of the migrant peasant settlers in the unplanned belt surrounding Santiago. They never go back to the countryside in spite of the miserable standard of living that they have in the "callampas" (or "mushroom-towns"). The city for them is considered the depository of goods and the countryside is a place of deprivation. It is necessary to note that this change in

behaviour of the traditional peasant in Latin America, has recently arisen with the development of better systems of communication and mass media. The fact that this urban oriented labour, not available for agricultural activities is included in the census figure for rural workers, creates an L_s° bias over L_s . At the moment these people behave as unemployed urban workers and not unemployed rural workers. Planning in the rural sector must deal with this problem.

B. The Labour Demand Figures

* 2

The major error between the estimated and true L_d figures, comes from the theoretical assumption which estimates the labour input requirements for each crop upon the basis of the average techniques of productions used in each province.¹¹ This assumption allows a comparative overview of labour demand for the whole region, but it distorts true L_d values for each township.

In this way, the estimated L_d values for the township using traditional techniques of intensive labour underestimates real figures. On the contrary, in the township using more advanced techniques of production which replace manpower, the L_d figures overestimate real values. For instance, wheat cultivation in areas where commercial farming prevails, employs less manpower than wheat cultivation in non-irrigated areas of subsistence farming.

¹¹For research purposes, it was necessary to set one basic technological level using it as a reference which would allow a comparison of the relative land potential in different areas. This potential is measured by the capacity of land to employ workers.

Another systematic error between the L_d^2 and true L_d^2 , can be expected as a result of labour mobility between crops. In fact, sometimes one peasant works in a day in two or three different crops. This would alter the estimated labour requirements for the area and overestimate true L_d values.

C. The Relative Bias in CH

The effects of the bias in L_s and L_d on the bias in $C\hat{H}$ are obscure. It depends upon the actual magnitude and direction of the errors in L_s and L_d . Even when L_s and L_d are biased in the same direction, the direction of the bias in $C\hat{H}$ is ambiguous:

Let

 $M_{t} = \text{demand for labour in month t}$ $N = \sum_{t=1}^{12} M_{t}; \quad L_{t} = \frac{M_{t}}{N}; \quad L_{1} = \frac{M_{1}}{N}$

B = Coef. of Bias.

Def:

$$L_{s}^{\circ} = B_{s} L_{s}$$

$$L_{d}^{\circ} = B_{d} L_{d}$$

$$C\hat{H} = \frac{L_{s}^{\circ}}{L_{d}^{\circ}} = \frac{B_{s}}{B_{d}} \frac{L_{s}}{L_{d}}$$

Case A. If $B_s > B_d \Rightarrow B_s = B_d + \alpha$

$$\frac{L_{s}^{\circ}}{L_{d}^{\circ}} = \frac{(B_{d} + \alpha)L_{s}}{B_{d} L_{d}} \Longrightarrow \frac{L_{s}^{\circ}}{L_{d}^{\circ}} > \frac{L_{s}}{L_{d}}$$

then $C\hat{H} > CH$

Case B. If $B_s < B_d \Rightarrow B_s = B_d - \alpha$

$$\frac{L_{s}^{2}}{L_{d}^{2}} = \frac{(B_{d} - \alpha)L_{s}}{B_{d} L_{d}} \Longrightarrow \frac{L_{s}^{2}}{L_{d}^{2}} < \frac{L_{s}}{L_{d}}$$

then $\hat{CH} < CH$

Therefore, the bias in CH depends on whether $B_s \gtrless B_d$.

IV. THEORETICAL DISCUSSION OF LABOUR DEMAND

It is further expected that aggregate $C\hat{H}$ figures for regions, provinces or townships, will contain shortcomings for planning purposes, because of the variability of $C\hat{H}$ due to characteristics which vary within each area. The $C\hat{H}$ figure for a province or a township is an aggregate value of individual $C\hat{H}$ figures for different types of holdings, land use systems, techniques of production etc. This will be expanded upon later.

Variations can be expected in CH patterns related to some specific functions of production in the area, to directly influence both of the CH components: L_d and L_s . For instance, there is a theoretical reason to expect L_s figure to be larger in minifundio areas than in commercial farms, or L_d values to be larger in areas of intensive crop mixture than in areas of extensive crops. The discussion that follows will analyze each of these variables.

At first we have assumed that CH is a possible measure of surplus labour, and second that L_s is fixed for short term planning purposes, because the population figure is already given. Therefore this analysis will concentrate on L_d as the dynamic variable susceptible to change.

A. The Land Use Structure

Assuming CĤ to be a possible measure of surplus labour, it is necessary to test the results by comparing them with theoretical

explanations of variations in CH.

The land-use structure in the region affects CH as a function of L_d values. The L_d values can be expected to be larger in areas of intensive mixed crops and smaller in areas of extensive crops. It seems apparent that the land-use structure provides one essential link between the structure of production in rural areas and the labour requirement patterns. As an example, the intensive cultivation of grape vines in Colchagua province absorbs the largest percentage of labour of any crop in the province, although this crop engages only 8.4% of the total agricultural area. It can be expected that the intensive crops in the region will employ the larger amount of labour in relation to the area.¹²

The estimated relationship between land use and labour requirements in the region is as follows. $\frac{L_{d}}{area}$ is an index of labour use intensity with the average labour use intensity in the province set at 1.0.

	O'Higg	ins Pro	vince		Colchagua Province					
Crops	Area %	Lâ %	$\frac{L_{d}}{Area}$		Area %	Lâ %	$\frac{L_{d}^{2}}{Area}$			
					· · · · · · · · · · · · · · · · · · ·					
Cereals	25.34	7.11	0.28		42.74	16.78	0.39			
Rice	0.86	0.46	0.53		2.41	1.95	0.81			
Corn	10.80	7.51	0.70		6.43	8.48	1.32			
Legumes	6.41	6.43	1.00		6.13	7.63	1.25			
Potatoes	2.44	4.38	1.80		1.57	4.29	2.73			
Ind. Crops	4.42	6.03	1.36		4.07	3.97	0.97			
Gard. Veg.	3.74	7.15	1,91		1.10	3.42	3.11			
Grape Vines	16.86	35.91	2.13		8.44	27.91	3.30			
Forage	29.13	25.02	0.86		27.11	25.57	0.94			
	100 %	100 %	1:1	•	100 %	100 %	1:1			

TABLE 3

LAND-USE AND LABOUR ABSORPTION IN O'HIGGINS AND COLCHAGUA PROVINCES

¹²Intensive crops refers to garden vegetables, grape vines, potatoes and industrial crops. (Industrial crops refer to sugar beets, tobacco, oilbearing crops and "Curaguilla"). The L_d values in the above table correspond to aggregate data for the whole region and differences can be expected between these L_d figures and true L_d . In practice, the link between land use and labour requirements is not as easily established, because differences in techniques of production alter the expected labour demand.

To assume that the L_d values are mainly a function of the land use structure, without considering the importance of the techniques of production or the pattern of land tenure, is to ignore important factors determining the value of CH. However, the range of $\frac{L_d}{area}$ values for O'Higgins and Colchagua, (Table 3) suggests that land use itself is significant.

The land use structure itself depends on the natural conditions in the region, and on the market demand. The problem which arises is to assess the degree of flexibility in mixed crops, in order to permit a more efficient use of the labour force. For instance, commercial farms tend toward single crop production because it is profit maximizing. This fact may affect labour demand as follows:

- Monocultural practices increase seasonal unemployment because of the single peak labour demand in one crop.

- The monocultural practices increases emigration of labourers who cannot survive extended periods of unemployment.

- Single crop production may tend to produce a demand for migrant workers because the peak demand for labour may no longer be supplied by the local permanent population.

- In some instances, mechanization may raise the non-peak demand for more skilled farm machine operators.
B. The Techniques of Production

The choice of technology for a particular farm depends on the type of crop mix, the land tenure, the capitalization of the farm and the wage rates.

As crops become increasingly mono-cultural, more capital intensive techniques can be applied. The large diversification in mixed crops coincides with less capital intensive techniques.

In relation to land tenure, the techniques of production adopted by the small subsistence farms, are labour intensive because of the pressure on the unit to maximize L_d . This situation is not expected to change because of the lack of capital and the inaccessibility to credit. The commercial farms use more capital intensive techniques of production because they behave as profit maximizing units. They employ labour only up to the point where the additional output covers the wage rate. Also, commercial farms have access to the credit necessary to purchase capital input. The "latifundios" employ less capital intensive techniques than commercial farms because they are only partly oriented toward profit maximization.

It can also be expected that a more capital intensive process is associated with higher wages. Conversely, low wages are associated with labour intensive processes.

Differences in techniques of production in each holding, affect the amount of L_d in the region. In this research, the L_d values correspond to aggregate data which is based on the existing mix of techniques of production used in the region. The real CH values vary according to the production techniques used. Policies directed at changing the production

techniques must take into account the effect of L_d on CH. Any plan to speed up the introduction of capital intensive technology may lead to decreased L_d values. For instance if technology is introduced in an area of extensive land use (as in wheat farming), the labour requirement will fall drastically. On the contrary if new technology accompanies the intensification of land use (as in fruit farming), the labour requirement would increase.

The introduction of technology, while causing a drop in employment, will gradually lead to a stabilization of the pattern of seasonal employment. If fewer workers are needed during the peak harvest season, it will be possible to employ a greater percentage of these people during the off-season in new activities such as irrigation, applying fertilizer, crop spraying and pruning.

C. The Types of Holding

It can be expected that $C\hat{H}$ and CH vary according to the land ownership structure in the region. It is also necessary to remember that $C\hat{H}$ estimates are based on average values of L_d for each region and that farm practices vary widely from place to place according to the type of holding, even within short distances.

Within each region, the intensity of labour use is a function of the land tenure system in addition to the more obvious variables of crop mix, land quality, climatic conditions and so on. Changes in the land tenure system, and in the combination of types of farm enterprises will alter labour demand. The pattern of land tenure is related to both the productivity of labour in the agricultural sector and the migration of

labour to urban centers.

The land tenure system manifests itself in three types of enterprises, each with a different relationship between land use and labour the minifundio, the latifundio and the commercial farm. demand: The minifundios or small subsistence farms are approximately 1-10 hectares in size, employ a high percentage of family labour, which yields a very low marginal product. The "minifundios" can be characterized as an output maximizing unit, subject to a minimum average product constraint. The "latifundios" are large farms of 500 ha. or more, where the labour is not used as intensively as in minifundios and the marginal product is The latifundio differs from the commercial farm in that it has higher. strong elements of income target behaviour. The commercial farms are intermediate size holdings which behave as profit maximizing production In 1965, the Chilean "latifundistas" (owners of large landed units. states) representing only 2 percent of farm proprietors owned 55 per cent of the total agricultural land (weighted according to quality), while the "minifundistas" (owners of very small farms) were 80 per cent of farm proprietors and owned less than 10 per cent of the land (standard quality).13

In reality, some minifundios may be larger than some commercial farms, and some commercial farms may be larger than some latifundios. The size of a specific type of holding in Chile, is extremely sensitive to whether or not the land is irrigated. Also, some latifundios are best

13 Shaw, R. Paul. "Land Tenure and Rural Exodus in Latin America". Economic Development and Cultural Change, Vol. 23, No. 1, Oct. 1974, pp. 123-132. viewed as a combination of a commercial and a latifundio enterprise.

The productive organization of each type of holding conditions the costs, use, availability and development of land, and therefore the levels of labour demand. The labour requirement patterns in the region depend upon the production criteria of each of the three categories mentioned above. For instance, neither land nor labour is being used economically or efficiently on most latifundios in Latin America. As for the inefficient use of land on the latifundios it is sufficient to point out that in Chile (1964), over half of the arable land was permanently left as natural pastures and over 10 per cent was left fallow. The latifundio employed only about 20 per cent of the rural labourers and produced an estimated 30 per cent of the total agricultural output. The minifundios engaged over 40 per cent of the rural workers and produced an estimated 15 per cent of the total output.¹⁴

In Chile and Peru between 1952 and 1960 Paul Shaw,¹⁵ from the United Nations applied empirical tests to a model which sought to identify causes of high rates of rural emigration in Latin America. The principal finding of this inquiry is that land tenure is empirically related to rural emigration in both countries. This study suggests that:-

1. Inadequate credit and highly exploitative pricing and marketing arrangements impede possibilities of higher incomes on minifundios.

¹⁴Cristobal Kay. "Agrarian Reform and the Transition to Socialism in Chile", The Journal of Peasant Studies, Vol. 2, No. 4, London, July 1975.

¹⁵Shaw, R. Paul. "Land Tenure and Rural Exodus in Latin America". Economic Development and Cultural Change, Vol. 23, No. 1, Oct. 1974, pp. 123-132. 2. The landless employee class is fraught with conditions of surplus labour, unstable land tenure rights, and a general lack of nonagricultural employment possibilities.

3. The "latifundistas" typically operate back from a profitmaximizing position on their production possibility curve; they seldom farm land intensively, exploit resident employers and occasional labour, reinvest a very small proportion on farm profits, and very often are "absentee landlords".

Three theoretical "ideal types" of enterprise which capture most clearly the differences between the behaviour of the minifundio, the latifundio, and the commercial farm will be presented.

The three types of land tenure systems present different objectives of production expressed in the economic making decisions, which directly affect the L_d values. One appropriate managerial behaviour corresponds to each type of land tenure. For instance, the choice of technology on each farm reflects the production attitudes of the owners. These are related to the land tenure system as follows:

a) <u>The minifundio</u>. The main characteristics of the minifundio are a high population density on small areas of poor quality land; thus, the objective is to use labour intensively. The behavioural objective translates into a production organization to absorb labour even when the marginal product is below the subsistence wage. This can be explained by using the following figure; the analysis in the graph is based on a 10 Ha. unit.



The behavioural objective in the minifundio is to maximize L_d given w_s , Q = F(L), and the surplus no less than zero. Employment is maximized at L_m where $Q = L \cdot w_s$ and s = 0.

b) <u>The latifundio</u>. The competitive pressures of a market economy are less directly felt by the latifundio than by the commercial farm. Decisions regarding output and input tend to reflect the attitudes of the owners about their life style and standard of living as a landed class. As a result, latifundio owners generally engage in less dynamic utilization of land, labour and new technology. The latifundio can be thought of as a "less than profit maximizing production unit"; it tends to underutilize land, labour and technology as compared to the commercial farms. Both market forces and government policy are trying to push the



latifundio lands towards a more commercial enterprise utilization.

On the graph the amount $0-Q_t$ represents a net income target in a latifundio. $0Q_L$ is the production relationship for the latifundio. The curve $0-Q_C$ refers to a commercial farm, which would use a more efficient production process and which would have a higher average product for labour. Employment in the latifundio is between L_L and L_t . A commercial farm would maximize its profit along $0Q_C$ at L_C . A subsistence farm or minifundio would employ labour up to L_M . Although, in the diagram it is possible for the latifundio to employ more labour than the commercial farm, it is probably unlikely that it would.

c) <u>The commercial farm</u>. The main characteristic of the commercial farm is that it functions as a commercial business and that it makes extensive use of capital formation. The behaviour objective is to maximize profit, here viewed as maximizing the surplus.





 L_c is the surplus maximizing level of employment. For a given technology it is below the level for a minifundio. Other things equal, policies to encourage commercial farms at the expense of minifundios will increase the marketable surplus but reduce the absorption of labour.

The $C\hat{H}$ values are based on average figures of labour demand. $C\hat{H}$ is based on estimates of L_{d}^{2} which are different from the real L_{d} values in each type of holding. In relation to L_{d} , it can be concluded that usually:

$$\begin{array}{ccc} L_{d} & L_{d} \\ \hline (--) & \min \end{array} > (--) & \operatorname{com. farm} > (--) & \operatorname{Lat.} \\ ha & ha & ha \end{array}$$

Thus, it appears that for the minifundios, CĤ underestimates real values, and for latifundios CĤ overestimates the true values. For the commercial farms, the CĤ bias is uncertain; assuming standard techniques of production, it depends more upon mixed crops.

D. The Price of Labour

The effect of the price of labour on employment is related to the type of holding. Minifundios employ labour to the point where the subsistence wage is equal to the average output. In Chile 1970, agricultural per capita incomes were half the national average. However, the poorest 70 per cent of the peasants had incomes of about \$100 U.S. dollars yearly per person due to the extreme unequal distribution of income. Rural wages were the lowest, diets were deficient, housing was miserable and infant mortality was high.¹⁶ The subsistence wage is determined in part by the biological minimum and in part by the possibilities for other employment.

For commercial farms, wages are determined in part by market forces, the price of foodstuffs and by social legislation. On commercial farms, labour is employed only up to the point where its marginal output covers its real wage.

In the latifundio, labour employment levels are determined in a more complex manner. When wages are paid, they are close to the subsistence wage earned in the minifundios. The real income received is bound up with various rights and obligations of the peasant and the land owner. In the large latifundios, the permanent farm workers are called "Inquilinos". They are remunerated in cash, partly with consumption goods and partly with rights to a small piece of land and pasture rights for a few animals. This arrangement is called "medieria" and half of

16 Cristobal Kay. "Agrarian Reform and the Transition to Socialism in Chile", The Journal of Peasant Studies, July, 1975, pp. 418-443.

the crop is paid as rent to the latifundista. The latifundios of Central Chile employed on average 30 per cent of its work force as "inquilinos", 21% as "voluntarios", and the remainder as "afuerinos". Afuerinos (outsiders), are seasonal labourers who are paid a cash wage plus some food. They are often relatives of Inquilinos living in their houses, unmarried and available for work when required by the landlord.¹⁷

At the present time, there is a general trend toward cash payment for labour in the rural areas of Latin America. This trend is also evident in Chile. The tendency is to move away from supplying workers with payment in kind or payment via "rights" to cultivate small plots or to maintain animals on the property of the landowner. The workers demand cash payment in order to buy more products from the urban sector (for example, clothing). The employers, especially on the commercial farms, prefer to reduce costs by only paying for labour when it is needed and remaining free of those types of reciprocal responsibilities toward workers embedded in the "rights" relationships. Lastly, the government encourages such practices to give the peasant more economic and political independence. However, due to the lack of market power the real wage of the peasant has been eroded by the inflationary process. In 1958, it was estimated that the real wage received in agriculture in Chile was 40% below what it was in 1953. In 1964, although it had risen from 1958, it

17 Schejtman, A., 1970. "Peasant Economies within the Large Haciendas of Central Chile". B. Litt. Thesis, University of Oxford.

was still 24% below what it was in 1953.¹⁸ The fall in real wages is a factor in the migration of rural peasants from the rural sector to the urban areas.

As has been suggested by G. Myrdal, the movement of the peasants from the rural to the urban sector may not generate wage responses of the sort simple economic theory would suggest. The simple theory of "static equilibrium" would suggest that the movement of workers from the rural areas to the urban sector, would tend to raise wages in the rural sector. This theory predicts that the working of economic forces will lead to regional differences becoming smaller. On the contrary, G. Myrdal argues that in the context of development, both economic and social forces create tendencies toward disequilibrium.¹⁹ Myrdal's notion of cumulative causation based on increasing returns to scale, suggests that the migration will continue to depress wages in the rural sector and may even increase wages in the urban sector depending upon the scale of production and the reserve of unemployed workers in the urban centers. Myrdal's proposition is that instead of leading towards equality, the forces of supply and demand interact with each other to produce cumulative movements away from regional equilibrium. The urban areas will be in a better position than lagging rural regions due to the migration of the factors of production

¹⁸Tenencia de la Tierra y Reforma Agraria en America Latina. Informe Regional y Resumenes de los Estudios por Paises. CIDA Secretaria General Organizacion de los Estados Americanos, 1971, p. 34.

¹⁹Thirlwal, A. P. Growth and Development, Chapter V, McMillan Press, New York 1972, pp. 127-145.

to the urban areas. Here larger markets as well as external economies produced by the concentration of production and consumption will cause greater efficiency in the use of the factors of production. Less manpower will be needed, but those required will be more skilled and therefore wages would rise. On the other hand, the urban reserve of unemployment will be larger, a fact that will regulate decreasing wages. In fact, migrant peasants from rural areas in O'Higgins and Colchagua provinces constitute a "reservoir" of unemployed labour around the cities; they live in "minifundios" close to the city, increasing the city marketing power but they are still seasonal rural workers whose influence tends to decrease rural wages on the "latifundios" or on "commercial farms".

Factors, including government policy, which affect the real wages of peasants, and the urban-rural wage differential will affect the migration of workers and also the CĤ variable, through changes in the supply of rural workers. Policies to change the price of rural labour will have different effects on L_d and CH, depending on the type of land holding and in the ability of producers to substitute labour for capital in production.

Some empirical estimates of $C\hat{H}$ will now be examined. In the conclusion to this essay the implications of the CH estimates for planning purposes will be explored.

V. DISCUSSION OF THE CH VARIATIONS WITHIN THE REGION

A. General Description of the Region

To analyse the CH variations, it is necessary at first to have an overview of the regional natural conditions, the land use structure, the settlement pattern and the land tenure system. The region can be clearly divided into six physiographic units:

- The Central Valley
- The Cachapoal Valley
- The Tinguiririca Valley
- The Interior non-irrigated area
- The non-irrigated area in the coast
- The Andean region.

To facilitate analysis, these units can be grouped into irrigated and non-irrigated areas. The irrigated area consists of Tinguiririca and Cachapoal Valleys which together are part of the Central Valley of Chile. This area covers 282,500 Ha. making up one-quarter of the total irrigated area of Chile.²⁰ With its good climate and soil conditions, this area composes a principal part of the national agricultural potential.²¹ It is suitable for Mediterranean types of crops such as fruits and wines.

The non-irrigated area consists of the Coast Range, the littoral plains, the interior non-irrigated areas in the central valley and the

²⁰At this moment in the interior non-irrigated area of Colchagua, a new reservoir "Convento Viejo" is under construction, which will greatly increase the amount of irrigated land by 47,000 Ha.

²¹In CHile, the land productivity of one Ha. in an irrigated area is approximately 15 times greater than one Ha. in a non-irrigated area.

Andean Mountains. There are 741,200 Ha. of non-irrigated land which makes up 48.8% of the total regional area. These areas are an economically backward region with a low population density, in relation to the valley region. Range land is almost the only economic activity of the area, and this is restricted by the lack of water. The soils are poor and highly eroded. Government policy views the region as having a potential for the development of forestry, an industry well suited to soil and climatic conditions. The Andean region will not be considered here because it does not present agricultural possibilities and because of the scarcity of population, except in mining centres.

The patterns of land use in irrigated areas differ from those in non-irrigated areas. There are three types of land use in the irrigated area: crops in rotation, orchards, and artificial grasslands. They are found individually and in combination on single production units. The land distribution of these crops is as follows:

Annual crops = 47.0% of the total area

Grasslands = 36.7% of the total area

Orchard and Wines = 12.9% of the total area

Forests = 0.9% of the total area

Non agricultural use = 3.5% of the total area.

In the non-irrigated area prairies and grassland prevail with some areas for the growth of occasional crops, bushlands, natural grass and forests. The land distribution for non-irrigated areas is as follows:

> Grassland and bushland - 52.7% of the total area Annual crops = 3.1% of the total area Forests = 2.4% of the total area

Orchards and Wines = 0.1% of the total area

Andean region without agricultural use = 41.7% of the total area.

Regarding the type of holding; in the irrigated area, holdings of less than 10 Ha. can be considered as subsistence farms and holdings between 100 and 500 Ha. are operated as commercial farms. In the nonirrigated areas, holdings up to 200 Ha. can be considered as subsistence farms, and only farms larger than 500 Ha. should be considered as other than subsistence farms.

The size of holding patterns in the O'Higgins and Colchagua provinces is as follows:

Size of Holdings Ha.	Number of Holdings	%	Area Ha.	%
0.1-10	13,395	87.1	23,689.8	3.7
10.1-20	752	4.9	10,782.3	1.7
20.1-50	495	3.2	15,530,7	2.4
50.1-100	230	1.5	16,473.8	2.6
100.1-200	193	1.2	27,084.4	4.3
200.1-500	165	1.1	52,031.0	8.2
500.1 and more	149	1.0	491,003.7	77.1
				<u></u>
TOTAL	15,379	100%	636,595.7	100%

TABLE 4

LAND CONCENTRATION IN O'HIGGINS PROVINCE

· · · · · · · · · · · · · · · · · · ·				
Size of Holdings	Number of	%	Area	%
Ha.	Holdings		Ha.	•
0.1-10	6859	66.1	10,706.6	2.4
10.1-20	1131	10.9	16,165.8	2.1
20.1-50	1037	10.0	33,243.5	4.3
50.1-100	502	4.8	35,406.1	4.5
100.1-100	321	3.2	44,741.8	5.8
200.1-500	264	2.5	82,697.9	10.6
500.1 and more	256	2.5	547,546.5	70.3
• • • • • • • • • • • • • • • • • • •				·
· · · · · ·		÷.,		
TOTAL	10,370	100%	778,508.2	100%
	4			
	· · · ·			•

LAND CONCENTRATION IN COLCHAGUA PROVINCE

TABLE 5

Source: Estudio Integrado de los Recursos Naturales: Provincias de O'Higgins y Colchagua. IREN, Santiago, Chile 1973.

In Colchagua province, the land concentration is slightly lower. In this province the 2.5% of owners with the largest holding have 70% of the area, and the 66% of the owners with the smallest holdings have less than 3% of the area. The average size of the largest holdings is 776 $70.3 \quad 66.2$ times the average size of holdings for the smallest (--- x --- = 776). $2.5 \quad 2.4$ The size of holdings related to non-irrigated and irrigated areas

is as follows:

TABLE 6

SIZE OF HOLDING ACCORDING TO IRRIGATED AND NON-IRRIGATED AREAS

Size of Holding	Irrigated Area %	Non-Irrigated Area %		
up to 10 Ha.	46.6	53.4		
10.1-20 Ha.	57.0	43.0		
20.1-50 Ha.	50.3	49.7		
50.1-100 Ha.	55.6	44.4		
200-500 На.	37.4	62.6		
500-and more	9.0	91.0		
	•			

Table 6 shows that large "latifundios" as well as farms 200 to 500 Ha. size are mainly in non-irrigated areas. In the irrigated areas the commercial farms tend to be less than 200 Ha. in size. The subsistence farms are in the same proportion irrigated and non-irrigated areas.

As mentioned before in O'Higgins province, 91% of the arable land is irrigated and in Colchagua province only 60% of the arable land is irrigated. In summary, in Colchagua province large latifundios up to 500 Ha. of non-irrigated range land prevail and the remaining area consists of "minifundios" with very low levels of subsistence production. In O'Higgins province, almost all the agricultural area is irrigated and it is devoted to annual crops combined with orchards, grape vines, and dairy pasture. In this province, 90% of the area consists of commercial farms and latifundios (Table 4). Subsistence farms make up only 10% of the area; however, they constitute the place where most of the population is to be found.

The land use and the size of holdings are important factors in CH variations. Policies to change the patterns of holdings or the land use structure in the region will alter CH. Given the small size of minifundios, any attempt to change them into commercial farms, will increase CH values. The consequences in shifting the latifundios towards commercial farms are less clear. Regarding land use, policies toward intensive use of land may increase CH values, even if they employ more intensive production techniques (for instance, in the irrigated areas, farms being changed from wheat to crops such as orchards, vines or garden vegetables). On the contrary, in the non-irrigated coastal plains, policies towards reforesting will decrease CH values. Regional plans proposing such a change need to consider the effects on CH. Consequently, another policy should be implemented simultaneously in order to create an alternative source of employment.

The following research will consist of exploring the meaning and validity of $C\hat{H}$ estimates in the region.

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B. Estimated Results of CĤ Variation for the region

In O'Higgins and Colchagua Provinces, the rural labour supply estimated from the census data of 1965 was 86,690 people. Using the theory to estimate the demand as previously discussed, the theoretical demand at the same time was only 50,601. For each province these figures break down into: TABLE 7

ESTIMATED	RESULTS OF	LABOUR SUPPLY AND	DEMAND I	FOR THE REGION	
Province	Supply (L _S)	Demand (L _d)	DF	RD	СН
O'Higgins	50,044	28,385	21,659	.43	1.8
Colchagua	36,646	22,216	14,430	.39	1.7
Region	86,690	50,601	36,089	.42	1.7

The CĤ figure 1.7 for the whole region means that there is an estimated rural supply of 36,089 (DF) people in excess of the theoretical demand required by agricultural activities and this figure represents 42% of the total supply (RD). In other words, 58% of the supply in the region can be absorbed by agricultural activities and 42% would be the theoretical unemployment rate.

At the provincial level,0'Higgins shows higher unemployment than Colchagua province. This situation exists, in spite of the fact that the land in O'Higgins province is more capable of supporting agricultural

·	СН	VARIATIONS			
Township	Labour	Labour Supply		Labour Demand	
	Ls	%	Ld	%	
					· · ·
Rancagua	3592	7	2454	9	1.46
Machali	1207	2	791	3	1.52
Graneros	3974	8	2934	10	1.35
S. F. Mostazal	1822	4	1241	4	1.46
Donihue	2392	5	605	2	3,95
Coltauco	3581	7	1832	7	1.95
Peumo	3928	8	2140	8	1.83
Las Cabras	3327	7	1750	6	1.90
San Vicente	7385	14	3635	13	2.03
Pichidegua	3269	6	1972	7	1.65
Rengo	4854	1	3428	12	1.41
Requinoa	2429	5	1955	7	1.24
01ivar	1792	3	920	3	1.94
Malloa	2761	6	1138	4	2.42
Coinco	1334	3	638	2	2.09
Q. Tilcoco	2396	5	952	3	2.51
TOTAL	50,043		28,385	100%	1.8
Tormahin	CĤ	VARIATIONS	Labour	Domand	CU
rownsnip		Labour Supply		Labour Demaild	
	L _s	%	L _d	%	· .
Dichilomu	1200	3	760		1 50
Nerrenu	1209	5	103	3	1.58
Nancagua	2027	15	1612	10	1.62
San Fernando	20/2	1	4015	18	1.41
Chinhamana	1542	12	2020	3	2.70
	4408	8	3230	10	1.38
	2778	2	1000	5	2.60
Pumanque	1089	15	397	2	2.74
Unepica	5032	ر ب	103/	8 -	2.73
LOIOL Demolill-	1100	. วุ	1054	5	1.55
	1108	່	1258	6	0.88
Santa Uruz	3046	ς Ο _. Ω	1000	8	1.82
	28/8	о ````	2452	10	1.17
Kosario	837	4 0	698	3	1.19
La Estrella	949	ר ב	506	2	1.87
raredones	1801	ر 	1111		1.62
TOTAL	36,646	100%	22,216	100%	1.7

TABLE 8 O'HIGGINS PROVINCE CH VARIATIONS

production. 22

At the township level, the $C\hat{H}$ estimates are as in Tables 8 and 9 on page 48. Between townships, the $C\hat{H}$ values show considerable variation. In O'Higgins province, Donihue township shows a $C\hat{H} = 3.95$ meaning an unemployment rate of 74% and in Requinoa township, $C\hat{H} = 1.24$ indicates an unemployment rate of only 29%. In Colchagua province, the CH fluctuations are slightly smaller: in Peralillo township $C\hat{H} = 0.88$ means that the labour supply is insufficient to meet the labour demand. On the other hand, in Pumanque township $C\hat{H} = 2.74$ represents a 63% unemployment rate.

To understand the meaning of the $C\hat{H}$ spatial distribution, it is necessary to find out how much can be explained by reference to: the land capability, the pattern of land use, the pattern of land tenure and the labour mobility. The CH variation should be treated with caution because of weaknesses in $C\hat{H}$ as an appropriate measuring tool. Some comments on this point are made at the end of this section. Now the spatial distribution of CH related to each of these variables will be analysed.

C. Analysis of the CH Variations

In order to analyse the CH variations and the capability of the land to support agricultural activities, irrigated and non-irrigated areas will be examined separately. There is a marked difference in the amount of capital investment between irrigated and non-irrigated land (e.g., dikes, pumps,

²²In O'Higgins province 91.7% of the total agricultural land corresponds to Class I to IV irrigated land. In Colchagua province this same group of soils embrace only 11.9% of the total area. Estudio Integrado de los Recursos Naturales: Provincias O'Higgins y Colchagua, IREN, Santiago, Chile 1973.

channels). Similarly techniques of production on irrigated land differ from those on non-irrigated lands. Therefore CH might be expected to vary according to whether the land is irrigated or non-irrigated.

The non-irrigated townships are located in Colchagua province. They are Pichilemu, Marchigue, Pumanque, Lolol, Rosario, La Estrella and Paredones. The remaining 25 townships will be treated as irrigated areas. In O'Higgins province, the agricultural activities are all found in the irrigated areas. In Colchagua province agricultural activities are located in the irrigated as well as in non-irrigated areas.

The average $C\hat{H}$ in irrigated and non-irrigated areas is similar (1.85 in irrigated areas and 1.89 in non-irrigated areas). The $C\hat{H}$ variance in irrigated townships (0.4242) is greater than the $C\hat{H}$ variance in nonirrigated townships (0.3589).

Looking at the \hat{CH} values for the two provinces, it must be remembered that O'Higgins province is irrigated and Colchagua province is partly irrigated.²⁴ Because of this, Colchagua province will be examined in order to discover whether the \hat{CH} for its irrigated areas is similar to that for O'Higgins province, and whether or not the non-irrigated areas in Colchagua differ from the irrigated areas.

²³In Colchagua province 83% of the total land is non-irrigated. Capacidad de Uso de la Tierra: Provincias de Atacama a Magallanes, IREN, Santiago, Chile 1973.

²⁴The non-irrigated areas in O'Higgins province are not considered here because they do not have agricultural capability. They are class VII and VIII, and are part of The Andean Range. Capacidad de Uso de la Tierra: Provincias de Atacama a Magallanes, IREN, Santiago, Chile 1973.

The average CH in the irrigated townships of Colchagua province is 1.70 and in O'Higgins province it is 1.92. The CH variance in both groups is very close; for irrigated townships in Colchagua province the CH variance is 0.4337 and for O'Higgins it is 0.4315. The slightly higher CH value in O'Higgins province is related to the presence of minifundio areas around the main cities.

Comparing the non-irrigated areas in Colchagua province with the irrigated areas, it can be noted that CH variance for the non-irrigated townships is 0.3589, lower than the figure found for the irrigated areas in Colchagua province (0.4337), and lower also than the variance for 0'Higgins province (0.4315).

It is confirmed that irrigated regions in O'Higgins and Colchagua provinces have a higher variance than in the non-irrigated townships. The CĤ average in irrigated areas is greater than in non-irrigated areas. Research will now be focussed on the analysis of the irrigated region, but before this, there will be a brief analysis of the non-irrigated regions.

In the non-irrigated townships, there are small variations; the CH values are about the same with the exception of Pumanque and Marchigue townships. An attempt will be made to summarize the general characteristics of these townships.²⁵ The non-irrigated townships have poor and badly eroded soils. For a larger part of the area the land capability is not suitable

²⁵ The analysis of the townships characteristics will be based on the thematic maps in *Estudio Integrado de los Recursos Naturales: Provincias de O'Higgins y Colchagua*, IREN, Santiago, Chile 1973.

for crops. Seventy-one per cent of the total land is included in Class V to VIII, the rest of the area presents soils rated as III and IV.²⁶ The land use consists mostly of natural grassland, bushlands and the rotation of annual crops, mainly wheat. Along seasonal streams there are some orchards and vineyards. With regard to land tenure, latifundios of more than 500 ha. prevail. Minifundios are found only in certain parts of the region, especially in Pumanque and Marchigue townships. These subsistence farms are located close to small rural towns and secondary roads. In summary, soil limitations and lack of water have determined a type of agriculture with homogenous characteristics, which explain the low CA. In this area, there are no significant variations in the size of holdings and in the mixed crops. The higher $C\hat{H}$ in Pumanque (2.74) and in Marchigue (2.70) townships, can be explained in part by the presence of "minifundios" which employ labour more intensively than implied by average production techniques used to estimate labour demand (L_d) . Hence the CH for Pumanque The low CH for the and Marchigue townships are probably overestimated. remaining townships can be explained by the fact that the region is an area of out-migration. It is difficult for surplus labour to remain on the latifundios: it tends to migrate to urban areas or to minifundios close to the cities. Now there will be further analysis of CH for the irrigated townships.

There is a high CĤ variation in the irrigated townships: the CH ranges from 0.88 to 3.95. In order to analyse these variations, the

²⁶These classes correspond to the U.S. Soil Conservation Service. This Land Capability Classification was adapted to Chile.

townships will be grouped according to the $C\hat{H}$ values into four categories (Figure 3, page 54). The first category groups the townships with $C\hat{H}$ less than 1.35. A $C\hat{H}$ of 1.35 implies an unemployment rate of 26%. The second category includes the townships with CH between 1.36 and 1.95; this refers to an estimated unemployment rate between 27% and 49%. The third category is comprised of the townships with $C\hat{H}$ 1.96 to 2.55, meaning an estimated unemployment rate between 50% and 61%. The last category groups the townships with $C\hat{H}$ more than 2.56, that is to say an unemployment rate higher than 62%.

The first category is made up of the lower CH values of the irrigated region, including Peralillo (0.88), Palmilla (1.17), Requinoa (1.24) and Graneros (1.35) townships. The land capability of these townships presents good conditions for agricultural activities, with the exception of Peralillo township where the soils are only fair. The four townships have soils included in Class I to IV. The land use consists mostly of crop rotations; the rotated crops are "chacra",²⁷ cereals, artificial grassland. Only some areas are devoted to permanent crops. In relation to land tenure, the type of holdings is made up of commercial farms and latifundios, the latter located especially in Peralillo townships. All these townships are in the Central Valley of Chile and possess a similar environment. They are not distant from the main cities of the region and the minifundio areas which surround the cities. Graneros and Requinoa

27 The term "chacra" refers to a specific type of mixed crop. The crops grown within the area of land generally include corn, potatoes, beans, squash, melon and watermelon.



townships, both in O'Higgins province, are in close proximity to one another and the Pan-American Highway cuts through them. Peralillo and Palmilla are neighbouring townships in Colchagua province. Land use in the four townships is similar. In Peralillo townships, land use differs slightly; crop rotation is almost the only agricultural activity, and part of the land is used as natural grasslands. The pattern of land tenure for these townships is homogenous, being made up of latifundios and commercial farms. In conclusion, the low CĤ in this category could be explained by the absence of minifundios. This affects the labour supply figure because population density is lower. The spatial distribution of labour supply is to a large degree a function of labour demand. The existence of commercial farms and latifundios imply the use of production techniques requiring less manpower. Consequently peasants have been leaving this area and moving to minifundios or urban centres. The latifundios and commercial farms require few permanent workers living on the holdings. Most workers are migrant peasants hired for season labour and living in the surrounding townships. The lower CH in Peralillo township could be explained by the number of latifundios found in the township and by the existence of abundant minifundios found in the neighbouring townships of Pumanque and Marchigue which supply seasonal labour.

The second category comprises the largest group of townships in the region. The townships included in this group are Chimbarongo (1.38), San Fernando (1.41), Rengo (1.41), S. F. Mostazal (1.46), Rancagua (1.46), Machali (1.52), Nancagua (1.62), Pichidegua (1.65), Santa Cruz (1.82), Peumo

(1.83), Las Cabras (1.90), Olivar (1.94) and Coltauco (1.95).

These townships have good soil capabilities and are mainly in classes I to III, without topographic limitations. The land use consists of orchards, crops in rotation ("chacra", cereals, artificial grass).²⁸ and grape vines; the latter are found in Nancagua township. Orchard cultivation is the major agricultural activity in these townships. This fact is true especially in Peumo, Rancagua, San Fernando and Olivar townships.²⁹ Regarding land tenure, commercial farms dominate in terms of area, but there are areas of minifundios close to the cities and along the rivers. ³⁰ Spatially, these townships are all located in the Central Valley of Chile. Most of them are placed along the International Pan-American Highway and those remaining have good connections by paved roads. In conclusion, there is a clear similarity in the environmental conditions of this group of townships. There is good soil capability, and land use focuses on orchard and grape production. Small-size holdings and commercial farms are spatially combined in each township. The CH values in this township, indicating unemployment of 27% to 49%, are influenced by the presence of minifundio areas which raise the labour supply estimated

28 Artifical grasslands in these townships are part of the rotation of crops and provide a basis for dairy farming activities. This activity requires a large amount of labour, which has been considered when calculating CĤ.

²⁹This area produces a large variety of fruits, such as one would find in California. Both places have a Mediterranean climate. Fruits grown in the township include apples, peaches, pears, plums, apricots, grapes, citrus fruits. Most are for export. In Peumo township, avocados are the principal product, due to a special microclimate found there.

³⁰The minifundios are generally located on the alluvial plains and have poor soils (made up of sand and stone), offering few agricultural prospects.

 (L_s) , as has been previously discussed. However, the pattern of land use balances the effect of minifundios. The land use stresses fruit production, which requires a large amount of manpower on a seasonal basis. This increases L_d but also increases the peak seasonal demand relative to offpeak demand. The peak season labour comes from the minifundios and resides on the minifundios during the off-peak periods. Even though the techniques of production on the commercial farms tend to be efficient, the amount of activities needed for fruit production maintains high L_d values. The overall result for townships in this category is a CH slightly below the average for the thirty-two townships studied.

The third category includes the townships of San Vicente (2.03), Coinco (2.09), Malloa (2.42) and Q. Tilcoco (2.51), all in O'Higgins province. The capability of the land is extremely good and almost any kind of crop can be grown. There is a predominance of land class II. The land use consists of the rotation of crops - "chacra", cereals, grassland. In addition, there are some areas devoted to natural grasslands and only a few areas are used for orchards and grape vines. In Coinco township, poplar forests are found; these trees supplement industry nearby in Rengo townships. Regarding land tenure, there are minifundios, latifundios and only a few commercial farms. In San Vicente township, latifundios prevail and in Coinco township, minifundios prevail. These townships are distants from urban centers and major highways, secondary roads provide communication. Better transportation facilities would probably promote the formation of commercial farms. In conclusion, the high CH for this group can be explained by the minifundio-latifundio pattern. The type of extensive agriculture prevailing in latifundios (in spite of the good land capability),

do not require large amounts of labour. There are no agricultural activities here, that employ much manpower such as fruit production. Besides this, minifundios raise the labour supply figure (L_c) .

The fourth category involves the townships with higher CH values of irrigated region. They are Placilla (2.60) and Chepica (2.73) in Colchagua province and Donihue (3.95) in O'Higgins province. These townships have above average soil conditions, with predominance in class II to IV. The land use consists, in large part, of crop rotation and natural grassland. There are only some areas of orchards and vineyard. The pattern of land tenure consists in minifundios, latifundios and commercial farms. This category of townships involves a large number of minifundios. Donihue is a small townships consisting almost completely of minifundios located along the Cachapoal river. In the north of this township, some latifundios are found in natural grassland. In Placilla township, there are minifundios, commercial farmers and latifundios. In this township, the land use in minifundios consists in subsistence crops in rotation, in commercial farms, grape vines abound; and in latifundios where the soil is poorer, the land is used for grazing. Chepica township has minifundios, commercial farms and latifundios. The land use in this township is almost the same, consisting in crop rotation and in natural grassland with the exception of commercial farms where some orchards are grown. These three townships are located in the Central Valley of Chile close to the main cities of the region; they are situated near the main North-South axis of road transportation in Chile.

The high CĤ figure in this group can be explained by the presence of the large number of minifundios which is a common characteristic of the

three townships and by the absence of intensive crops, such as fruits and grapes which require more labour. In these townships, the minifundios are almost always located close to the towns, or around the few commercial farms. The township with the highest $C\hat{H}$, Donihue (3.95) is all mini-fundios and is located close to the main city of the region, Rancagua, close to the commercial farms and the river, and close to the central highway.

In summary, the spatial distribution of $C\hat{H}$ is related to the irrigation possibilities. In non-irrigated areas, $C\hat{H}$ is lower; in irrigated areas, $C\hat{H}$ is higher. This seems paradoxical but this is due to the fact that the labour supply migrates to the irrigated areas, and resides mainly on the minifundios and in the cities.³¹ Thus, the labour supply residing on the minifundios in the irrigated areas, causes the supply to be greater than the demand. The higher variance of $C\hat{H}$ in the irrigated areas is a reflection of the mixture of types of holdings; minifundios, commercial farms and latifundios.

Land tenure is an important factor influencing the CĤ distribution. In minifundio areas, CĤ is higher than that in latifundio areas. The areas where commercial farms prevail show medium CĤ figures. In these three types of holdings, the major factor which influences the CĤ figure is the existence of an itinerant labour supply: the primary movement is from the

³¹Some migrant peasants move to the irrigated areas within the region and some move to Santiago province where the capital city is found. For Colchagua province, census data of 1970 gives an emigration rate of 6% per year and for O'Higgins province (including urban centres), a rate of 1.6%. The population growth rate in Colchagua province (0.61) is much lower than the national average (1.9). Estudio Integrado de los Recursos Naturales: Provincias de O'Higgins y Colchagua, IREN, Santiago, Chile 1973, pp.254.

minifundios to the commercial farms and less so from the minifundios to the latifundios. Both these forms of movement are on a daily or seasonal basis; however, there is also a movement that is more permanent namely, from the latifundios to minifundios. This more permanent type of movement brings about an increase in the CĤ figure in the minifundios and a decrease in the CĤ figure in the latifundios.

This pattern of movement is in fact a series of interrelated causes and effects: the three types of holdings are not isolated units but are inseparably linked one to another. The labour demand is the main cog in the labour supply distribution and therefore in the $C\hat{H}$ rate. For example one must not assume that the removal of minifundios would "solve" the unemployment problem suggested by the high $C\hat{H}$ figures.

To sum up simply then: the labour demand is determined by the land use and land use is determined by land capability; land tenure; and as the analysis suggests, accessibility to markets. The third category townships with a high CĤ (2.26) are located on good land. The land is held mainly by "latifundistas" and is underutilized relative to its potential. There are also poor transportation links to markets. It would appear that land tenure is a significant factor in determining land use and labour absorption. It would require further study to determine the relative importance of land tenure and market accessibility as determining factors for land use. It would also require further study to understand the relationship between land tenure and the development of transportation systems.

In the conclusion to the paper the importance of these points in planning for increased labour absorption and increased agricultural output will be discussed.

VI. CONCLUSIONS

Increased rural employment and increased agricultural output constitute important elements in rural development in Chile. Massive rural to urban emigration and the dependency on imported foodstuffs constitute serious problems confronting the Chilean economy. This study has analyzed the role of land capability, land use, and land tenure in the absorption of labour and explored the usefulness of one measure of surplus labour, the CH coefficient, as a planning tool. In this last section, the adequacy of CH as a planning tool is explored and the implications of the analysis for rural planning, labour absorption, and increased production are discussed.

The analysis of the $C\hat{H}$ distribution within the region indicated that the spatial allocation of labour supply is a function of labour demand and of labour mobility. As a result of the analysis of the $C\hat{H}$ spatial distribution within the region, it would appear that the $C\hat{H}$ bias is not as relevant as it had been assumed and that the labour mobility related to the land tenure system is an important factor to be considered when analyzing rural employment.

There is a degree of bias in the labour demand estimated within the region. The labour demand estimated corresponds to an average of the data for each type of holding (minifundio, latifundio and commercial farms) in each township. For minifundios, because these subsistence farms employ larger amounts of labour than the average estimated, L_d^{\uparrow}

underestimated the true L_d . For commercial farms, the L_d bias is uncertain, but it is known that in the majority of cases within the region, the labour requirement is greater than for latifundios. The apparent reason for this fact is the intensive labour activities that fruit production involves. It cannot be established if L_d is less than or greater than the true L_d for latifundios; therefore the sign of the CĤ bias for these type of holdings is unknown. A more detailed study of L_d as a function of land capability, land tenure, crop mix and agricultural output is suggested since rural development policies will change the mix of land tenure, land use, and techniques of production.

To evaluate the \widehat{CH} bias for a region is difficult because of the mixture of types of holdings and because some holdings are not pure subsistence minifundios or pure commercial farms. What is usually found is a mixture of farm types especially within the large farms. To estimate \widehat{CH} for each type of holding, data would have to be calculated separately. Given the \widehat{CH} results, the best possibility for planners would be to assume overestimated values for areas where minifundios prevail and underestimated values for latifundio areas. For commercial farm areas, the direction of the \widehat{CH} bias is more uncertain.

Any government policy to restructure the land tenure system, or any unplanned innovations in the holding arrangements will directly affect the L_d values in the region. Changes in shifting the latifundios towards commercial farming present two possibilities: if the land could be used more intensively, the L_d values will increase and if the changes involves more capital intensive techniques, the L_d values might decrease. One theoretical implication of the analysis is that attempts to make minifundios more like commercial farms would have two possible results: the land could be used less intensively; and probably with more capital intensive techniques. In both cases, the results will be decreased L_d values leading to less employment. Reforms may have to be linked with complementary policies directed at alternative and seasonal employment.

Although the overall CĤ for a region and for each township gives a rough idea of the extent of surplus labour, CĤ probably overestimates surplus labour on minifundios because it fails to recognize the employment maximizing aspect of this type of holding. Also, CĤ does not deal with the daily and seasonal mobility of labour off the minifundio. Labour absorption policies which change labour demand by changing the type of holding, the land use, or the technique of production must take explicit account of the effects of such changes on regional migration and on short term labour mobility.

Analysis of CH distribution in the townships showed that in most cases land use and production techniques utilized in the region are not those best suited to meet the goals of increased agriucltural output and labour employment. Often the best land in the township is underutilized, in the production of extensive crops, such as wheat. This fact is evident in the third category townships of San Vicente, Mallao, Q. Tilcoco and Coinco where the pattern of land tenure and transportation links appear to play a strong role in determining land use and the techniques of production.

In relation to rural employment, it has been found that the relationship between labour demand and labour supply is such that the spatial distribution of the labour supply is dependent on the location of labour demand. Permanent and seasonal migration play an important role in determining the spatial distribution of the supply of labour. Without considering the techniques of production or the pattern of land tenure, the labour demand would only be a function of the land capability and the land-use structure in the region. However, differences in production techniques as well as differences in the intensity of land use according to the land tenure system imply large variations in the amount of labour required. In such circumstances, the labour supply tends to move. The analysis suggests that the spatial supply of labour responds to employment opportunities in both the rural and urban sectors and to the ability of the minifundios to "hold" the surplus labour. This suggests that policy directed at increasing rural employment and agricultural output must pay particular attention to labour migration behaviour.

In addition to natural conditions, types of soils and crop mix, land tenure is an important factor affecting agricultural output, labour absorption and the location of labour supply. The land tenure pattern in the region (minifundios, commercial farms and latifundios) constitutes an associated phenomena linked by labour supply which moves from one types of holding to another. The minifundios make up a manpower reservoir of peasants for commercial farms and latifundios, and as well supply labour for employment in nearby cities. Because these three types of holdings are interrelated, through the labour market, any changes in one, such as in the crop mix, pattern of land tenure, or in the techniques of production,
will have effects on the other two, in terms of the amount of labour available, the price of labour, and agricultural output.

The analysis further suggests that the minifundios are a symptom of problems in the rural sector. Their high CĤ's and low average labour productivity are not primary problems which can be attacked directly in isolation from other rural development policies. Any policy directed at reducing labour supply on the minifundios with the aim of increased average productivity carried out in the absence of policies directed at the structure and effects of the existing system of land tenure, would result in further problems regarding displaced labour and probably fail to reduce the minifundios in any event.

Policies directed at shifting minifundios towards commercial farms would result in increasing both the productivity per worker and the surplus labour, but reduce the total amount of labour demand and possibly lower the total output. Policies to shift latifundios towards commercial farms would increase the productivity per worker and the total output. It is not known if labour demand would decrease or increase, but the analysis of the region suggests a tendency towards an increase.

The fact that land use, land tenure and the techniques of production are taken as given in the estimation of $C\hat{H}$, indicates that $C\hat{H}$ is an inadequate tool for planning. Since these three factors are interdependent, changes in one are likely to affect changes in the other two. Planning estimates of the change in L_d^2 , and hence $C\hat{H}$, resulting from policies intended to alter land use, techniques of production, or type of holding would not. ... reflect associated changes in the other two factors. This suggests that $C\hat{H}$ has serious shortcomings as a planning tool. A more adequate approach

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would be to couple the calculation of $C\hat{H}$ with an analysis of the specific relationship between the pattern of land use, the choice of technique of production, and the mixture of land holdings. This would allow the planners to measure the total effect of policies on L_d and CH.

To increase rural employment in the region, the degree of flexibility in the crop mix towards a more intensive use of the land, requires further study. The extreme seasonal variations of employment indicate that an analysis of peak seasonal demand is an important point to be considered. The seasonal employment coefficient proposed in this paper can be used in conjunction with $C\hat{H}$ and labour mobility information.

This study also suggests that accessibility to markets is an important factor influencing L_d and land use. The expansion of a rural market is proposed as an important policy in addition to more closely linking rural output with urban and international markets. One way to develop rural markets would be to promote industry in the rural sector.

The creation of rural industries based on the processing of agricultural products and on the production of agricultural inputs would be beneficial on several grounds. Such activities would distribute the spatial effects of development, would promote the creation of nonagricultural jobs in the rural sector, would have both forward and backward linkage effects with agriculture. They would increase rural labour absorption, and produce those inputs necessary for increasing the productivity of agricultural activity. The location of agriculture related activities in the rural sector will cause more of the multiplier effects of such activity to be retained in the rural sector. Expanded markets, increased food processing, and improved access to distant markets would allow greater land use specialization according to land capability and would generate the benefits of specialization and economies of scale.

In conclusion, it has been found that aggregate estimates of surplus labour, such as CH, are of limited use for planning purposes. However, CH provides a first approach to the problem of the regional capacity to absorb labour. The spatial supply of labour is a function of the location of labour demand. Labour demand is in turn heavily dependent upon the system of land tenure and accessibility to produce markets. Further research on labour absorption in the rural sector should pay particular attention to the role of market access, land tenure systems, and labour mobility as well as the role of the traditional factors of land capability, land use, and techniques of production.

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