CENTER OF ECONOMIC RESEARCH

LECTURE SERIES

8.

LABOR SHORTAGES IN GREEK AGRICULTURE, 1963-1973

By

ADAM A. PEPELASIS

ATHENS, GREECE

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Deputy Governor of the
Agricultural Bank of Greece

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This publication is a part of a research monograph soon to appear under the title

Labor Requirements in Greek Agriculture, 1963 – 1973

Printed in Greece
by
CONTOS PRESS Co.

ACKNOWLEDGEMENTS

I wish to express my appreciation to the Center team which worked on the project.

Dr. James Thomas, and Dr. Anna Kokkova helped me a great deal with the work of projecting labor potential and with many valuable suggestions.

Messrs. Andreas Kintis, Christos Paraskevopoulos, and Kyprianos Prodromides, all junior economists at the Center, offered assistance substantially beyond that which is usually given by young research assistants. I could not possibly have undertaken this research without their conscientious and enthusiastic assistance.

I must also acknowledge the contribution of professors George Break, George Coutsoumaris, and Pan. A. Yotopoulos, who discussed with me various aspects of the project.

Special thanks are due to N. Avramopoulos, N. Xanthakis, and G. Papastamelos, who served as technical consultants on various points.

ADAM. A. PEPELASIS

THE CENTER OF ECONOMIC RESEARCH

The Center of Economic Research in Greece was established in 1961 in the expectation that it would fulfill three functions: (1) Basic research on the structure and behavior of the Greek economy, (2) scientific programming of resource allocation for economic development, and (3) technical-economic training of personnel for key positions in government and industry. Its financial resources have been contributed by the Greek Government, the United States Mission in Greece and the Ford and Rockefeller Foundations. The University of California at Berkeley participates in the process of selection of scholars who join the Center's staff on an annual basis. It also participates in a fellowship program which supports research in Greece by American graduate students, as well as studies by Greek students for advanced work in economics in American Universities.

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are published in a Research Monograph Series.

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The ultimate aim is eminently practical: to help in creating a better life for the Greek people.

ANDREAS G. PAPANDREOU, Director

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LABOR SHORTAGES IN GREEK AGRICULTURE, 1963-1973

LABOR SHORTAGES IN GREEK AGRICULTURE, 1963–1973[1]

I

THE PROBLEM

The Greek economy has performed reasonably well during the last decade, growing at an average annual rate of about 6% in terms of G.N.P. Yet this recent economic progress should not conceal the fact that the structure of the economy has not been altered sufficiently and that further growth can hardly be self-generating. The issues to be tackled in the next decade are different in kind and complexity from the problems of the 1950's. The crucial difference is between planning for growth within a small national market and planning for de-

1. This is a summary of the key findings of a research project on labor in Greek Agriculture for the period 1963-1973. A detailed account of the procedures employed, the findings, and their policy implications will be published in the Monograph Series of the Center. This research project is an extension of Monograph No. 2 titled Surplus Labor in Greek Agriculture, 1953-1960 (Athens: Center of Economic Research, 1962).

velopment on a continental scale. The twin impulses of a traditional policy, to expand productive activity and reduce imports, can no longer be the basis for industrialization. After the association of Greece with the Common Market, this development must be sought within a larger market in which Greece must pursue and create its comparative advantages.

The difficulties Greece will have to face in the next decade may become further complicated by changes which presently are occurring in its labor force. At least three recent developments lend significant interest to an investigation of the Greek labor problem. First, the association of Greece with the European Common Market may be expected to make labor movements freer between national economies of wide wage differentials and of high and low employment opportunities. Such labor movements, at least in the short run, may in some ways create additional obstacles to planned regional economic development. A pinch on the agricultural labor supply is already being felt on the farms. Second, Greek emigration has reached an all time high level and is likely to continue at the same pace. Emigration has now outstripped the growth of population. And third, official economic policy has

emphasized the necessity for a more rapid growth of the industrial sector. Industrial development, however, will depend partly upon the availability of labor surpluses and their transferability from one sector to another.

In an empirical investigation conducted at the Center of Economic Research in 1962 it was found that a removable agricultural labor surplus, defined as labor available over and above the peak season actual employment, has not existed since 1955.[2] In 1953 and 1954 the surplus amounted to 3.5% and 2.3% of agricultural labor respectively—or to some 90,000 and 60,000 persons. But starting in 1955 this removable surplus was absorbed mainly outside agriculture through an increasing outflow of population from rural areas to Athens and abroad. In 1955 the outflow of active agricultural population was just about equal to the size of the labor shortages. In other words, if it had not been for emigration, an equilibrium would have been approximated in terms of the peak-season demand for and supply of agricultural labor. Ever since then Greek agricul-

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2. Adam A. Pepelasis and Pan. A. Yotopoulos, Surplus Labor in Greek Agriculture, 1953-1960 (Athens: Center of Economic Research, 1962). Also Adam A. Pepelasis, « Seasonal Shortage of Labor in Greek Agriculture, 1961-1962, » Economicos Tachydromos, May 2, 1963.

ture has consistently experienced rising, although erratic, labor shortages during both peak seasons. The Labor Diagram (Table 1) shows that, for the last two years of the period studied (1953-1962), labor shortages became more pronounced, climbing from 2.6% in 1960

TABLE 1. Chronic Labor Surplus and Labo
In Thousands of Ma

	1953	1954	1955	1956
1. Labor Available before Labor Outflow	85,837.1	86,174.3	86,454.2	86,601.
2. Labor Available after Labor Outflow	83,452.4	83,789.6	84,069.5	84,216.
3. Labor Required	80,567.9	81,867.1	86,565.8	87,414.
4. Excess Labor before Labor Outflow	5,269.2	4,307.2	-111.6	-813.
5. Excess Labor after Labor Outflow	2,884.5	1,922.6	-2,496.3	-3,197.
6. Rate of Chronic Surplus Labor (before Labor Outflow) (4/1)	6.1	5.0	-0.1	-0.
7. Rate of Chronic Surplus Labor ..... (5/2)	3.5	2.3	-3.0	-3.
8. Rate of Labor Already Removed ..... (6-7)	2.6	2.7	2.9	2

Note: Computations based on the peak employment season (spring) f
all years of the series.
Emigrating labor has a different age distribution from total ag

(some 65,000 workers) to about 11% in 1961 (approximately 200,000 workers). The shift from removable surpluses to shortages was attributable mainly to two factors: first, the persistent movement of the agricultural population from the countryside into the cities (between

Outflow from the Agricultural Sector, 1953 - 1962
Productive Days (MPDs).

1957	1958	1959	1960	1961	1962
86,715.3	86,857.9	87,009.5	87,077.7	87,215.5	86,868.0
84,330.6	84,473.2	84,624.8	84,693.0	84,782.6	84,435.1
90,887.3	88,236.7	89,271.5	86,914.5	94,130.0	91,422.0
-4,172.0	-1,378.8	-2,262.0	163.2	-6,914.5	-4,554.0
-6,556.7	-3,763.5	-4,646.7	-2,221.5	-9,347.4	-6,986.9
-4.8	-1.6	-2.6	0.2	-7.9	-5.2
-7.8	-4.5	-5.5	-2.6	-11.0	-8.3
3.0	2.9	2.9	2.8	3.1	3.1

cultural labor. Equal numbers of MPDs from the emigrating labor group and from the total agricultural labor group, when transformed into equivalent labor units (e.g., persons), give different results.

1953 and 1962 about half a million persons) and, second, the rise in labor requirements resulting from a more intensive crop-mix, increased acreage, and higher yields.

The labor shortages observed, although constantly growing, have not yet become alarming, because they can still be offset by an elastic supply of effort and by the substitution of capital for labor, for example by speeding up the mechanization of certain agricultural activities. One such case is the current introduction of small-size tractors for ploughing vineyards in regions where labor is both scarce and relatively expensive during the peak season. Futhermore, the absence of labor shortages does not necessarily imply an ideal situation. On the contrary, in regions where productivity and incomes are low, reallocation of labor, even at the expense of labor requirements during the peak season, to more productive employment is a movement in the right direction for the economy as a whole, even if regional agricultural output falls.

In view of the serious policy implications of these historical findings, it was decided to attempt a look into the future conditions in the agricultural labor market. A series of projections, covering the decade 1963-1973, was therefore undertaken, although it was recog-

nized that they would be subject to a number of limitations on account of the lack of statistical data on Greek agriculture. The main objective of this new study was to estimate, under alternative assumptions affecting the supply of labor and labor requirements, the annual and the seasonal surplus or shortage of labor for 1968, 1970 and 1973.

The concept of surplus labor used in making these forecasts is the same as that used in the earlier study, Surplus Labor in Greek Agriculture, 1953-1960—i.e., the volume of removable labor for at least a complete year without any reduction in output. Apart from any limitations imposed by the nature of Greek statistical data, admittedly this concept of surplus labor is of limited usefulness as a basis for overall policy decisions. It overlooks efficiency considerations, as there is no reason why the maintenance of agricultural output should be used as a criterion in allocating resources among productive activities. From the standpoint of optimum allocation the question ought to be whether resources used in agriculture earn as much at the margin as they could earn in alternative employment. If they do not, an efficient reallocation would lead to increased output. To put it differently, surplus labor would then be regarded as labor which earns

less in agriculture than in alternative activities; that is to say, that there exist workers who are tied up in work which is less remunerative than existing alternatives on the labor market.

On the other hand, our objective here is not to come up with a plan for agricultural development within an overall national economic plan. It is merely to indicate roughly the magnitudes of labor available and of labor required, on the basis of what agriculture may reasonably be expected to look like in the next few years. For such a task, the concept of surplus labor as defined earlier will perhaps be reasonably operational.

In what follows we shall first outline the methods used to estimate labor potential and labor requirements for the period 1963-1973 and then derive estimates of annual and seasonal labor shortages for 1968, 1970, and 1973.

II

LABOR POTENTIAL IN AGRICULTURE, 1963 - 1973

It is worth noting at the outset that the size of the work force committed to agriculture is not readily measurable and that data referring to such measurements are not easily comparable over time and between countries. Dual employment in agriculture and in other activities is common, and many farmers move out of agriculture into employment in other industries gradually and without changing their residence. Dually employed persons move into and out of agriculture more often than is indicated by census data.[3]

Lack of relevant official data makes our projection of labor potential a difficult task that can be carried out only through utilization of imaginative detective methods. Although it is possible to make reasonable alternative assumptions about the birth, death, and net emigration rates for the whole population,

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3. See O.E.C.D.'s working document on Problems of Manpower in Agriculture by F. Dorving (Paris, Nov. 1963), p. 3.

it is not possible at this stage to examine whether there are many significant differences between the demographic characteristics of the agricultural and those of the nonagricultural sections which should be taken into account. Furthermore, there are no data on internal migration, and particularly on how this affects the agricultural population, nor are there figures for the degree to which members of the agricultural population have changed occupations without migrating.

A further note of caution is in order here. The various coefficients used in the early study of surplus labor were based on data derived from the population censuses of 1951, 1960, and 1961 and may thus represent some of the demographic developments which took place during the period, but since the data were generally derived indirectly from the official statistics it is not possible to say how closely they reflect actual movements. A number of the projections for 1963 - 1973 were based on some of our previous coefficients. The statistical techniques used were simple ones in that where variables showed no evidence of trend, the average value for 1953 - 1962 was used, and where there was evidence of a trend during the period 1953-1962 this trend was incorporated into the projection by extrapolating the vari-

able linearly according to the average annual rate of change during the period.

These projections could very well be in error to the extent that either (1) our data derived indirectly in the early study did not represent the actual behavior of the variables concerned or (2) our linear projections failed to include new trends which may have developed in the latter years of the period 1953-1962.

Finally, owing to the complex way in which the projections were built up it was not possible to apply statistical theory to the estimates to calculate confidence intervals which would give the probability of true values lying within certain limits. The alternative was to consider a series of different assumptions and see how these modify the projections, but this was done only for the assumptions relating to birth, death, and net emigration rates for the total population.

The first step in our projections of labor available was to estimate the total active male and female population in agriculture. These estimates were based on official population data. Total active population was then converted into the labor potential in agriculture. The conversion factors employed were those used in the earlier study on Surplus Labor in Greek Agriculture, 1953-1960.

For the years up to 1961, the mid-year estimates of total population were based directly upon the census reports and data contained in the Statistical Yearbooks. For the ensuing period, our labor projections were made for three bench-mark years, namely, 1968, 1970, and 1973. For those years, we played with three alternative assumptions with respect to birth, death, and net emigration rates, as they appeared in Professor Papandreou's A Strategy for Greek Economic Development;[4] they are shown below in Table 2.

TABLE 2

Alternative Assumptions for Birth, Death, and Net Emigration Rates.

	Birth Rate	Death Rate	Net Emigration Rate*
Projection I	1.9%	0.7%	0.3%
Projection II	1.9%	0.8%	0.4%
Projection III	1.9%	0.8%	0.6%

* Preliminary evidence from a migration study now being carried out at the Center of Economic Research suggests that our maximum net emigration rate may be underestimated by at least 100%.

As an example, the estimate of the total population in 1964 is 8,596,937. Given this figure,

4. Andreas G. Papandreou, A Strategy for Greek Economic Development (Athens: Center of Economic Research, 1962), p. 94.

a birth rate of 1.9% gives 163,342 births; a death rate of 0.7% gives 60,179 deaths; and a net emigration rate of 0.3% gives 25,791 emigrants for 1964. The population estimate for 1965 is obtained by adding the births and subtracting the deaths and number of emigrants from the 1964 total. Thus the total population in 1965 is 8,674,309.

Then the annual distribution of males and females was estimated in five-year age groups as percentages of total population for 1955-1960. Similarly, the number of deaths and the number of emigrants were estimated by five-year age groups for both sexes as percentages of total deaths and total emigration. Using these estimates, the death and emigration rates for males and females in the age groups 6-60, 7-61, 8-62, 9-63, 10-64, 11-65, 12-66, 13-67, 14-68 were derived by interpolation between the averages for the period 1955-1960 for the age groups 5-59, 10-64, and 15-69.[5]

5. To obtain the number of males aged 15 to 69 in 1968, for example, we began with the number of males aged 5-59 in 1958. The number of males in this group who died or emigrated was subtracted to give the total of males 5 to 59 surviving at the end of 1958. This group became the age group 6 to 60 in 1959, and for that year the number of males 6 to 60 who died or emigrated was subtracted to give the number of survivors who would form the group 7-61 in 1960. This process was continued through 1968, and the final figure obtained gives the total number of males aged 15 to 69 in 1968. The computation for females was carried out similarly.

TABLE 3. Total Active Population, Active Agricultural Population,

	1953	1954	1955
1. Total Population (all ages)	7,817,095	7,893,412	7,965,53
2. Males, Aged 15-69			
3. Females, Aged 15-69			
4. Total Active Agricultural Population 15-59	2,498,335	2,504,659	2,513,35
5. Male Active Agricultural Population 15-69	1,888,844	1,193,208	1,196,28
6. Female Active Agricultural Population 15-69	1,309,491	1,311,451	1,317,07
7. Total Labor Potential in Agriculture 15-69	1,611,908	1,617,410	1,622,78
8. Male Labor Potential in Agriculture 15-69	1,054,970	1,059,233	1,062,12
9. Female Labor Potential in Agriculture 15-69	556,938	558,177	560,66
10. Total Active Agricultural Population. % of Total Active Population	31.96%	31.73%	31.55%
11. Male Active Agricultural Population. % of Total Active Population			
12. Female Active Agricultural Population. % of Total Active Population			
13. Total Labor Potential in Agriculture. % of Total Active Agricultural Population	64.52%	64.58%	64.67%
14. Male Labor Potential in Agriculture. % of Male Active Agricultural Population	88.74%	88.77%	88.79%
15. Female Labor Potential in Agriculture. % of Female Active Agricultural Population	42.53%	42.56%	42.57%

and Labor Potential in Agriculture, 1953-1960.

1956	1957	1958	1959	1960	Average Annual Rate of Change
8,031,013	8,096,218	8,173,129	8,258,162	8,327,405	
2,667,962	2,681,424	2,701,557	2,731,307	2,755,915	
2,878,917	2,895,035	2,912,787	2,937,131	2,964,447	
2,513,548	2,517,468	2,519,330	2,519,209	2,521,170	
1,197,870	1,197,492	1,198,885	1,199,578	1,198,952	
1,315,678	1,319,976	1,320,455	1,319,631	1,322,218	
1,624,554	1,626,476	1,628,351	1,629,883	1,630,805	
1,063,921	1,063,914	1,065,541	1,066,813	1,066,584	
560,633	562,562	562,810	563,070	564,221	
31.30%	31.09%	30.82%	30.51%	30.28%	−0.24
44.90%	44.66%	44.38%	43.92%	43.50%	−0.34
45.70%	45.59%	45.33%	44.93%	44.60%	−0.27
64.63%	64.61%	64.63%	64.70%	64.68%	
88.82%	88.85%	88.88%	88.93%	88.96%	+0.03
42.12%	42.19%	42.22%	42.67%	42.67%	

TABLE 4. Labor Potential,

Labor Potential in Agriculture	1953	1954	1955	1956
Males	1,054,970	1,059,233	1,062,120	1,063,921
15 — 19	13.70	13.53	13.37	13.21
20 — 64	82.50	82.67	82.70	82.87
65 — 69	3.80	3.79	3.93	3.92
Females	556,938	558,177	560,669	560,633
15 — 19	12.70	12.44	12.14	11.77
20 — 64	84.58	84.84	85.06	85.43
65 — 69	2.72	2.72	2.80	2.80

	1961	1962	1963	1964	1965	1966
Males						
15 — 19	12.32	12.15	11.98	11.81	11.64	11.47
20 — 64	83.76	83.92	84.08	84.24	84.40	84.56
65 — 69	3.92	3.93	3.94	3.95	3.96	3.97
Females						
15 — 19	10.24	9.93	9.62	9.31	9.00	8.69
20 — 64	86.66	86.92	87.18	87.44	87.70	87.96
65 — 69	3.10	3.15	3.20	3.25	3.30	3.35

The second stage in our projections was to convert the estimated population in the age group 15 to 69, in 1968, 1970, and 1973, into estimates of active agricultural population, which finally were converted into an estimate of the agricultural labor potential. The coefficients of conversion were derived from data covering the period 1956-1960. The basic data

1953-1973, by age groups (%).

1957	1958	1959	1960	Average Change
1,063,914	1,065,541	1,066,813	1,066,584	
13.10	12.91	12.63	12.49	−.17
83.00	83.18	83.46	83.60	+.16
3.92	3.91	3.91	3.91	+.01
562,562	562,810	563,070	564,221	
11.48	11.21	10.82	10.55	−.31
85.64	85.82	86.21	86.40	+.26
2.88	2.97	2.97	3.05	+.05

1967	1968	1969	1970	1971	1972	1973
11.30	11.13	10.96	10.79	10.62	10.45	10.28
84.72	84.88	85.04	85.20	85.36	85.52	85.68
3.98	3.99	4.00	4.01	4.02	4.03	4.04
8.38	8.07	7.76	7.45	7.14	6.83	6.52
88.22	88.48	88.74	89.00	89.26	89.52	89.78
3.40	3.45	3.50	3.55	3.60	3.65	3.70

for the construction of the coefficients are given in Table 3. Rows 10 to 12 give the male, female, and total population active in agriculture, expressed as percentages of corresponding segments of the active Greek population. In rows 13 to 15 these divisions of the agricultural labor potential are expressed as percentages of the corresponding totals active in agriculture. These

two sets of percentages were adjusted for trends and then combined with our estimates of the projected total active Greek population for 1963-1973.

With respect to the percentages in rows 10 to 12, it was found that this series showed a downward trend for 1956-1960. The annual rate of change was used to adjust the percentages which were projected for 1961-1973. The series for total and for female labor potential expressed as percentages of the corresponding active agricultural population showed no evidence of a trend over 1956 - 1960, whereas the series for the percentage of male labor potential in the active male population showed a slight upward trend, so that an annual rate of change of 0.03 was used to adjust the percentage for 1961-1973. The adjusted series of percentages for 1961-1973 is given in Table 4 above. These percentages were used to convert the male, female, and total active population into their respective divisions of the active agricultural population, which was then converted into its labor potential for 1968, 1970 and 1973. Thus, for example, the active agricultural male population in 1968 was estimated to be 1,191,531. From Table 5 we find that the projection of male labor potential as a percentage of male population active in agricul-

ture is 89.20%. Combining these two figures gives an estimate of 1,062,846 for male labor potential in agriculture in 1968.

Finally, the derived labor potential is converted into man productive units and man productive days. This involves breaking down the estimates for the male and female labor potential aged 15 to 69 into three sub-groups, namely, those aged 15 to 19, 20 to 64, and 65 to 69. Labor potential in the age group 15 to 19 was found to be declining as a percentage of total labor potential over the period 1953-1962, whereas the percentages in the age groups 20-64 and 65-69 showed a rising trend. The average annual rates of change for 1953-1962 were calculated and used to construct a set of percentage coefficients for 1963-1973. These were estimated by linear extrapolation, starting with the percentages which obtained in 1960 and assuming that the annual rates of change for 1963-1973 would be equal to those observed during the period 1953-1962.

The lower part of Table 4 gives these projections for 1963-1973. The coefficients from this table were used as follows: In Tables 5 through 7 we have the estimates of the male and female labor potential aged 15 to 69. These are then broken down into labor potential in the age groups 15 to 19, 20 to 64, and 65 to

TABLE 5

Labor Potential in Agriculture, 1961, 1968, 1970, 1973.

Birth Rate	1.9%
Death Rate	.7%
Emigration Rate	.3%

	Total Number	% Coeffi-cient	Active in Agriculture	% Coeffi-cient	Labor Potential in Agriculture	Labor Potential by age group		MPUs	MPDs (1,000)
						15 — 19	130,439	91,307	23,283.3
Males in 1961 (15-69)	2,756,600*	43,16	1,189,749	88.99	1,058,758	20 — 64	886,816	886,816	226,138.1
						65 — 69	41,503	29,052	7,408.3
						15 — 19	56,514	33,908	8,646.5
Females in 1961 (15-69)	2,933,500*	44.33	1,300,420	42.44	551,898	20 — 64	478,275	334,792	85,372.0
						65 — 69	17,109	10,265	2,617.6
Total					1,610,656			1,386,140	353,465.8
						15 — 19	118,295	82,807	21,115.8
Males in 1968 (15-69)	2,921,851	40.78	1,191,531	89.20	1,062,846	20 — 64	902,144	902,144	230,046.7
						65 — 69	42,707	29,685	7,569.7

						15 — 19	45,647	27,388	6,983.9
Females in 1968 (15-69)	3,140,416	42.44	1,332,792	42.44	565,637	20 — 64	500,476	350,333	89,334.9
						65 — 69	19,514	11,708	2,985.5
Total					1,628,483			1,404,065	358,036.5
						15 — 19	112,272	78,590	20,040.5
Males in 1970 (15-69)	2,953,559	40.10	1,184,377	89.26	1,057,175	20 — 64	902,405	902,405	230,113.3
						65 — 69	42,498	29,749	7,586.0
						15 — 19	40,390	24,234	6,179.7
Females in 1970 (15-69)	3,181,141	41.90	1,332,898	42.44	565,682	20 — 64	504,928	353,450	90,129.8
						65 — 69	20,364	12,218	3,115.6
Total					1,622,857			1,400,646	357,164.9
						15 — 19	108,674	76,072	19,398.4
Males in 1973 (15-69)	3,027,499	39.08	1,183,147	89.35	1,057,142	20 — 64	905,759	905,759	230,968.5
						65 — 69	42,708	29,896	7,623.5
						15 — 19	36,676	22,006	5,611.5
Females in 1973 (15-69)	3,225,694	41.09	1,325,438	42.44	562,516	20 — 64	505,027	353,519	90,147.3
						65 — 69	20,813	12,488	3,184.4
Total					1,619,658			1,399,740	356,933.6

* Estimates based on 1961 Emigration (National Statistical Service of Greece).

TABLE 6

Labor Potential in Agriculture, 1961, 1968, 1970, 1973.

Birth Rate	1.9%
Death Rate	.8%
Emigration Rate	.4%

	Total Number	% Coeffi-cient	Active in Agriculture	% Coeffi-cient	Labor Potential in Agriculture	Labor Potential by age group		MPUs	MPDs. (1,000)
						15 — 19	130,439	91,307	23,283.3
Males in 1961 (15-69)	2,756,600*	43.16	1,189,749	88.99	1,058,758	20 — 64	886,816	886,816	226,138.1
						65 — 69	41,503	29,052	7,408.3
						15 — 19	56,514	33,908	8,646.5
Females in 1961 (15-69)	2,933,500*	44.33	1,300,420	42.44	551,898	20 — 64	478,275	334,792	85,372.0
						65 — 69	17,109	10,265	2,617.6
Total					1,610,656			1,386,140	353,465.8
						15 — 19	116,706	81,694	20,832.0
Males in 1968 (15-69)	2,882,605	40.78	1,175,526	89.20	1,048,569	20 — 64	890,025	890,025	226,956.4
						65 — 69	41,838	29,287	7,468.2

						15 — 19	44,860	26,916	6,863.6
Females in 1968 (15-69)	3,086,263	42.44	1,309,810	42.44	555,883	20 — 64	491,845	344,292	87,794.5
						65 — 69	19,178	11,507	2,934.3
Total					1,583,096			1,363,333	347,650.1
						15 — 19	107,332	75,132	19,158.7
Males in 1970 (15-69)	2,823,603	40.10	1,132,265	89.26	1,010,660	20 — 64	862,699	862,699	219,988.2
						65 — 69	40,629	28,440	7,252.2
						15 — 19	39,465	23,679	6,038.1
Females in 1970 (15-69)	3,108,286	41.90	1,302,372	42.44	552,727	20 — 64	493,364	345,355	88,065.5
						65 — 69	19,898	11,939	3,034.4
Total					1,563,387			1,347,244	343,537.1
						15 — 19	102,393	71,675	18,277.1
Males in 1973 (15-69)	2,852,522	39.08	1,114,766	89.35	996,043	20 — 64	853,410	853,410	217,619.5
						65 — 69	40,240	28,168	7,182.8
						15 — 19	35,476	21,286	5,430.0
Females in 1973 (15-69)	3,120,180	41.09	1,272,082	42.44	544,116	20 — 64	488,507	341,955	87,198.5
						65 — 69	20,132	12,079	3,080.1
Total					1,540,159			1,328,573	338,788.0

* Estimates based on 1961 Emigration (National Statistical Service of Greece).

TABLE 7

Labor Potential in Agriculture, 1961, 1968, 1970, 1973.

Birth Rate	1.9%
Death Rate	.8%
Emigration Rate	.6%

	Total Number	% Coeffi-cient	Active in Agriculture	% Coeffi-cient	Labor Potential in Agriculture	Labor Potential by age group		MPUs	MPDs (1,000)
						15 — 19	130,439	91,307	23,283.3
Males in 1961 (15-69)	2,756,600*	43.16	1,189,749	88.99	1,058,758	20 — 64	886,816	886,816	226,138.1
						65 — 69	41,503	29,052	7,408.3
						15 — 19	56,514	33,908	8,646.5
Females in 1961 (15-69)	2,933,500	44.33	1,300,420	42.44	551,898	20 — 64	478,275	334,792	85,372.0
						65 — 69	17,109	10,265	2,617.2
Total					1,610,656			1,386,140	353,465.4
						15 — 19	114,329	80,030	20,407.7
Males in 1968 (15-69)	2,823,894	40,78	1,151,584	89.20	1,027,213	20 — 64	871,898	871,898	222,334.0
						65 — 69	40,986	28,690	7,316.0

Females in 1968 (15-69)	3,117,461	42.44	1,323,050	42.44	561,502	15 — 19	45,313	27,188	6,932.9
						20 — 64	496,817	347,772	88,681.9
						65 — 69	19,372	11,623	2,963.9
Total					1,610,071			1,387,589	353,835.3
Males in 1970 (15-69)	2,902,057	40.10	1,163,725	89.26	1,038,741	15 — 19	110,315	77,221	19,691.4
						20 — 64	886,669	886,669	226,100.6
						65 — 69	41,757	29,230	7,453.7
Females in 1970 (15-69)	3,151,251	41.90	1,320,374	42.44	560,367	15 — 19	40,010	24,006	6,121.5
						20 — 64	500,184	350,129	89,282.9
						65 — 69	20,173	12,104	3,086.5
Total					1,599,108			1,379,359	351,736.6
Males in 1973 (15-69)	2,960,286	39.08	1,156,880	89.35	1,033,672	15 — 19	106,261	74,383	18,967.7
						20 — 64	885,650	885,650	225,840.7
						65 — 69	49,760	29,232	7,454.2
Females in 1973 (15-69)	3,179,578	41.09	1,306,489	42.44	554,474	15 — 19	36,152	21,691	5,531.2
						20 — 64	497,807	348,465	88,858.6
						65 — 69	20,515	12,309	3,138.8
Total					1,588,146			1,371,730	349,791.2

* Estimates based on 1961 Emigration (National Statistical Service of Greece).

69. For example, from Table 5 we find the estimate of male labor potential aged 15 to 69 for 1968 to be 1,062,846, and from Table 4 the percentage coefficients for males in 1968 are estimated at 11.13% aged 15 to 19, 84.88% aged 20 to 64, and the remaining 3.9% aged 65 to 69. Combining these percentages with the total of 1,062,846 for all three groups, we estimate that in 1968 there will be 118,295 males aged 15 to 19, 902,144 aged 20 to 64, and 42,707 aged 65 to 69. The calculations for females and for other years were performed similarly.

The labor potential in the three age groups was then converted into man productive units by using the same coefficients as in the early study i.e., male groups 15-19 = 70, 20-64 = 100, and 65-69 = 70. The man productive units were then converted to man productive days by multiplying them by 255.

A composite picture of the final estimates of available man productive days for agriculture for 1968, 1970 and 1973 on the various alternative assumptions concerning birth, death, and emigration rates is given in Tables 5 through 7 above.

III

LABOR REQUIREMENTS

Projections of the demand for agricultural labor in the coming decade are much more risky than projections of the labor supply. In the first place, the forces which would make for changes in labor requirements are numerous and are open to short-run influences and policy reversals. Furthermore, there is a balking lack of even rudimentary data necessary for making projections of labor requirements (e.g., price data).

The indirect method that we introduced for estimating labor requirements in agriculture in our earlier study of Surplus Labor in Greek Agriculture, 1953-1960 is composite. It derives «man productive days» utilized in agriculture by applying «labor-intensity coefficients» on the area planted with each crop — or on the amount of capital or size of production as in the case of animal husbandry, forestry, and fishing. Both in the computation of the «labor intensity coefficients» and in the projection of land utilization we used alternative methods that proposed to minimize

TABLE 8. Alternative Forecasts of Land

Groups of Products	1968	
	Simple Projections	Projected Output Projected Yield
1. Wheat	11,736,358	11,468,415
2. Barley - Oats	2,701,186	2,831,695
3. Maize	1,320,186	1,638,494
4. Rice	184,725	183,937
5. Other Cereals	—	—
6. Pulses	821,642	903,909
7. Tobacco	1,142,181	1,226,095
8. Cotton	2,605,824	2,458,800
9. Fodder from grain	1,000,186	1,072,987
10. Fodder from hay	4,065,456	4,712,080
11. Vegetables	1,079,756	972,465
12. Melons	279,865	269,994
13. Potatoes	426,796	417,065
14. Grapes and Must	1,856,725	1,966,133
15. Currants	682,549	388,416
16. Sultanas	—	238,022
17. Citrus Fruit	550,648	541,777
18. Olive Groves	6,316,363	6,316,363
19. Fresh Fruit	1,352,870	1,351,894
20. Dried Fruit	1,185,077	1,185,077
21. Other Trees	130,000	130,000
22. Sesame Seed	204,672	188,917
23. Sugar Beets	300,000	300,000
24. Other (Manufactured) Products	110,000	110,000
Total	40,053,874	41,052,535

* One stremma is equal to 0.2471 acres.

Requirements for 1968, 1970 and, 1973, in stremas.*

1970		1973	
Simple Projections	Projected Output/ Projected Yield	Simple Projections	Projected Output/ Projected Yield
11,904,236	11,574,632	12,156,053	11,690,321
2,576,661	2,742,011	2,388,660	2,630,750
1,154,126	1,567,144	905,036	1,474,422
187,149	186,079	190,785	189,438
—	—	—	—
797,764	888,211	761,947	877,404
1,150,787	1,228,382	1,163,696	1,248,147
2,806,552	2,596,163	3,107,644	2,787,199
1,086,126	1,188,812	1,215,036	1,361,573
4,427,638	5,108,638	4,970,911	5,678,571
1,129,998	1,001,128	1,205,359	1,044,349
275,897	264,030	269,944	255,520
430,918	419,034	437,099	422,291
1,891,149	2,057,989	1,942,785	2,244,757
697,701	387,062	720,429	385,838
—	274,834	—	263,238
574,418	610,784	669,498	725,730
6,573,575	6,573,575	6,959,393	6,959,393
1,393,116	1,424,255	1,554,100	1,535,213
1,231,798	1,231,798	1,418,682	1,418,682
135,000	135,000	140,000	140,000
194,009	142,685	178,007	53,809
320,000	320,000	350,000	350,000
120,000	120,000	130,000	130,000
41,058,618	42,015,246	42,835,064	43,866,645

the inherent weakness of our agriculture labor demand projection.

The first task was to estimate land utilization for the three bench-mark years, 1968, 1970, and 1973. Three alternative estimates were worked out. The first was derived indirectly by projecting output and yields. The second estimate, also indirect, utilized a demand projection for agricultural commodities on the assumption of two different crop structures and rates of growth in agriculture. A third estimate employed the projection of land requirements as incorporated in the program of the Ministry of Agriculture.

By the first method of estimating land requirements, we initially estimated output for 1968, 1970, and 1973 through a projection of its trend over the period 1953-1962. The trend of a longer period (e. g., 1950-1962) which would have given a much higher slope of the regression line was rejected because before 1953 conditions in agriculture were in many respects atypical. By dividing projected output by projected yield for each crop group, we derived land requirement estimates for 1968, 1970, and 1973.

These findings were checked against estimates of land requirements arrived at by a rough and straight projection of past (1953-

1962) trends in cultivated areas. The overall difference between the two projections is relatively small (i.e., about a million stremmas, or approximately 2% of the cultivated land). The two estimates are shown in Table 8 above, which gives total land requirements broken down into 24 commodity groups.[6]

It was thought, however, that the projected values of land requirements for two important crop groups, wheat and tobacco, needed correction. Specifically, the projected area for wheat cultivation (some 9 to 11.5 million stremmas) is exaggerated in view of the wheat policy adopted by the government and the present glut in the wheat market. On the other hand, the projected land requirement for tobacco is on the low side. The association of Greece with the Common Market is expected to raise Greek tobacco exports. An output

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6. With respect to the method of construction of this table some further remarks are in order. Land requirements for commodity group No. 10 were derived by projecting the average yield over a shorter period — i.e., 1959-1962 — during which yields seemed to be stabilized. For No. 18 we employed a straight projection of land requirements, which may be more reliable given the two-year cycle in olive output. Similarly, for « dried fruit, » which includes sub-groups with widely differing yields, we relied on a straight projection of the area under cultivation. Finally, for sugar beets we adopted the official estimate of the Ministry of Agriculture, as there are no other data available and this crop is fairly new in Greece.

of about 120,000 to 135,000 tons would require an area of approximately 1.6 to 1.8 million stremmas. In both cases the estimates of the Ministry of Agriculture were adopted. Table 9 below shows adjusted total land requirements for 1968, 1970, and 1973.

TABLE 9

1968, 1970, and 1973 Projected Output/Projected Yields.

Year	Stremmas
1968	37,608,458
1970	38,442,665
1973	41,412,463

These land requirements were converted into labor requirements by applying our set of employment coefficients. Of this conversion more will be said later.

Under the second method, land requirements were alternatively computed by projecting demand for agricultural commodities and dividing by the projected yields. The demand was analyzed into the following three components: the demand for domestic use (domestic disappearance — i.e. domestic consumption plus or minus the change in stocks), the exports component, and the imports component. These three components were computed by projections and/or educated esti mates. Finally, the feasibility of the program was checked.

The demand for domestic use (domestic disappearance) for each agricultural commodity for the period 1952-1961 was determined from the Food Balance Sheet of the Ministry of Coordination and was reduced to per capita terms. This domestic disappearance per capita was expressed as a function of prices (at the farm gate) and income per capita.

Our early statistical results showed clearly positive price elasticities of demand, which may partly be due to the unreliability of the price data as well as to the government subsidization of the farmers through price supports frequently at levels above the free market price. Realizing that the price variable in Greece is hopelessly distorted for the purposes of the present analysis, we had to continue our investigation by retaining income as the sole variable in our demand equation.

The statistical equation finally employed for the period 1952-1961 takes the form of

$$(1) \qquad X_{1i} = a + bX_2, \text{ where}$$

X_{1i} is per capita domestic disappearance of good i; X_{2i} is the per capita disposable income deflated by the national price index, and i is from 0 to 27 for each agricultural commodity.

The trend established by equation (1) for

domestic disappearance of each agricultural commodity was projected to 1968, 1970, and 1973 on the basis of two alternative assumptions about the income variable—namely, of a 6% and a 7% real annual increase. The per capita domestic disappearance of each agricultural commodity was then multiplied by the population and rendered into total terms.

The estimates derived for the three benchmark years by the use of equation (1) were subsequently submitted to a rough check by use of the equation

$$(2) \qquad Y_i = a + bt_j, \qquad \text{where}$$

Y_i is the per capita domestic disappearance of good i, and t_j is time.

The results of the two projections are very close together, enabling us for most commodities finally to use equation (2), which represents the simplest available hypothesis.

The domestic disappearance of agricultural products determines the domestic production only after allowance has been made for imports and exports. Where imports are concerned, we assumed in our projections that only rice, potatoes, cereals, cotton, and maize would be imported in quantities roughly analogous to those experienced in the last decade. These

imports were subtracted from domestic disappearance.

It is hard to forecast what will be the size of Greek agricultural exports in the next decade. The study of the last twelve years, however, provides some hints for probable future developments. The «established» Greek export products (tobacco, olives, figs, etc.) face a certain inelasticity of international demand, and they are mostly absorbed by countries of the Common Market. We assumed that these «established» products will continue in the future to represent a sizeable portion of Greek exports and that they will remain roughly at their present levels. The «non-established» Greek exports (cotton, citrus fruit, dried fruit) are mainly absorbed by Eastern Bloc countries, and for lack of any better hypothesis we adopted the assumption that they will not vary significantly from their present levels. The exports were added to domestic disappearance in order to derive the quantities of agricultural commodities, by product category, that are expected to be produced in Greece during each year of the next decade.

Tables 10 and 11 show the projected demand for 27 commodity groups. The projected values in Table 10 have been estimated on the basis of the assumption of an annual real rate of in-

TABLE 10

Total Disappearance at the Farm.
Conservative Crop Structure in thousands of metric tons.

Products	Years			
	1961	1968	1970	1973
1. Wheat	1,594.0	1,695.0	1,675.0	1,640.0
2. Barley - Oats	388.0	440.0	450.0	460.0
3. Maize	270.0	455.0	535.0	670.0
4. Rice in Husks	85.3	70.0	75.0	80.0
5. Other Cereals	40.2	20.0	20.0	20.0
6. Pulses	85.0	105.0	105.0	102.0
7. Tobacco	73.0	115.0	125.0	140.0
8. Cotton (Non-Irrigated)	46.5	30.0	30.0	25.0
9. Cotton (Irrigated)	230.6	455.0	540.0	680.0
10. Sesame Seed	8.1	8.0	8.0	8.0
11. Vegetables	1,300.5	1,640.0	1,750.0	1,900.0
12. Potatoes	466.5	480.0	485.0	495.0
13. Melons	412.8	445.0	455.0	465.0
14. Currants	91.5	110.0	115.0	120.0
15. Sultanas	55.0	90.0	95.0	100.0
16. Table grapes	130.5	240.0	300.0	375.0
17. Must	396.3	450.0	455.0	465.0
18. Citrus Fruit	319.0	495.0	560.0	670.0
19. Fruit	412.1	590.0	680.0	760.0
20. Olive Oil *	145.0	165.0	170.0	175.0
21. Olives *	47.5	43.0	45.0	45.0
22. Dried Fruit	89.8	95.0	95.0	95.0
23. Sugar Beets	—	1,140.0	1,215.0	1,280.0
24. Cattle Feed Legumes	66.2	75.0	85.0	90.0
25. Fodder from grain	127.5	122.0	118.0	110.0
26. Fodder from hay	359.6	640.0	725.0	840.0
27. Fodder	679.5	1,380.0	1,600.0	1,800.0

* Two year average.

TABLE 11

Total Disappearance at the Farm.
Optimistic Crop Srtucture in thousands of metric tons.

Products	Years			
	1961	1968	1970	1973
1. Wheat	1,594.0	1,520.0	1,520.0	1,490.0
2. Barley - Oats	388.0	395.0	400.0	410.0
3. Maize	270.0	500.0	590.0	730.0
4. Rice in Husks	85.3	78.0	87.0	90.0
5. Other Cereals	40.2	19.0	19.0	19.0
6. Pulses	85.0	95.0	90.0	90.0
7. Tobacco	73.0	130.0	140.0	150.0
8. Cotton (Non-Irrigated)	46.5	28.0	25.0	20.0
9. Cotton (Irrigated)	230.6	500.0	590.0	740.0
10. Sesame Seed	8.1	7.0	7.0	7.0
11. Vegetables	1,302.5	1,800.0	1,900.0	2,100.0
12. Potatoes	466.4	525.0	540.0	560.0
13. Melons	412.8	460.0	470.0	490.0
14. Currants	91.5	110.0	110.0	105.0
15. Sultanas	55.0	100.0	109.0	110.0
16. Table Grapes	130.5	265.0	330.0	420.0
17. Must	369.3	405.0	430.0	440.0
18. Citrus Fruit	319.0	600.0	680.0	800.0
19. Fruit	412.1	700.0	760.0	850.0
20. Olive Oil *	145.0	165.0	170.0	175.0
21. Olives *	47.5	43.0	45.0	45.0
22. Dried Fruit	89.9	105.0	105.0	105.0
23. Sugar Beets	—	1,215.0	1,215.0	1,280.0
24. Cattle Feed Legumes	66.2	75.0	75.0	70.0
25. Fodder from grain	127.2	120.0	120.0	115.0
26. Fodder from hay	359.6	670.0	750.0	870.0
27. Fodder	679.5	1,560.0	1,700.0	1,900.0

* Two year average.

4

come growth of 6%, while Table 11 assumes a 7% increase and reflects an increased output of commodities such as vegetables, fruits, tobacco, and cotton and a decreased demand for cereals and other «inferior goods.»

To transform quantities of agricultural commodities in demand into areas cultivated, quantity demanded should be divided by projected yields per stremma. The resulting quotient is then expressed in units of stremmas on which the employment coefficients are applied. These coefficients are basically expressed in terms of man-days per land unit for each commodity (animal husbandry, forestry, and fishing are excepted, and labor coefficients refer to man-days per animal or per volume of production). To estimate the yields for each commodity, we projected their past trends by using linear regression. The values thus derived were corrected by the Center's team of agricultural experts to allow for changes in technology and methods of production.

Thus, two alternative estimates of land requirements were derived:

a) A conservative estimate based on a crop structure corresponding to projected demand on the assumption of a 6% annual increase in national income; this crop structure would result in an annual rate of real growth in

agriculture of about 4.2%.

b) An optimistic estimate implying a crop structure which emphasizes more intensive cultivation and which assumes a 7% annual increase in national income; this crop mix would produce for the decade a faster rate of agricultural growth-i.e., 4.8%. It is worth noting here that the crop structure planned by the Ministry of Agriculture for 1970 would imply a 4% growth in agricultural output.

The next stage in the procedure of estimating labor requirements is the conversion of land requirements into labor units. The conversion factors are our employment coefficients. In the earlier study by Pepelasis and Yotopoulos, Surplus Labor in Greek Agriculture, 1953-1960, the employment coefficients used constituted perhaps the weakest point of the investigation. As a basis for their computations the authors took a set of employment coefficients derived by Professor Evelpides for 1955. But there has been little explanation of the Evelpides method of their derivation, and thus the margin of their reliability could not be easily checked. Moreover, when these coefficients were adjusted to apply to an earlier (1953-1954) and a later period (1956-1960) we could do no better than intelligent guesswork.

The research team which worked on the derivation of the new set of employment coefficients made use of the findings of an extensive empirical investigation of labor requirements per unit of land for all crops throughout Greece in 1961 and 1962. In constructing these new employment coefficients allowance was made for expected changes in the relations between various types of cultivated land (e.g., mountain terrain as against plains, etc.), technological improvements, changing farm size, organizational changes, and improvements in the skills of agricultural workers for all years of the period 1963-1973.

Specifically, our team of experts took into account the possibilities of improved labor efficiency resulting from greater land consolidation; (not much is expected in this directios during the next decade). Another consideration was the expected change in the ratio of plain to slope cultivation in favor of the former, making possible more intensive mechanization per unit of land. We also made allowance for the greater use of contract services in agriculture, e.g. transportation, spraying, etc. The employment effect of new planting methods was also examined; thus, in the case of currants, our new employment coefficients are considerably lower because new

planting methods make possible increased use of small tractors. A detailed discussion of all factors involved in determining labor coefficients appears in the forthcoming monograph on Labor Requirements in Greek Agriculture, 1963-1973.

Tables 12-14 below show the changes in employment coefficients between the base period 1961-1962 and the years 1968, 1970, and 1973.

So far our treatment has neglected the seasonal aspects of employment in agriculture. Labor available and labor required have been converted into man productive days per year. Agricultural activities, however, follow a seasonal pattern more than other kinds of economic activity. Chronic surplus or deficit labor must be delineated in seasonal terms. To this end both annual labor available and annual labor required must be distributed over the four seasons.

In distributing labor available seasonally we used the same distribution base as in the earlier study of 1953-1962, since the institutional conditions (e.g., number of holidays) and the climatological ones (e.g., rainfall) affecting agricultural work are unchanged.

The seasonal distribution of labor requirements, on the other hand, was based on sea-

TABLE 12

Employment Coefficients 1961 - 62, 1968 and Factors Affecting them (in work-days per stremma).

Crops	Employment Coefficients 1961	Factors making for Increase		Factors making for Decrease		Net Change	Employment Coefficients 1968
		Increase of yields & other factors	Extension of Irrigation	Mechani-zation	Improvement in methods of production & other factors		
1. Wheat	1.85	0.15	—	0.30	0.10	−0.25	1.60
2. Barley - Oats	2.00	0.10	—	0.20	0.10	−0.20	1.80
3. Maize	4.18	0.27	0.20	0.90	0.25	−0.68	3.50
4. Rice in Husks	8.35	0.15	—	1.20	0.30	−1.35	7.00
5. Other Cereals	4.50	0.15	—	0.55	0.10	−0.50	4.00
6. Pulses	3.20	0.15	0.05	0.30	0.10	−0.20	3.00
7. Tobacco	34.00	0.20	0.05	1.50	1.75	−3.00	31.00
8. Cotton (Non Irrigated)	6.50	0.10	—	0.50	0.10	−0.50	6.00
9. Cotton (Irrigated)	8.80	0.15	0.10	0.55	0.30	−0.60	7.20
10. Sesame Seed.....	2.40	0.15	0.10	0.40	0.15	−0.30	2.10

11. Other Crops for Industrial Purposes	5.50	0.15	0.05	0.55	0.15	−0.50	5.00
12. Vegetables	11.00	0.50	0.20	0.30	0.20	+ 0.20	11.20
13. Potatoes	9.00	0.30	0.20	1.30	0.70	−1.50	7.50
14. Melons	8.00	0.20	0.10	0.30	0.30	−0.30	7.70
15. Currants	18.00	0.15	0.05	3.50	1.70	−5.00	13.00
16. Sultanas	23.00	0.15	0.05	3.50	1.70	−5.00	18.00
17. Table Grapes	15.00	0.15	0.05	1.10	1.10	−2.00	13.00
18. Vineyards	8.50	0.15	0.05	1.00	0.70	−1.50	7.00
19. Citrus Fruit	15.00	0.30	1.10	0.90	1.00	−1.50	13.50
20. Fruit	11.50	0.15	0.05	0.90	0.30	−1.00	10.50
21. Olive Groves	3.90	0.30	0.10	0.10	0.10	+ 0.20	4.10
22. Dried Fruit	5.50	0.30	0.10	0.05	0.05	+ 0.30	5.80
23. Sugar Beets	13.00	0.20	0.20	1.40	1.00	−2.00	11.00
24. Cattle Feed Legumes	3.10	0.15	0.05	0.60	0.20	−0.60	2.50
25. Fodder from grain	2.30	0.10	—	0.30	0.10	−0.30	2.00
26. Fodder from hay	3.50	0.10	0.10	0.70	0.30	−0.80	2.70
27. Fodder	8.00	0.10	0.10	2.00	0.70	−2.50	5.50
28. Natural Grass	2.00	—	—	0.25	0.05	−0.30	1.70
29. Fallow	0.10	0.05	—	—	—	+ 0.05	0.75

TABLE 13

Employment Coefficients 1961 - 62, 1970 and Factors Affecting them (in work - days per stremma).

Crops	Employment Coefficients 1961	Factors making for Increase		Factors making for Decrease		Net Change	Employment Coefficients 1968
		Increase of yields & other factors	Extension of Irrigation	Mechanization	Improvement in methods of production & other factors		
1. Wheat	1.85	0.20	–	0.39	0.10	−0.29	1.56
2. Barley - Oats	2.00	0.10	–	0.25	0.10	−0.25	1.75
3. Maize	4.18	0.35	0.25	1.58	0.40	−1.38	2.80
4. Rice in Husks	8.35	0.20	–	2.85	0.70	−3.35	5.00
5. Other Cereals.....	4.50	0.20	–	1.10	0.10	−1.00	3.50
6. Pulses	3.20	0.20	0.10	0.60	0.15	−0.45	2.75
7. Tobacco.....	34.00	0.25	0.05	2.30	3.00	−5.00	29.00
8. Cotton (Non Irrigated) ..	6.50	0.10	–	0.80	0.30	−1.00	5.50
9. Cotton (Irrigated)	8.80	0.20	0.10	1.90	0.40	−2.00	6.80
10. Sesame Seed	2.40	0.15	0.10	0.50	0.15	−0.40	2.00

11. Other Crops for Industrial Purposes	5.50	0.15	0.10	0.95	0.30	−1.00	4.50
12. Vegetables	11.00	0.80	0.50	0.50	0.30	+0.50	11.50
13. Potatoes	9.00	0.30	0.30	2.00	1.10	−2.50	6.50
14. Melons	8.00	0.25	0.15	0.50	0.40	−0.50	7.50
15. Currants	18.00	0.25	0.10	4.00	3.35	−7.00	11.00
16. Sultanas	23.00	0.25	0.10	4.00	2.35	−6.00	17.00
17. Table Grapes	15.00	0.25	0.10	3.00	2.35	−5.00	10.00
18. Vineyards	8.50	0.25	0.10	1.30	1.05	−2.00	6.50
19. Citrus Fruit	15.00	0.40	0.10	2.00	1.50	−3.00	12.00
20. Fruit	11.50	0.40	0.20	1.20	0.40	−1.00	10.50
21. Olive Groves	3.90	0.75	0.20	0.20	0.15	+0.60	4.50
22. Dried Fruit	5.50	0.75	0.20	0.30	0.15	+0.50	6.00
23. Sugar Beets	13.00	0.45	0.25	2.70	2.00	−4.00	9.00
24. Cattle Feed Legumes	3.10	0.20	0.10	1.00	0.30	−1.00	2.10
25. Fodder from grain	2.30	0.15	–	0.40	0.15	−0.40	1.90
26. Fodder from hay	3.50	0.20	0.20	1.00	0.40	−1.00	2.50
27. Fodder	8.00	0.20	0.15	2.50	0.85	−3.00	5.00
28. Natural Grass	2.00	–	–	0.40	0.10	−0.50	1.50
29. Fallow	0.10	0.10	–	–	–	+0.10	0.20

TABLE 14

Employment Coefficients 1961 - 62, 1973 and Factors Affecting them (in work-days per stremma).

Crops	Employment Coefficients 1961	Factors making for Increase		Factors making for Decrease		Net Change	Employment Coefficients 1973
		Increasc of yields & other factors	Extension of irrigation	Mecha-niza-tion	Improvement in methods of production & other factors		
1. Wheat	1.85	0.30	—	0.45	0.20	—0.35	1.50
2. Barley - Oats	2.00	0.20	—	0.45	0.15	—0.40	1.60
3. Maize	4.18	0.40	0.30	1.78	0.60	—1.68	2.50
4. Rice in Husks	8.35	2.20	—	2.85	0.70	—3.35	5.00
5. Other Cereals	4.50	0.30	—	1.60	0.20	—1.50	3.00
6. Pulses	3.20	0.30	0.15	0.90	0.25	—0.70	2.50
7. Tobacco	34.00	0.40	0.10	3.00	5.50	—8.00	26.00
8. Cotton (Non-Irrigated) ...	6.50	0.20	—	1.20	0.50	—1.50	5.00
9. Cotton (Irrigated)	8.80	0.15	0.10	0.50	0.15	—0.40	2.00
10. Sesame Seed	2.40	0.30	0.10	2.30	0.70	—2.60	6.20

11. Other Crops for Industrial Purposes	5.50	0.30	0.20	1.30	0.70	—1.50	4.00
12. Vegetables	11.00	1.00	0.60	0.50	0.30	+0.80	11.80
13. Potatoes	9.00	0.50	0.30	2.50	1.30	—3.00	6.00
14. Melons	8.00	0.30	0.20	0.80	0.70	—1.00	7.00
15. Currants	18.00	0.35	0.15	4.50	4.00	—8.00	10.00
16. Sultanas	23.00	0.35	0.15	4.50	4.00	—8.00	15.00
17. Table Grapes	15.00	0.35	0.15	3.50	3.00	—6.00	9.00
18. Vineyards	8.50	0.35	0.15	1.70	1.30	—2.50	6.00
19. Citrus Fruit	13.00	0.60	0.20	2.80	3.00	—5.00	10.00
20. Fruit	11.50	0.60	0.20	2.00	1.30	—2.50	9.00
21. Olive Groves	3.90	1.30	0.30	0.40	0.30	+0.90	4.80
22. Dried Fruit	5.50	0.75	0.20	0.30	0.15	+0.50	6.00
23. Sugar Beets	13.00	0.55	0.25	4.00	2.80	—6.00	7.00
24. Cattle Feed Legumes	3.10	0.30	0.10	1.10	0.40	—1.10	2.00
25. Fodder from grain	2.30	0.20	—	0.60	0.30	—0.70	1.60
26. Fodder from hay	3.50	0.30	0.20	1.40	0.60	—1.50	2.00
27. Fodder	8.00	0.30	0.20	2.50	1.00	—3.00	5.00
28. Natural Grass	2.00	—	—	0.80	0.20	—1.00	1.00
29. Fallow	0.10	0.10	—	—	—	+0.10	0.20

sonal coefficients, calculated anew by our team of agricultural experts. These seasonal coefficients were computed for 31 crop groups per unit of land and were corrected for differences in soil, farm size, and annual changes in crop structure. The methods of computing the seasonal coefficients are discussed in great detail in the forthcoming volume on Labor Requirements in Greek Agriculture, 1963-1973. Tables 15 and 16 show the seasonal coefficients for 31 groups in 1970 and the percentage seasonal distribution for farming, animal husbandry, forestry, and fishing for 1968, 1970, and 1973.

Our final findings are presented in composite form in Tables 17-20 at the end of the book.

These tables show the projected volume of annual and seasonal labor shortages and of seasonal surpluses for farming, husbandry, forestry, fishing, and transport.[7] The projected values are presented for 1968, 1970, and 1973

7. In estimating the amount of labor required in agriculture to produce a given volume of output during a given period, not only the time required for agricultural work in the narrow sense of the word but also the time spent in transporting the product from one stage of the process to the next as well as time spent in all activities related to the agricultural operations must be taken into account. However, in «transport» we do not include the transport of labor to and from the field since national income accounting conventionally excludes such transportation from production costs.

under three alternative assumptions regarding labor availability and under two alternative assumptions concerning crop mix and the rate of growth in agricultural income. For 1970 there are two sets of estimates, one on the basis of our own work and the other on the basis of official (Ministry of Agriculture) expectations regarding changes in the structure of agriculture and in the composition of output in 1970.

TABLE 15

Seasonal Percentages Distribution of Wage Days Required in Agriculture.

I. Farming	Fall	Winter	Spring	Summer
1. Wheat	25	5	20	50
2. Barley - Oats	25	5	30	40
3. Maize	45	—	15	40
4. Rice	45	—	25	30
5. Other Cereals	20	5	20	55
6. Pulses	17	4	23	56
7. Tobacco	30	15	25	30
8. Cotton	45	5	20	30
9. Fodder from grain	25	2	3	70
10. Fodder from hay	27	3	46	24
11. Vegetables	20	20	30	30
12. Melons	10	—	45	45
13. Potatoes	18	20	30	32
14. Grapes - Must	34	15	35	16
15. Currants	20	15	35	30
16. Sultanas	30	15	35	20
17. Citrus Fruit	20	20	35	25
18. Olive Groves	35	40	20	5
19. Fresh Fruit	25	10	25	40
20. Dried Fruit	30	10	20	40
21. Other Trees	25	10	25	40
22. Sesame Seed	30	—	25	45
23. Sugar Beets	20	10	30	40
24. Other Products	25	5	30	40
25. Flowers	25	25	25	25
26. New Plantations	25	25	25	25
27. Beans (Multicropping)	17	4	23	56
28. Maize (Multicropping)	45	—	15	40
29. Miscellaneous	25	25	25	25
30. Natural Grass	20	—	10	70
31. Fallow	70	—	—	30
II. Animal Husbandry	23.8	27.0	26.9	22.3
III. Forestry	25.0	25.0	25.0	25.0
IV. Fishing	28.0	16.0	28.0	28.0

TABLE 16

Seasonal Percentage Distribution of Wage Days Required in Agriculture, 1968, 1970, 1973.

1968	Fall	Winter	Spring	Summer	Total
Farming	30.3	14.0	26.4	29.3	100.0
Husbandry	24.0	27.0	27.0	22.0	100.0
Forestry	30.0	20.0	25.0	25.0	100.0
Fishing	28.0	16.0	28.0	28.0	100.0
1970					
Farming	30.5	14.1	26.4	29.0	100.0
Husbandry	24.0	27.0	27.0	22.0	100.0
Forestry	30.0	20.0	25.0	25.0	100.0
Fishing	28.0	16.0	28.0	28.0	100.0
1973					
Farming	30.7	14.5	26.2	28.6	100.0
Husbandry	24.0	27.0	27.0	22.0	100.0
Forestry	30.0	20.0	25.0	25.0	100.0
Fishing	28.0	16.0	28.0	28.0	100.0

IV

RECOMMENDATIONS

Admittedly a number of errors and a degree of arbitrariness must have crept into the projections of the conditions affecting the volume of labor available and labor required. But where discretion was allowed, efforts were made to adopt assumptions which would underestimate rather than overestimate labor shortages. Thus, for example, in the derivation of our employment coefficients the rate of technological and institutional changes implied was based upon the most optimistic experience of recent years. Or, on the labor supply side, labor potential for the decade was computed without corrections for the changes in age structure because of the fact that most emigrants fall at present within an age group of approximately 20 to 30 years of age. There has been a marked differential propensity to leave agriculture and migrate. Consequently the composition of the agricultural labor force by sex and age is not a typical cross-section of the active population. We can therefore expect a change in the future size and age distribution of agricul-

tural labor. Had this been taken properly into account, our projected labor potential for 1970 or 1973 would have been somewhat lower.

In any case, our findings suggest that labor shortages in agriculture will be rather considerable by the end of the decade, ranging between 11% and 23% for the peak period;[8] the shortages will be spread to winter as well, summer being the only season of labor surplus.

When these findings — tentative as they may be — are compared with the expectation that Greek industrial unemployment may disappear by the end of the decade, serious developmental policy implications suggest themselves. Specifically, given the assumption that industrial labor productivity in the 1960's will maintain the rate observed in the late 1950's, it is likely that the 175,000—200,000 industrial unemployed workers will be absorbed partly through emigration — if the moderate trend of 1957-1960 continues — and partly through an increasing demand for labor. Professor Papandreou, in a discussion of alternative types of

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8. An important finding of the present study was that due to new crop mixtures the peak season of labor shortages for the next decade wil be in fall rather than in spring, as was the case for the period 1953-1960 studied in our previous monograph.

programs, noted that an industrial labor surplus will persist by 1972 only on the assumption that the emigration rate will be lower than that of 1960-1961 and that the net value added per worker will grow faster in the 1960's than in the 1950's. If labor productivity in the current decade falls, labor shortages will develop even if emigration is less than in 1960—1961.[9]

In the face of these considerations four general recommendations are in order:

a) Social reform measures should be extended to the rural areas of Greece. An enormous disparity prevails between living conditions in the cities and the villages. This gap must be narrowed if peasant Greece is to participate in the national efforts for economic growth. Any development plan should take into account the large regional differences in income and employment opportunities and provide for ways of reducing them.

b) The program for changes in the crop mix ought to provide not only for new high-income crops but also for crops which will require increased labor during the slack season and less labor during the peak period. In other words, both the productivity and the employment cri-

9. Andreas G. Papandreou, op. cit. pp. 98,99.

teria should guide the selection of new crops. The transformation of agriculture from a low into a relatively high productivity sector will depend upon the extent of changes in the crop mix and the replacement of marginal and labor intensive agricultural activities by new types of non-seasonal activities such as processing, handicrafts, etc.

The transition from a more extensive to a less extensive pattern of agriculture does not automatically imply that labor requirements should rise. It may very will be, as is clear from past evidence, that the technical margin for increasing productivity could become greater than it appears to be at present. This would depend on i) institutional changes and developments in other sectors (low productivity and high labor requirements are to an extent synonymous); ii) changes in land use and techniques. To the extent that a large proportion of rural population lives in the mountain and semi-mountain areas, labor requirements per stremma would decline considerably if a more rational pattern of land use were applied, even if the existing composition of output were to remain unchanged.

Availability of local materials and of managerial talents, regional specialization, balance of payments, considerations which would

determine what import saving and what export industries should be promoted are some of the criteria which will influence the choice of new activities to be promoted.

c) Long-run emigration policy should be reconsidered. The labor exodus from Greece in the last decade has not received sufficient attention. Emigration of surplus labor certainly eases the process of economic development in many ways, as, for example, by restraining total consumption. But, on the other hand, continuing mass labor emigration may create a number of conditions which will affect future growth adversely. This may very well be the case with Greece in view of at least three factors: i) a dwindling labor surplus, ii) a relatively low rate of population growth (0.9%), and iii) the skill composition of the emigrants. In 1962 more than 50% of them were classified as skilled industrial workers with secondary education. Furthermore, all emigrants are carefully screened by the receiving country, and the ones selected are above average in intelligence, health, receptivity to change, and skills. Thus, to a large extent it is not «surplus» labor that emigrates but the very type of labor which is in demand in the industrial communities of Western Europe and which will become more and more scarce in a rapidly devel-

oping Greek economy. The argument is not-being made here that emigration should be restricted—in any case such restrictions are prohibited by the Common Market regulations. Rather, incentives for emigration should be reviewed and a repatriation policy should be worked out for the-not-too-distant future. Furthermore, emigration should be used as a vehicle whereby emigrants receive training in certain skills, and—partly at least—then utilize these skills upon return home.

d) If the shifting of the center of gravity from agriculture to industry through labor reallocation is to go on smoothly — i.e., without a fall in agricultural output — productivity in the agricultural sector must rise faster than in the past and faster than the rates of technological change implied in our projections of labor requirements. This as suggested above would require, among other things, drastic organizational and technological innovations in agriculture and a reconsideration of planned capital investments in this sector. Within the constraints imposed by productivity considerations, such outlays ought to be redesigned in ways which in part would tend to alleviate seasonal shortages and in part release labor for employment elsewhere.

The margins for technological and especially

organizational and institutional changes (e.g., land consolidation, extension services, etc.) are potentially large in Greek agriculture. Productivity is low by European standards, and many improvements remain to be introduced. In an investigation of the extent to which labor-saving methods could be adopted in Greek agriculture the following points should be made:

1) While the margin for certain types of agricultural equipment (e.g., small tools), is wide, for others it is limited. Further tractorization, for example, is restricted inasmuch as small plots are a predominant feature of Greek agriculture. Given the topography of Greece, the crop pattern, the overall size of farms and their fragmentation, it is estimated that some 30,000 tractors could be used on the 14 million stremmas of plain. There are already about 20,000 tractors in use.

2) Certain new advanced techniques may affect labor requirements either way.

3) Given existing techniques, expanded irrigation, which is now under way, will increase labor requirements by 100%.

4) On the other hand, the recent experience of a number of countries (Japan, Taiwan, Denmark) suggests that many technological improvements — e.g., mechanization of auxiliary

operations, extension of the range of planting dates, and institutional innovations such as better production cooperatives — can increase agricultural output considerably without involving sizeable capital outlays.[10] If this proves to be the case with Greek agriculture, increased productivity in this sector will be achieved without the imposition of additional heavy strains upon the investment budget and without further reduction of resources available for industrial development.

Lastly, the sine qua non of a rational approach to the many sided problems of Greek agriculture is a thorough review of the short —and long— run plans for agricultural development and their integration with the overall development plan for the Greek economy. Only then can the problem of agricultural labor shortages or seasonal surpluses be discussed more meaningfully in terms of policy alternatives.

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10. Bruce F. Johnston, « Agricultural Development and Economic Transformation: A Comparative Study of the Japanese Experience, » Food Research Institute Studies (Stanford University, Nov. 1962), Vol. III.

TABLE 17 Employment Diagram
In Thousands of

Assumption A of Labor Supply**	Fall MPDs	Fall %	Winter MPDs
1. Labor Available	89,648.4	25.1	71,433.0
2. Labor Required	106,138.0		67,528.0
a. Farming	68,576.0	30.3	31,867.0
(Transport)	(5,640.3)		(1,807.5)
b. Husbandry	25,418.2	24.0	28,595.4
(Transport)	(2,541.8)		(2,859.6)
c. Forestry	1,088.4	30.0	725.6
(Transport)	(326.4)		(217.6)
d. Fishing	2,564.9	28.0	1,455.3
e. Agricultural Transport	8,508.5		4,884.7
3. Surplus Labor	−16,489.6		3,906.0
4. Rate of Surplus Labor	−18.39%		5.47%
5. Rate of Chronic Surplus Labor			
Assumption B of Labor Supply			
1. Labor Available	88,285.9	25.1	70,347.3
2. Labor Required	106,138.0		67,528.0
a. Farming	68,576.0	30.3	31,867.0
(Transport)	(5,640.3)		(1,807.5)
b. Husbandry	25,418.2	24.0	28,595.4
(Transport)	(2,541.8)		(2,859.6)
c. Forestry	1,088.4	30.0	725.6
(Transport)	(326.4)		(217.6)
d. Fishing	2,546.9	28.0	1,455.3
e. Agricultural Transport	8,508.5		4,884.7
3. Surplus Labor	−17,852.1		2,819.3
4. Rate of Surplus Labor	−20.22%		4.01%
5. Rate of Chronic Surplus Labor			
Assumption C of Labor Supply			
1. Labor Available	86,230.3	25.1	68,709.4
2. Labor Required	106,138.0		67,528.0
a. Farming	68,576.0	30.3	31,867.0
(Transport)	(5,640.0)		(1,807.5)
b. Husbandry	25,418.2	24.0	28,595.4
(Transport)	(2,541.8)		(2,859.6)
c. Forestry	1,088.4	30.0	725.6
(Transport)	(326.4)		(217.6)
d. Fishing	2,546.9	28.0	1,455.3
e. Agricultural Transport	8,508.5		4,884.7
3. Surplus Labor	−19,907.7		1,181.4
4. Rate of Surplus Labor	−23.09%		1.72%
5. Rate of Chronic Surplus Labor			

* Our estimates for Farming and Husbandry were based on data provided by the Ministry of Agriculture (Preliminary Report). For Forestry and Fishing we used the results of our Conservative Estimate .

in Agriculture, 1970. Ministry of Agriculture.*
Man Productive Days (MPDs).

	Spring		Summer		Annual	
%	MPDs	%	MPDs	%	MPDs	%
20.0	84,648.1	23.7	111,435.4	31.2	357,164.9	100.0
	99,722.0		100,974.0		374,362.0	
14.2	59,552.0	26.3	65,978.0	29.2	225,973.0	100.0
	(4,989.1)		(5,640.1)		(18,077.0)	
27.0	28,595.4	27.0	23,300.0	22.0	105,909.0	100.0
	(2,859.6)		(2,330.0)		(10,591.0)	
20.0	907.0	25.0	907.0	25.0	3,628.0	100.0
	(272.0)		(272.0)		(1,088.0)	
16.0	2,546.0	28.0	2,546.9	28.0	9,096.0	100.0
	8,120.7		8,242.1		29,756.0	
	−15,073.9		10,461.4		−17,197.1	
	−17.80%		9.39%		−4.81%	
					−18.39%	
20.0	83,361.6	23.7	109,741.8	31.2	351,736.6	100.0
	99,722.0		100,974.0		374,362.0	
14.2	59,552.0	26.3	65,978.0	29.2	225,973.0	100.0
	(4,989.1)		(5,640.1)		(18,077.0)	
27.0	28,595.4	27.0	23,300.0	22.0	105,909.0	100.0
	(2,859.6)		(2,330.0)		(10,591.0)	
20.0	907.0	25.0	907.0	25.0	3,628.0	100.0
	(272.0)		(272.0)		(1,088.0)	
16.0	2,546.9	28.0	2,546.9	28.0	9,096.0	100.0
	8,120.7		8,242.1		29,756.0	
	−16,360.1		8,767.8		−22,625.4	
	−19.62%		7.99%		−6.43%	
					−20.22%	
20.0	81,420.7	23.7	107,186.7	31.2	343,547.1	100.0
	99,722.0		100,974.0		374,362.0	
14.2	59,552.0	26.3	65,978.0	29.2	225,973.0	100.0
	(4,989.1)		(5,640.1)		(18,077.0)	
27.0	28,595.4	27.0	23,300.0	22.0	105,909.0	100.0
	(2,859.6)		(2,330.0)		(10,591.0)	
20.0	907.0	25.0	907.0	25.0	3,628.0	100.0
	(272.0)		(272.0)		(1,088.0)	
16.0	2,546.9	28.0	2,546.9	28.0	9,096.0	100.0
	8,120.7		8,242.1		29,756.0	
	−18,301.3		6,212.7		−30,814.9	
	−22.48%		5.80%		−8.97%	
					−23.09%	

** Assumptions :
A : Birth rate 1.9; Death rate 0.7; Emigration rate 0.3.
B : 1.9; 0.8; 0.4; C : 1.9; 0.8; 0.6;

TABLE 18. EMPLOYMENT DIAGRAM IN AGRICULTURE, 1968

In thousands of Man Productive Days (MPDs).

Assumption A of Labor Supply*	Output Projection / Yields Projection										Conservative Estimate										Optimistic Estimate									
	Fall		Winter		Spring		Summer		Annual		Fall		Winter		Spring		Summer		Annual		Fall		Winter		Spring		Summer		Annual	
	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%
1. Labor Available	89,867.2	25.1	71,607.3	20.0	84,854.6	23.7	111,707.4	31.2	358,036.5	100.0	89,867.2	25.1	71,607.3	20.0	84,854.6	23.7	111,707.4	31.2	358,036.5	100.0	89,867.2	25.1	71,607.3	20.0	84,854.6	23.7	111,707.4	31.2	358,036.5	100.0
2. Labor Required	104,430.5		71,873.8		101,525.5		101,073.8		378,903.6		102,224.0		66,204.0		96,612.0		97,443.0		362,483.0		105,646.0		67,855.0		99,753.0		100,730.0		373,984.0	
a. Farming	63,211.1	29.8	30,479.6	14.4	56,791.3	26.7	61,907.8	29.1	212,389.8	100.0	64,276.0	30.3	29,741.0	14.0	55,917.0	26.4	62,146.0	29.3	212,080.0	100.0	67,317.0	30.3	31,168.0	14.0	58,691.0	26.4	65,063.0	29.3	222,239.0	100.0
(Transport)	(5,056.9)		(2,438.4)		(4,543.4)		(4,952.6)		(16,991.3)		(5,293.0)		(1,697.0)		(4,683.0)		(5,293.0)		(16,966.0)		(5,547.0)		(1,778.0)		(4,907.0)		(5,547.0)		(17,779.0)	
b. Husbandry	28,114.6	23.8	31,894.5	27.0	31,776.5	26.9	26,342.6	22.3	118,128.2	100.0	26,219.0	24.0	29,496.0	27.0	29,496.0	27.0	24,035.0	22.0	109,246.0	100.0	26,335.0	24.0	29,626.0	27.0	29,626.0	27.0	24,140.0	22.0	109,727.0	100.0
(Transport)	(2,811.4)		(3,189.5)		(3,177.7)		(2,634.3)		(11,812.9)		(2,622.0)		(2,950.0)		(2,950.0)		(2,403.0)		(10,925.0)		(2,633.0)		(2,963.0)		(2,963.0)		(2,414.0)		(10,973.0)	
c. Forestry	1,578.5	25.0	1,578.5	25.0	1,578.5	25.0	1,578.5	25.0	6,314.0	100.0	1,141.0	30.0	760.0	20.0	950.0	25.0	951.0	25.0	3,802.0	100.0	1,141.0	30.0	760.0	20.0	950.0	20.0	951.0	25.0	3,802.0	100.0
(Transport)	(473.6)		(473.6)		(473.6)		(473.6)		(1,894.4)		(342.0)		(228.0)		(285.0)		(285.0)		(1,140.0)		(342.0)		(228.0)		(285.0)		(285.0)		(1,140.0)	
d. Fishing	3,184.4	28.0	1,819.7	16.0	3,184.5	28.0	3,184.4	28.0	11,373.0	100.0	2,331.0	28.0	1,332.0	16.0	2,331.0	28.0	2,330.0	28.0	8,324.0	100.0	2,331.0	28.0	1,332.0	16.0	2,331.0	16.0	2,330.0	28.0	8,324.0	100.0
e. Agricultural Transport	8,341.9		6,101.5		8,194.7		8,060.5		30,698.6		8,257.0		4,875.0		7,918.0		7,981.0		29,031.0		8,522.0		4,969.0		8,155.0		8,246.0		29,892.0	
3. Surplus Labor	−14,563.3		−266.5		−16,670.9		10,663.6		−20,867.1		−12,356.8		5,403.3		−11,757.4		14,264.4		−4,446.5		−15,778.8		3,752.3		−14,898.4		10,977.4		−15,947.5	
4. Rate of Surplus Labor	−16.20%		−0.37%		−19.65%		9.52%		−5.83%		−13.75%		7.55%		−13.85%		12.77%		−1.24%		−17.56%		5.24%		−17.56%		9.83%		−4.45%	
5. Rate of Chronic Surplus Labor									−19.65%										−13.85%										−17.56%	
Assumption B of Labor Supply																														
1. Labor Available	88,812.7	25.1	70,767.1	20.0	83,589.0	23.7	110,396.5	31.2	353,835.3	100.0	88,812.7	25.1	70,767.1	20.0	83,859.0	23.7	110,396.5	31.2	353,835.3	100.0	88,812.7	25.1	70,767.1	20.0	83,859.0	23.7	110,396.5	31.2	353,835.3	100.0
2. Labor Required	104,430.5		71,873.8		101,525.5		101,073.8		378,903.6		102,224.0		66,204.0		96,612.0		97,443.0		362,483.0		105,646.0		67,855.0		99,753.0		100,730.0		373,984.0	
a. Farming	63,211.1	29.8	30,479.6	14.4	56,791.3	26.7	61,907.8	29.1	212,389.8	100.0	64,276.0	30.3	29,741.0	14.0	55,917.0	26.4	62,146.0	29.3	212,080.0	100.0	67,317.0	30.3	31,168.0	14.0	58,691.0	26.4	65,063.0	29.3	222,239.0	100.0
(Transport)	(5,056.9)		(2,438.4)		(4,543.4)		(4,952.6)		(16,991.3)		(5,293.0)		(1,697.0)		(4,683.0)		(5,293.0)		(16,966.0)		(5,547.0)		(1,778.0)		(4,907.0)		(5,547.0)		(17,779.0)	
b. Husbandry	28,114.6	23.8	31,894.5	27.0	31,776.5	26.9	26,342.6	22.3	118,128.2	100.0	26,219.0	24.0	29,496.0	27.0	29,496.0	27.0	24,035.0	22.0	109,246.0	100.0	26,335.0	24.0	29,626.0	27.0	29,626.0	27.0	24,140.0	22.0	109,727.0	100.0
(Transport)	(2,811.4)		(3,189.5)		(3,177.7)		(2,634.3)		(11,812.9)		(2,622.0)		(2,950.0)		(2,950.0)		(2,403.0)		(10,925.0)		(2,633.0)		(2,963.0)		(2,963.0)		(2,414.0)		(10,973.0)	
c. Forestry	1,578.5	25.0	1,578.5	25.0	1,578.5	25.0	1,578.5	25.0	6,314.0	100.0	1,141.0	30.0	760.0	20.0	950.0	25.0	951.0	25.0	3,802.0	100.0	1,141.0	30.0	760.0	20.0	950.0	20.0	951.0	25.0	3,802.0	100.0
(Transport)	(473.6)		(473.6)		(473.6)		(473.6)		(1,894.4)		(342.0)		(228.0)		(285.0)		(285.0)		(1,140.0)		(342.0)		(228.0)		(285.0)		(285.0)		(1,140.0)	
d. Fishing	3,184.4	28.0	1,819.7	16.0	3,184.5	28.0	3,184.4	28.0	11,373.0	100.0	2,331.0	28.0	1,332.0	16.0	2,331.0	28.0	2,330.0	28.0	8,324.0	100.0	2,331.0	28.0	1,332.0	16.0	2,331.0	16.0	2,330.0	28.0	8,324.0	100.0
e. Agricultural Transport	8,341.9		6,101.5		8,194.7		8,060.5		30,698.6		8,257.0		4,875.0		7,918.0		7,981.0		29,031.0		8,522.0		4,969.0		8,155.0		8,246.0		29,892.0	
3. Surplus Labor	−15,617.8		−1,106.7		−17,666.5		9,322.7		−25,068.3		−13,411.3		4,563.1		−12,753.0		12,953.5		−8,647.7		−16,833.3		2,912.1		−15,894.0		9,666.5		−20,148.7	
4. Rate of Surplus Labor	−17.58%		−1.56%		−21.07%		8.44%		−7.08%		−15.10%		6.45%		−15.21%		11.73%		−2.44%		−18.95%		4.11%		−18.95%		8.76%		−5.92%	
5. Rate of Chronic Surplus Labor									−21.07%										−15.21%										−18.95%	
Assumption C of Labor Supply																														
1. Labor Available	87,260.0	25.1	69,529.9	20.0	82,393.0	23.7	108,466.6	31.2	347,649.5	100.0	87,260.0	25.1	69,529.9	20.0	82,393.0	23.7	108,466.6	31.2	347,649.5	100.0	87,260.0	25.1	69,529.9	20.0	82,393.0	23.7	108,466.6	31.2	347,649.5	100.0
2. Labor Required	104,430.5		71,873.8		101,525.5		101,073.8		378,903.6		102,224.0		66,204.0		96,612.0		97,443.0		362,483.0		105,646.0		67,855.0		99,753.0		100,730.0		373,984.0	
a. Farming	63,211.1	29.8	30,479.6	14.4	56,791.3	26.7	61,907.8	29.1	212,389.8	100.0	64,276.0	30.3	29,741.0	14.0	55,917.0	26.4	62,146.0	29.3	212,080.0	100.0	67,317.0	30.3	31,168.0	14.0	58,691.0	26.4	65,063.0	29.3	222,239.0	100.0
(Transport)	(5,056.9)		(2,438.4)		(4,543.4)		(4,952.6)		(16,991.3)		(5,293.0)		(1,697.0)		(4,683.0)		(5,293.0)		(16,966.0)		(5,547.0)		(1,778.0)		(4,907.0)		(5,547.0)		(17,779.0)	
b. Husbandry	28,114.6	23.8	31,894.5	27.0	31,776.5	26.9	26,342.6	22.3	118,128.2	100.0	26,219.0	24.0	29,496.0	27.0	29,496.0	27.0	24,035.0	22.0	109,246.0	100.0	26,335.0	24.0	29,626.0	27.0	29,626.0	27.0	24,140.0	22.0	109,727.0	100.0
(Transport)	(2,811.4)		(3,189.5)		(3,177.7)		(2,634.3)		(11,812.9)		(2,622.0)		(2,950.0)		(2,950.0)		(2,403.0)		(10,925.0)		(2,633.0)		(2,963.0)		(2,963.0)		(2,414.0)		(10,973.0)	
c. Forestry	1,578.5	25.0	1,578.5	25.0	1,578.5	25.0	1,578.5	25.0	6,314.0	100.0	1,141.0	30.0	760.0	20.0	950.0	25.0	951.0	25.0	3,802.0	100.0	1,141.0	30.0	760.0	20.0	950.0	20.0	951.0	25.0	3,802.0	100.0
(Transport)	(473.6)		(473.6)		(473.6)		(473.6)		(1,894.4)		(342.0)		(228.0)		(285.0)		(285.0)		(1,140.0)		(342.0)		(228.0)		(285.0)		(285.0)		(1,140.0)	
d. Fishing	3,184.4	28.0	1,819.7	16.0	3,184.5	28.0	3,184.4	28.0	11,373.0	100.0	2,331.0	28.0	1,332.0	16.0	2,331.0	28.0	2,330.0	28.0	8,324.0	100.0	2,331.0	28.0	1,332.0	16.0	2,331.0	16.0	2,330.0	28.0	8,324.0	100.0
e. Agricultural Transport	8,341.9		6,101.5		8,194.7		8,060.5		30,698.6		8,257.0		4,875.0		7,918.0		7,981.0		29,031.0		8,522.0		4,969.0		8,155.0		8,246.0		29,892.0	
3. Surplus Labor	−17,170.5		−2,343.9		−19,132.5		7,392.8		−31,254.1		−14,964.0		3,325.9		−14,219.0		11,023.6		−14,833.5		−18,386.0		1,674.9		−17,360.0		7,736.6		−26,334.5	
4. Rate of Surplus Labor	−19.67%		−3.37%		−23.22%		6.82%		−8.99%		−17.15%		4.78%		−17.26%		10.16%		−4.27%		−21.07%		2.41%		−21.06%		7.13%		−7.57%	
5. Rate of Chronic Surplus Labor									−23.22%										−17.26%										−21.07%	

* Assumptions:
A: Birth rate 1.9; Death rate 0.7; Emigration rate 0.3.
B: 1.9; 0.8; 0.4; C: 1.9; 0.8; 0.6;

TABLE 19 - EMPLOYMENT DIAGRAM IN AGRICULTURE, 1970

In thousands of Man Productive Days (MPDs).

	Output Projection / Yields Projection										Conservative Estimate										Optimistic Estimate							
Assumption A of Labor Supply*	Fall		Winter		Spring		Summer		Annual		Fall		Winter		Spring		Summer		Annual		Fall		Winter		Spring		Summer		Annual	
	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%
1. Labor Available	89,648.4	25.1	71,433.0	20.0	84,648.1	23.7	111,435.4	31.2	357,164.9	100.0	89,648.4	25.1	71,433.0	20.0	84,648.1	23.7	111,435.4	31.2	357,164.9	100.0	89,648.4	25.1	71,433.0	20.0	84,648.1	23.7	111,435.4	31.2	357,164.9	100.0
2. Labor Required	103,935.3		72,806.4		100,825.1		99,050.1		376,616.9		100,390.0		65,512.0		94,471.0		94,560.0		354,933.0		104,768.0		67,957.0		98,443.0		98,303.0		369,471.0	
a. Farming	62,970.9	29.8	31,696.8	15.0	56,420.3	26.7	60,223.9	28.5	211,311.9	100.0	63,276.0	30.4	29,995.0	14.4	54,698.0	26.3	60,013.0	28.9	207,982.0	100.0	66,965.0	30.4	31,905.0	14.5	57,966.0	26.3	63,098.0	28.9	219,934.0	100.0
(Transport)	(5,037.7)		(2,535.7)		(4,513.6)		(4,817.9)		(16,904.9)		(5,192.3)		(1,663.5)		(4,592.1)		(5,191.1)		(16,639.0)		(5,490.1)		(1,758.4)		(4,856.0)		(5,490.5)		(17,595.0)	
b. Husbandry	27,670.9	23.8	31,391.4	27.0	31,275.1	26.9	25,927.0	22.3	116,264.4	100.0	25,418.2	24.0	28,595.4	27.0	28,595.4	27.0	23,300.0	22.0	105,909.0	100.0	25,773.8	24.0	28,995.6	27.0	28,995.6	27.0	23,626.0	22.0	107,391.0	100.0
(Transport)	(2,767.1)		(3,139.1)		(3,127.5)		(2,592.7)		(11,626.4)		(2,541.8)		(2,859.6)		(2,859.6)		(2,330.0)		(10,591.0)		(2,577.4)		(2,899.5)		(2,899.5)		(2,362.6)		(10,739.0)	
c. Forestry	1,628.0	25.0	1,628.0	25.0	1,628.0	25.0	1,628.0	25.0	6,512.0	100.0	1,088.4	30.0	725.6	20.0	907.0	25.0	907.0	25.0	3,628.0	100.0	1,088.4	30.0	725.6	20.0	907.0	25.0	907.0	25.0	3,628.0	100.0
(Transport)	(488.4)		(488.4)		(488.4)		(488.4)		(1,953.6)		(326.4)		(217.6)		(272.0)		(272.0)		(1,088.0)		(326.4)		(217.6)		(272.0)		(272.0)		(1,088.0)	
d. Fishing	3,372.3	28.0	1,927.0	16.0	3,372.2	28.0	3,372.2	28.0	12,043.7	100.0	2,546.9	28.0	1,455.3	16.0	2,546.9	28.0	2,546.9	28.0	9,096.0	100.0	2,546.9	28.0	1,455.3	16.0	2,546.9	28.0	2,546.9	28.0	9,096.0	100.0
e. Agricultural Transport	8,293.2		6,163.2		8,129.5		7,899.0		30,484.9		8,060.5		4,740.7		7,723.7		7,793.1		28,318.0		8,393.9		4,875.5		8,027.5		8,125.1		29,422.0	
3. Surplus Labor	-14,286.9		-1,373.4		-16,177.0		12,385.3		-19,452.0		-10,741.6		5,921.0		-9,822.9		16,875.4		2,231.9		-15,119.6		3,476.0		-13,794.9		13,132.4		-12,306.1	
4. Rate of Surplus Labor	-15.94%		-1.92%		-19.11%		11.11%		-5.44%		-11.99%		8.29%		-11.60%		15.14%		0.63%		-16.87%		4.87%		-16.30%		11.78%		-3.45%	
5. Rate of Chronic Surplus Labor									-19.11%										-11.99%										-16.87%	
Assumption B of Labor Supply																														
1. Labor Available	88,285.9	25.1	70,347.3	20.0	83,361.6	23.7	109,741.8	31.2	351,736.6	100.0	88,285.9	25.1	70,347.3	20.0	83,361.6	23.7	109,741.8	31.2	351,736.6	100.0	88,285.9	25.1	70,347.3	20.0	83,361.6	23.7	109,741.8	31.2	351,736.6	100.0
2. Labor Required	103,935.3		72,806.4		100,825.1		99,050.1		376,616.9		100,390.0		65,512.0		94,471.0		94,560.0		354,933.0		104,768.0		67,957.0		98,443.0		98,303.0		369,471.0	
a. Farming	62,970.9	29.8	31,696.8	15.0	56,420.3	26.7	60,223.9	28.5	211,311.9	100.0	63,276.0	30.4	29,995.0	14.4	54,698.0	26.3	60,013.0	28.9	207,982.0	100.0	66,965.0	30.4	31,905.0	14.5	57,966.0	26.3	63,098.0	28.9	219,934.0	100.0
(Transport)	(5,037.7)		(2,535.7)		(4,513.6)		(4,817.9)		(16,904.9)		(5,192.3)		(1,663.5)		(4,592.1)		(5,191.1)		(16,639.0)		(5,490.1)		(1,758.4)		(4,856.0)		(5,490.5)		(17,595.0)	
b. Husbandry	27,670.9	23.8	31,391.4	27.0	31,275.1	26.9	25,927.0	22.3	116,264.4	100.0	25,418.2	24.0	28,595.4	27.0	28,595.4	27.0	23,300.0	22.0	105,909.0	100.0	25,773.8	24.0	28,995.6	27.0	28,995.6	27.0	23,626.0	22.0	107,391.0	100.0
(Transport)	(2,767.1)		(3,139.1)		(3,127.5)		(2,592.7)		(11,626.4)		(2,541.8)		(2,859.6)		(2,859.6)		(2,330.0)		(10,591.0)		(2,577.4)		(2,899.5)		(2,899.5)		(2,362.6)		(10,739.0)	
c. Forestry	1,628.0	25.0	1,628.0	25.0	1,628.0	25.0	1,628.0	25.0	6,512.0	100.0	1,088.4	30.0	725.6	20.0	907.0	25.0	907.0	25.0	3,628.0	100.0	1,088.4	30.0	725.6	20.0	907.0	25.0	907.0	25.0	3,628.0	100.0
(Transport)	(488.4)		(488.4)		(488.4)		(488.4)		(1,953.6)		(326.4)		(217.6)		(272.0)		(272.0)		(1,088.0)		(326.4)		(217.6)		(272.0)		(272.0)		(1,088.0)	
d. Fishing	3,372.3	28.0	1,927.0	16.0	3,372.2	28.0	3,372.2	28.0	12,043.7	100.0	2,546.9	28.0	1,455.3	16.0	2,546.9	28.0	2,546.9	28.0	9,096.0	100.0	2,546.9	28.0	1,455.3	16.0	2,546.9	28.0	2,546.9	28.0	9,096.0	100.0
e. Agricultural Transport	8,293.2		6,163.2		8,129.5		7,899.0		30,484.9		8,060.5		4,740.7		7,723.7		7,793.1		28,318.0		8,393.9		4,875.5		8,027.5		8,125.1		29,422.0	
3. Surplus Labor	-15,649.4		-2,459.1		-17,463.5		10,691.7		-24,880.3		-12,104.1		4,835.3		-11,109.4		15,181.8		-3,196.4		-16,482.1		2,390.3		-15,081.4		11,438.8		-17,734.0	
4. Rate of Surplus Labor	-17.73%		-3.49%		-20.95%		9.74%		-7.07%		-13.71%		6.87%		-13.32%		13.83%		-0.91%		-18.67%		3.40%		-18.09%		10.42%		-5.04%	
5. Rate of Chronic Surplus Labor									-20.95%										-13.71%										-18.67%	
Assumption C of Labor Supply																														
1. Labor Available	86,230.3	25.1	68,709.4	20.0	81,420.7	23.7	107,186.7	31.2	343,547.1	100.0	86,230.3	25.1	68,709.4	20.0	81,420.7	23.7	107,186.7	31.2	343,547.1	100.0	86,230.3	25.1	68,709.4	20.0	81,420.7	23.7	107,186.7	31.2	343,547.1	100.0
2. Labor Required	103,935.3		72,806.4		100,825.1		99,050.1		376,616.9		100,390.0		65,512.0		94,471.0		94,560.0		354,933.0		104,768.0		67,957.0		98,443.0		98,303.0		369,471.0	
a. Farming	62,970.9	29.8	31,696.8	15.0	56,420.3	26.7	60,223.9	28.5	211,311.9	100.0	63,276.0	30.4	29,995.0	14.4	54,698.0	26.3	60,013.0	28.9	207,982.0	100.0	66,965.0	30.4	31,905.0	14.5	57,966.0	26.3	63,098.0	28.9	219,934.0	100.0
(Transport)	(5,037.7)		(2,535.7)		(4,513.6)		(4,817.9)		(16,904.9)		(5,192.3)		(1,663.5)		(4,592.1)		(5,191.1)		(16,639.0)		(5,490.1)		(1,758.4)		(4,856.0)		(5,490.5)		(17,595.0)	
b. Husbandry	27,670.9	23.8	31,391.4	27.0	31,275.1	26.9	25,927.0	22.3	116,264.4	100.0	25,418.2	24.0	28,595.4	27.0	28,595.4	27.0	23,300.0	22.0	105,909.0	100.0	25,773.8	24.0	28,995.6	27.0	28,995.6	27.0	23,626.0	22.0	107,391.0	100.0
(Transport)	(2,767.1)		(3,139.1)		(3,127.5)		(2,592.7)		(11,626.4)		(2,541.8)		(2,859.6)		(2,859.6)		(2,330.0)		(10,591.0)		(2,577.4)		(2,899.5)		(2,899.5)		(2,362.6)		(10,739.0)	
c. Forestry	1,628.0	25.0	1,628.0	25.0	1,628.0	25.0	1,628.0	25.0	6,512.0	100.0	1,088.4	30.0	725.6	20.0	907.0	25.0	907.0	25.0	3,628.0	100.0	1,088.4	30.0	725.6	20.0	907.0	25.0	907.0	25.0	3,628.0	100.0
(Transport)	(488.4)		(488.4)		(488.4)		(488.4)		(1,953.6)		(326.4)		(217.6)		(272.0)		(272.0)		(1,088.0)		(326.4)		(217.6)		(272.0)		(272.0)		(1,088.0)	
d. Fishing	3,372.3	28.0	1,927.0	16.0	3,372.2	28.0	3,372.2	28.0	12,043.7	100.0	2,546.9	28.0	1,455.3	16.0	2,546.9	28.0	2,546.9	28.0	9,096.0	100.0	2,546.9	28.0	1,455.3	16.0	2,546.9	28.0	2,546.9	28.0	9,096.0	100.0
e. Agricultural Transport	8,293.2		6,163.2		8,129.5		7,899.0		30,484.9		8,060.5		4,740.7		7,723.7		7,793.1		28,318.0		8,393.9		4,875.5		8,027.5		8,125.1		29,422.0	
3. Surplus Labor	-17,705.0		-4,097.0		-19,404.4		8,136.6		-33,069.8		14,159.7		3,197.4		-13,050.3		12,626.7		-11,385.0		-18,537.7		752.4		-17,022.3		8,883.7		-25,923.9	
4. Rate of Surplus Labor	-20.53%		-5.96%		-23.83%		7.59%		-9.63%		16.42%		4.65%		-16.02%		11.78%		-3.31%		-21.49%		1.09%		-20.91%		8.29%		-7.55%	
5. Rate of Chronic Surplus Labor									-23.83%										-16.42%										-21.49%	

* Assumptions:
A: Birth rate 1.9; Death rate 0.7; Emigration rate 0.3.
B: 1.9; 0.8; 0.4; C: 1.9; 0.8; 0.6.

TABLE 20. EMPLOYMENT DIAGRAM IN AGRICULTURE, 1973

In thousands of Man Productive Days (MPDs).

Assumption A of Labor Supply*	Output Projection / Yields Projection										Conservative Estimate										Optimistic Estimate									
	Fall		Winter		Spring		Summer		Annual		Fall		Winter		Spring		Summer		Annual		Fall		Winter		Spring		Summer		Annual	
	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%	MPDs	%
1. Labor Available	89,590.3	25.1	71,386.7	20.0	84,593.3	23.7	111,363.3	31.2	356,933.6	100.0	89,590.3	25.1	71,386.7	20.0	84,593.3	23.7	111,363.3	31.2	356,933.6	100.0	89,590.3	25.1	71,386.7	20.0	84,593.3	23.7	111,363.3	31.2	356,933.6	100.0
2. Labor Required	106,665.9		76,076.3		102,954.0		100,253.4		385,949.6		99,362.0		65,530.0		92,618.0		92,191.0		349,701.0		102,212.0		67,434.0		95,811.0		95,097.0		360,554.0	
a. Farming	63,944.2	29.9	33,239.1	15.6	56,706.3	26.5	59,845.7	28.0	213,735.3	100.0	62,417.0	30.7	30,151.0	14.8	52,989.0	26.1	57,780.0	28.4	203,337.0	100.0	64,426.0	30.6	31,261.0	14.8	55,282.0	26.2	59,899.0	28.4	210,868.0	100.0
(Transport)	(5,115.5)		(2,659.1)		(4,536.5)		(4,787.7)		(17,098.8)		(5,075.0)		(1,627.0)		(4,490.0)		(5,075.0)		(16,267.0)		(5,263.0)		(1,687.0)		(4,656.0)		(5,263.0)		(16,869.0)	
b. Husbandry	28,650.6	23.8	32,502.9	27.0	32,382.5	26.9	26,845.0	22.3	120,381.0	100.0	25,320.0	24.0	28,485.5	27.0	28,485.5	27.0	23,210.0	22.0	105,501.0	100.0	25,913.6	24.0	29,152.7	27.0	29,152.7	27.0	23,754.6	22.0	107,973.6	100.0
(Transport)	(2,865.1)		(3,250.3)		(3,238.2)		(2,684.5)		(12,038.1)		(2,532.0)		(2,848.5)		(2,848.5)		(2,321.0)		10,550.0		(2,591.4)		(2,915.3)		(2,915.3)		(2,375.4)		(10,797.4)	
c. Forestry	1,695.6	25.0	1,695.5	25.0	1,695.6	25.0	1,695.5	25.0	6,782.2	100.0	984.6	30.0	656.9	20.0	820.8	25.0	820.7	25.0	3,283.0	100.0	984.6	30.0	656.9	20.0	820.8	25.0	820.7	25.0	3,283.0	100.0
(Transport)	(508.6)		(508.7)		(508.6)		(508.7)		(2,034.6)		(295.4)		(197.1)		(246.2)		(246.3)		(985.0)		(295.4)		(197.1)		(246.2)		(246.3)		(985.0)	
d. Fishing	3,886.3	28.0	2,220.7	16.0	3,886.3	28.0	3,886.3	28.0	13,879.6	100.0	2,738.0	28.0	1,564.0	16.0	2,738.0	28.0	2,738.0	28.0	9,778.0	100.0	2,738.0	28.0	1,564.0	16.0	2,738.0	28.0	2,738.0	28.0	9,778.0	100.0
e. Agricultural Transport	8,489.2		6,418.1		8,283.3		7,980.9		31,171.5		7,902.4		4,672.6		7,584.7		7,642.3		27,802.0		8,149.8		4,799.4		7,817.5		7,884.7		28,651.4	
3. Surplus Labor	−17,075.6		−4,689.6		−18,360.7		11,109.9		−29,016.0		−9,771.7		5,856.7		−8,024.7		19,172.3		7,232.6		−12,621.7		3,952.7		−11,217.7		16,266.3		−3,620.4	
4. Rate of Surplus Labor	−19.06%		−6.57%		−21.70%		9.98%		−8.13%		−10.92%		8.20%		−9.49%		17.22%		2.03%		−14.09%		5.54%		−13.26%		14.61%		−1.01%	
5. Rate of Chronic Surplus Labor									−21.70%										−10.92%										−14.09%	
Assumption B of Labor Supply																														
1. Labor Available	87,797.6	25.1	69,958.3	20.0	82,900.5	23.7	109,134.8	31.2	349,791.2	100.0	87,797.6	25.1	69,958.3	20.0	82,900.5	23.7	109,134.8	31.2	349,791.2	100.0	87,797.6	25.1	69,958.3	20.0	82,900.5	23.0	109,134.8	31.2	349,791.2	100.0
2. Labor Required	106,665.9		76,076.3		102,954.0		100,253.4		385,949.6		99,362.0		65,530.0		92,618.0		92,191.0		349,701.0		102,212.0		67,434.0		95,811.0		95,097.0		360,554.0	
a. Farming	63,944.2	29.9	33,239.1	15.6	56,706.3	26.5	59,845.7	28.0	213,735.3	100.0	62,417.0	30.7	30,151.0	14.8	52,989.0	26.1	57,780.0	28.4	203,337.0	100.0	64,426.0	30.6	31,261.0	14.8	55282.0	26.2	59,899.0	28.4	210,868.0	100.0
(Transport)	(5,115.5)		(2,659.1)		(4,536.5)		(4,787.7)		(17,098.8)		(5,075.0)		(1,627.0)		(4,490.0)		(5,075.0)		(16,267.0)		(5,263.0)		(1,687.0)		(4,656.0)		(5,263.0)		(16,869.0)	
b. Husbandry	28,650.6	23.8	32,502.9	27.0	32,382.5	26.9	26,845.0	22.3	120,381.0	100.0	25,320.0	24.0	28,485.5	27.0	28,485.5	27.0	23,210.0	22.0	105,501.0	100.0	25,913.6	24.0	29,152.7	27.0	29,152.7	27.0	23,754.6	22.0	107,973.6	100.0
(Transport)	(2,865.1)		(3,250.3)		(3,238.2)		(2,684.5)		(12,038.1)		(2,532.0)		(2,848.5)		(2,848.5)		(2,321.0)		(10,550.0)		(2,591.4)		(2,915.3)		(2,915.3)		(2,375.4)		(10,797.4)	
c. Forestry	1,695.6	25.0	1,695.5	25.0	1,695.6	25.0	1,695.5	25.0	6,782.2	100.0	984.6	30.0	656.9	20.0	820.8	25.0	820.7	25.0	3,283.0	100.0	984.6	30.0	656.9	20.0	820.8	25.0	820.7	25.0	3,283.0	100.0
(Transport)	(508,6)		(508.7)		(508.6)		(508.7)		(2,034.6)		(295.4)		(197.1)		(246.2)		(246.3)		(985.0)		(295.4)		(197.1)		(246.2)		(246.3)		(985.0)	
d. Fishing	3,886.3	28.0	2,220.7	16.0	3,886.3	28.0	3,886.3	28.0	13,879.6	100.0	2,738.0	28.0	1,564.0	16.0	2,738.0	28.0	2,738.0	28.0	9,778.0	100.0	2,738.0	28.0	1,564.0	16.0	2,738.0	28.0	2,738.0	28.0	9,778.0	100.0
e. Agricultural Transport	8,489.2		6,418.1		8,283.3		7,980.9		31,171.5		7,902.4		4,672.6		7,584.7		7,642.3		27,802.0		8,149.8		4,799.4		7,817.5		7,884.7		28,651.4	
3. Surplus Labor	−18,868.3		−6,118.0		−20,053.5		8,881.4		−36,158.4		−11,564.4		4,428.3		−9,717.5		16,943.8		90.2		−14,414.4		2,524.3		−12,910.5		14,037.8		−10,762.8	
4. Rate of Surplus Labor	−21.49%		−8.75%		−24.19%		8.14%		−10.34%		−13.17%		6.33%		−11.72%		15.53%		0.03%		−16.42%		3.61%		−15.57%		12.86%		−3.22%	
5. Rate of Chronic Surplus Labor									−24.19%										−13.17%										−16.42%	
Assumption C of Labor Supply																														
1. Labor Available	85,035.8	25.1	67,757.6	20.0	80,292.8	23.7	105,701.8	31.2	338,788.0	100.0	85,035.8	25.1	67,757.6	20.0	80,292.8	23.7	105,701.8	31.2	338,788.0	100.0	85,035.8	25.1	67,757.6	20.0	80,292.8	23.7	105,701.8	31.2	338,788.0	100.0
2. Labor Required	106,665.9		76,076.3		102,954.0		100,253.4		385,949.6		99,362,0		65,530.0		92,618.0		92,191.0		349,701.0		102,212.0		67,434.0		95,811.0		95,097.0		360,554.0	
a. Farming	63,944.2	29.9	33,239.1	15.6	56,706.3	26.5	59,845.7	28.0	213,735.3	100.0	62,417.0	30.7	30,151.0	14.8	52,989.0	26.1	57,780.0	28.4	203,337.0	100.0	64,426.0	30.6	31,261.0	14.8	55,282.0	26.2	59,899.0	28.4	210,868.0	100.0
(Transport)	(5,115.5)		(2,659.1)		(4,536.5)		(4,787.7)		(17,098.8)		(5,075.0)		(1,627.0)		(4,490.0)		(5,075.0)		(16,267.0)		(5,263.0)		(1,687.0)		(4,656.0)		(5,263.0)		(16,869.0)	
b. Husbandry	28,650.6	23.8	32,502.9	27.0	32,382.5	26.9	26,845.0	22.3	120,381.0	100.0	25,320.0	24.0	28,485.5	27.0	28,485.5	27.0	23,210.0	22.0	105,501.0	100.0	25,913.6	24.0	29,152.7	27.0	29,152.7	27.0	23,754.6	22.0	107,973.6	100.0
(Transport)	(2,865.1)		(3,250.3)		(3,238.2)		(2,684.5)		(12,038.1)		(2,532.0)		(2,848.5)		(2,848.5)		(2,321.0)		(10,550.0)		(2,591.4)		(2,915.3)		(2,915.3)		(2,375.4)		(10,797.4)	
c. Forestry	1,695.6	25.0	1,695.5	25.0	1,695.6	25.0	1,695.5	25.0	6,782.2	100.0	984.6	30.0	656.9	20.0	820.8	25.0	820.7	25.0	3,283.0	100.0	984.6	30.0	656.9	20.0	820.8	25.0	820.7	25.0	3,283.0	100.0
(Transport)	(508.6)		(508.7)		(508.6)		(508.7)		(2,034.6)		(295.4)		(197.1)		(246.2)		(246.3)		(985.0)		(295.4)		(197.1)		(246.2)		(246.3)		(985.0)	
d. Fishing	3,886.3	28.0	2,220.7	16.0	3,886.3	28.0	3,886.3	28.0	13,879.6	100.0	2,738.0	28.0	1,564.0	16.0	2,738.0	28.0	2,738.0	28.0	9,778.0	100.0	2,738.0	28.0	1,564.0	16.0	2,738.0	28.0	2,738.0	28.0	9,778.0	100.0
e. Agricultural Transport	8,489.2		6,418.1		8,283.3		7,980.9		31,171.5		7,902.4		4,672.6		7,584.7		7,642.3		27,802.0		8,149.8		4,799.4		7,817.5		7,884.7		28,651.4	
3. Surplus Labor	−21,630.1		−8,318.7		−22,661.2		5,448.4		−47,161.6		−14,326.2		2,227.6		−12,325.2		13,510.8		−10,913.0		−17,176.2		323.6		−15,518.2		10,604.8		−21,766.0	
4. Rate of Surplus Labor	−25.44%		−12.28%		−28.22%		5.15%		−13.92%		−16.85%		3.29%		−15.35%		12.78%		−3.22%		−20.20%		0.48%		−19.32%		10.03%		−6.42%	
5. Rate of Chronic Surplus Labor									−28.22%										−16.85%										−20.20%	

* Assumptions:
A: Birth rate 1.9; Death rate 0.7; Emigration rate 0.3.
B: 1.9; 0.8; 0.4; C: 1.9; 0.8; 0.6.