

**WORLD-WIDE ESTIMATES AND
PROJECTIONS OF THE AGRICULTURAL
POPULATION
AND LABOUR FORCE**

1950-2010



**Statistical Analysis Service
Statistics Division
Economic and Social Department
FAO, Rome, 2000**

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Foreword

This report summarizes the results of the latest work of the FAO Statistics Division in world-wide estimates and projections of the agricultural population and labour force 1950-2010. The work, as in the past, has been carried out as part of the combined inter-agency programme in the field of global demographic estimates and projections. It includes a description of the data sources and the methodology employed. The results are presented at the global and regional levels only whereas the detailed country information is available on-line through the FAOSTAT website (<http://apps.Fao.org>).

The document was prepared under the general supervision of Mr. L. Naiken, Chief, Statistical Analysis Service (ESSA). The methodological work was undertaken by Mr. L. Naiken with the assistance of Mr. E. Ruhumuliza while the projections were prepared by a team composed of Mr. E. Ruhumuliza, Statistician and Ms. A. Chinappi-Favilli, Research Assistant and led by Mr. J. Mernies, Senior Officer. Computational support was provided by F. Vizioli-De Meo and secretarial support, by Ms. G. Marciani-Politi.

L. Kabat

Director of the Statistics Division

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1. Introduction

This document is the fourth edition of FAO's long-term estimates and projections of agricultural population and labour force. The first edition was distributed in 1972, the second in 1978 and the third in 1988. It thus supersedes the previous publications.

The work, as in the past, has been carried out as part of the combined inter-agency programme in the field of global demographic estimates and projections. Estimates and projections of the total population were prepared in 1998 by the United Nations Population Division (UN, 1999) and the estimates and projections of labour force participation rates by ILO Bureau of Statistics (ILO, 1997). These two sets of data have been used for the preparation of the present estimates and projections of the agricultural population and labour force. The UN total population projections are given in terms of four variants - high, medium, low and constant. However, the medium variant, which reflects the most probable course of events, is chosen for the purpose of deriving the projections of the economically active population and the agricultural population segments. The historical series, as in the past editions, go back as far as 1950. However, in conformity with the latest ILO assessment, the projections extend up to the year 2010 only.

This document is divided into five major parts, presented as follows: section 2 presents the benchmark estimates (sources of data and underlying concepts, definitions and methods), section 3 discusses the methodology for projections, and section 4 provides an overview of the results. Annex 1 includes a discussion on the procedure used for cases when the general projection model could not be applied systematically. Annex 2 presents the results for the world, developed regions, developing regions and continents according to the FAO classification.

2. Benchmark estimates: sources of data, concepts, definitions and methods

2.1 The economically active population in agriculture

The economically active population in agriculture results from the classification of the economically active population (or labour force) by major branches of economic activity or sectors of the economy, i.e. agriculture, industry and services. Therefore, the series of benchmark estimates referring to 1950, 1960, 1970, 1980 and 1990, as in the past, have been prepared by the ILO as part of its work on estimates and projections of the economically active population (ILO, 1996). The estimates conform to a standard concept of the economically active population that is defined to comprise all employed and unemployed persons (including those seeking work for the first time). The categories covered by this concept are employers, persons working for their own account, salaried employees, wage earners, unpaid family workers, members of producers' co-operatives and members of the armed forces¹.

The economically active population in agriculture therefore refers to the persons engaged in or seeking work in agricultural activities, the latter covering crop and livestock production, hunting, fishery or forestry. Those engaged or seeking work in the other sectors are considered as economically active in non-agriculture.

¹ The definition retained for the economically active population is that adopted by the 13th International Conference of Labour Statisticians in 1982. For details, see '*Current international recommendations on labour statistics: 1988 edition*', ILO, Geneva 1988.

The present series of estimates take into account information on the economically active population obtained from national population censuses, labour force sample surveys and related surveys carried out during the period 1945-1995. Data from the national surveys have been systematically evaluated and adjusted by the ILO prior to deriving estimates of the economically active that are consistent with total population figures given by the UN assessment. The latter process, in brief, involved the following steps:

- (i) On the basis of the evaluated and adjusted data, a set of sex-age specific activity rates corresponding to each reference year were derived. These were then applied to the corresponding total population estimates by sex and age emanating from the UN assessment to obtain the economically active population by sex and age.
- (ii) Sex-specific proportions of the economically active population engaged in agriculture, industry and services, also derived for each reference period on the basis of the evaluated and adjusted data, were applied to the estimated total economically active population by sex to obtain the absolute numbers engaged in the three sectors by sex.

2.2 The agricultural population

The agricultural population refers to the total number of persons that depend on agriculture for their livelihood. In other words, it consists of the persons economically active in agriculture as well as their non-working dependants. Needless to say, the residual from the total population is taken as the non-agricultural population.

The concept of agricultural population was defined in the UN recommendations for the 1950 and 1960 population censuses (UN, 1958 and UN, 1967) as resulting from the classification of all individuals according to the sector of the economy on which they depend for their livelihood. However, judging from the countries' response to the earlier UN Statistical Office questionnaires relating to population censuses, very few countries or territories have obtained the appropriate data. This is partly a reflection of the practical difficulties encountered in applying the sectoral dependency concept, which involves the identification of the sector of the economy to which not only the economically active but also the non-working dependants belong. In fact the concept was no longer included in the subsequent UN recommendations for population censuses.

A similar fate befell the related concept of farm population that is applied in connection with agricultural censuses. Farm population was defined as the population living on agricultural holdings or in the households of the agricultural holders in the 1960 and 1970 Programmes for the Agricultural Censuses (FAO, 1957 and FAO, 1965). However, compared with the concept of agricultural population, farm population excludes agricultural labourers and their dependants who live outside the agricultural holdings or outside the holders' households. On the other hand, it includes people living on or operating small holdings, although their main economic activity is outside agriculture. For these reasons, the concept has proved to be of little use as a measure of the agricultural population and it was decided to drop any reference to it in the FAO's 1980 and 1990 Programmes for the Agricultural Censuses.

However, because of the importance of obtaining an adequate measure of the size of the agricultural population, FAO has issued a publication dealing with the appropriate methods for collecting the data in connection with censuses and/or surveys (FAO, 1978b). But no tangible results have been forthcoming. It is recognised that the population census is more appropriate than the agricultural census as a vehicle for collecting data on the agricultural and non-agricultural population but there is a reluctance to overburden the population census schedules with additional questions that are needed to properly identify the dependants on agriculture.

Thus, the present situation is still characterised, for the large majority of countries or territories, by a lack of appropriate or up-to-date data on the agricultural population, and hence the non-agricultural population. Therefore, the previous approach of deriving estimates on the basis of the agricultural/non-agricultural sector distributions of the economically active population continues to be employed. This procedure is described below.

2.3 Deriving the agricultural population

Activity rates link the economically active population to the total population. Thus, given the activity rate and the economically active population, the parent population can be estimated. The derivation of the agricultural population is based on this principle and on the disaggregation of the activity rate by agricultural and non-agricultural sectors. For the purpose of illustrating the procedure, the following notations are employed:

AP	=	agricultural population
NP	=	non-agricultural population
TP	=	total population
EAPA	=	economically active population in agriculture
EAPN	=	economically active population in non-agriculture
TEAP	=	total economically active population

It should be noted that TP, EAPA, EAPN and TEAP are given or fixed by the UN and ILO assessments. Thus, in order to derive the AP and NP values that sum up to the fixed TP, one must obtain an estimate of the ratio AP/TP (or NP/TP) that can be applied to the total population as estimated by the UN. For this purpose the activity rate of the agricultural population (c_a) and that of the non-agricultural population (c_n) are defined as follows:

$$c_a = \frac{EAPA}{AP}$$

and

$$c_n = \frac{EAPN}{NP}$$

The overall activity rate is given by:

$$c_t = \frac{TEAP}{TP} = \frac{EAPA + EAPN}{AP + NP}$$

Thus

$$AP = EAPA \times \frac{1}{c_a}$$

and

$$NP = EAPN \times \frac{1}{c_n}$$

so that

$$\frac{AP}{NP} = \frac{EAPA}{EAPN} \times \frac{c_n}{c_a} \dots\dots\dots (1)$$

Since $AP + NP = TP$, one can also express AP/TP as follows:

$$\frac{AP}{TP} = \frac{EAPA \cdot m}{EAPA \cdot m + EAPN} \dots\dots\dots (2)$$

where m is equal to c_n / c_a .

By dividing both the numerator and the denominator of the right-hand side of (2) by $TEAP$, taking into account the fact that $EAPA + EAPN = TEAP$ and linking AP/TP with $EAPA/TEAP$ and m , we obtain the following equation:

$$\begin{aligned} \frac{AP}{TP} &= \frac{(EAPA / TEAP) m}{(EAPA / TEAP) m + (1 - EAPA / TEAP)} \\ &= \frac{(EAPA / TEAP) m}{(EAPA / TEAP) m + (1 - EAPA / TEAP)} \dots\dots\dots (3) \end{aligned}$$

Thus, the proportion of agricultural population in the total population, can be determined on the basis of the proportion of the economically active population in agriculture, $EAPA/TEAP$, and the agricultural/non-agricultural activity rate differential m . $EAPA/TEAP$ is known from the ILO assessment so that the problem reduces to one of fixing the value of m . The latter will be equal to 1 if $c_a = c_n = c_t$. Deviations from 1 will depend on the difference between c_a and c_n . However, since the difference cannot be too large, m will vary within a narrow range around 1.

It has been possible to estimate m directly only for the few countries where data on AP and NP are available. However, since most of the agricultural population normally resides in rural areas, and most of the non-agricultural population in urban areas, m may be approximated by the ratio of the activity rate of the urban population (c_u) to that of the rural population (c_r). This approximation has been applied in the case of a large number of countries or territories for which population census data on the urban and rural population and the corresponding economically active population have been published in the UN Demographic Yearbooks.

It must, however, be pointed out that the available data for estimating or approximating m in the above-mentioned countries or territories² generally referred to one census point spread within the benchmark period. Therefore, it was not possible to assess changes over time in m . Furthermore, the inter-country differences did not exhibit any particular pattern that could assist in making approximate time adjustments. In view of this, the single estimate of m was applied to all the time points. In the few cases where it was possible to obtain m value corresponding to two census points, the average was applied. In other words, m was assumed to have remained constant over time. This assumption, is, however, not likely to be of major consequence since the variation in m among countries was found to be rather small - generally between 0.9 and 1.1 - and large shifts cannot be expected over time.

For the large majority of countries or territories there was no basis to allow for a difference in the activity rates, so m was taken to be equal to 1. Under this condition, the relationship (3) reduces to the following:

$$\frac{AP}{TP} = \frac{EAPA}{TEAP} \dots\dots\dots (4)$$

The assumption of equality in the activity rates obviously implies a greater approximation in the estimates of the ratio AP/TP . In Table 1, the difference between AP/TP and $EAPA/TEAP$ for various combinations of m and $EAPA/TEAP$ are shown. These provide an indication of the possible magnitude and direction of the error involved, should m deviate from 1 within the given range.

Table 1. Difference between AP/TP and EAPA/TEAP for various combinations of m and EAPA/TEAP

m	EAPA/TEAP						
	0.95	0.90	0.70	0.50	0.30	0.10	0.05
0.90	-0.005	-0.010	-0.023	-0.026	-0.022	-0.009	-0.005
0.95	-0.002	-0.005	-0.011	0.013	-0.011	-0.005	-0.002
1.00	-	-	-	-	-	-	-
1.05	0.002	-0.004	0.010	-0.012	0.010	0.004	0.002
1.10	0.004	0.008	0.020	0.024	0.024	0.009	0.005

It is observed that the difference between AP/TP and $EAPA/TEAP$ is actually very small for moderate deviations of m from 1. For a fixed m value the maximum difference occurs when $EAPA/TEAP$ is 0.5. Even at this level a 10% deviation from 1 in m leads to an absolute difference of less than 0.03 between AP/TP and $EAPA/TEAP$.

² Countries or territories where m was estimated either on the basis of c_a and c_n or c_u and c_r are the following: Algeria, Argentina, Bolivia, Brazil, Bulgaria, Cameroon, Canada, Chile, Colombia, Costa Rica, Cuba, Djibouti, Dominican Rep., Ecuador, Egypt, El Salvador, Finland, Ghana, Greece, Guam, Guatemala, Haiti, Honduras, Hungary, India, Indonesia, Iran, Japan, Kazakhstan, Lithuania, Luxembourg, Macao, Malawi, Malaysia, Maldives, Mauritius, Mexico, Morocco, Mozambique, Namibia, New Zealand, Nicaragua., Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Rep Korea, Romania, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Turkey, Uganda, Ukraine, Uruguay, Us Virgin Is., USA, Utd Rep. Of Tanzania, Vanuatu, Venezuela.

3. Methodology for projections

3.1 Agricultural labour force projections

FAO's projections of the agricultural labour force by sex are obtained by applying projections of the agricultural sector proportion of the labour force by sex to the ILO projections of the total economically active population by sex. Thus the key problem in projecting the agricultural labour force concerns the estimation of the future change in the sectoral ratio (proportion) which mainly reflects the shift of population or labour from the agricultural sector. FAO's methodology in this context has traditionally been one of attempting to extrapolate the past trends on the basis of a suitable statistical model. The model which was applied in connection with the previous projection exercise (FAO, 1988) has been reviewed and improved as discussed below.

A two sector (agricultural/non-agricultural) model implying a continuous but restricted growth in the non-agricultural share (and hence a continuous but restricted decline in the agricultural share) has been adopted for the purpose of deriving projections of the share of the agricultural population or labour force.

If p is taken as the non-agricultural sector share and $(1-p)$ as the agricultural sector share, the projection model has been expressed by the following differential equation:

$$dp / dt = kp(1 - p) \quad \text{..... (5)}$$

where $k > 0$

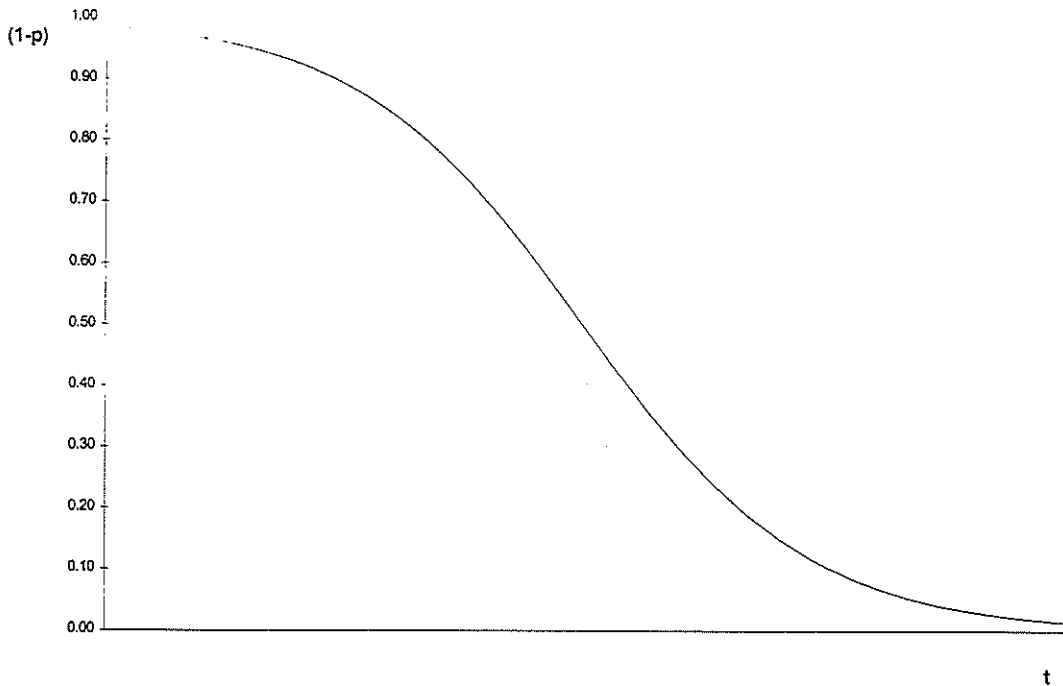
which postulates a continuous growth in p within the range of 0 and 1 (or a continuous decline in $(1-p)$ within the range of 1 and 0).

The left hand side of (5), i.e. dp/dt , can in the discrete case be taken to represent the absolute annual increase in p (or the annual decrease in $(1-p)$). If one disregards the effects of the possible existence of a difference in the rate of natural increase of the agricultural and non-agricultural sectoral groups, the absolute annual change in p or $(1-p)$, i.e. dp/dt , can be regarded as an indicator of the net rate of migration from the agricultural to the non-agricultural sector. Therefore expression (5) can be also viewed as a two-sector migration model. In this connection, the implicit rise and fall in the migration rate as p tends to 1 may be explained within the framework of the "push" and "pull" theory.

At a very early stage of a country's development (i.e. when p is close to zero) the "push" from agriculture due to pressure on land and underemployment may be present but the non-agricultural sector in its under-developed stage exerts little "pull" so that the rate of migration is low. As development gets underway, (i.e. as p grows larger) the "pull" effect starts to operate and amplify the "push" effect of the agricultural sector thus accelerating the migration rate. As the proportion in the agricultural sector becomes smaller, the "push" effect should diminish while the "pull" effect will be operating to its full extent so that the migration rate should reach a maximum and start to decline towards zero. The "push" and "pull" factors in the context are represented by the sectoral shares themselves, (i.e. $(1-p)$ and p respectively), and the constant k determine the migration rate (i.e. dp/dt).

The general shape of the function of $(1-p)$ over time is shown in Figure 1.

Figure 1. Shape of the curve for the proportion of agricultural labour force in total labour force over time



The differential equation given by (5) reduces to the following function with respect to time t :

$$\ln p - \ln(1 - p) = c + kt \quad \text{..... (6)}$$

where c is fixed.³

³

If, from equation (5)

$$\frac{dp}{dt} = kp(1-p) \quad \text{(i)}$$

it follows that

$$\frac{dp}{p(1-p)} = kdt$$

so that (i) can be written as

$$dp \left[\frac{1}{p} + \frac{1}{1-p} \right] = kdt$$

which reduces to

$$d[\ln p - \ln(1-p)] = d(kt)$$

Since two functions that have equal differentials differ by a constant we have

$$\ln p - \ln(1-p) = c + kt$$

Since (6) can be written as

$$\ln(p/(1-p)) = c + kt \quad \text{..... (7)}$$

the parameters c and k can be estimated by fitting (7) to the historical series corresponding to the ratio $p/(1-p)$ and hence projections corresponding to time t can be formulated as follows:

$$p_t / (1 - p_t) = e^{(c+kt)} = e^c e^{kt} \quad \text{..... (8)}$$

If the right hand side of (8) is written as v_t it follows that

$$p_t = v_t / (1 + v_t) \quad \text{..... (9)}$$

and

$$(1 - p_t) = 1 / (1 + v_t) \quad \text{..... (10)}$$

The shape of the curve of $1-p$ against time is logistic with 1 and 0 as the upper and lower asymptotes (as shown in figure 1) and vice versa for p . It is however, obvious that the resulting logistic curve for p or $(1-p)$ against t will not necessarily pass through the last point of the historical series which is normally taken as the starting point or the base for the projections.

Therefore, in order to ensure consistency with the base year estimates, the following formula has been adopted in deriving projections for future years.

$$p_t / (1 - p_t) = p_o / (1 - p_o) e^{kt} \quad \text{..... (11)}$$

where p_o and $(1-p_o)$ represent the base year figures and t the number of years from the base year.

In replacing the initial value e^c of the fitted curve by the base year data for the projections, a discontinuity has been introduced in the logistic growth process (the projections will be along a curve that is below or above that fitted to the historical series).

In order to avoid this discontinuity it is necessary to introduce additional parameters that force the fitted curve to pass through the base year data for the projections. In this connection it may be noted that equation (5) may be equally written as:

$$\frac{d(p(1-p))}{dt} = k p(1-p) \quad \text{..... (12)}$$

which signifies that the powers of p and $(1-p)$ (i.e. the "pull" and "push" factors) in determining the growth parameter k , are equal to 1. In view of this we can express the act of forcing the curve (8) to pass through the data point corresponding to base year (for the projections) as a change in the powers of p and $(1-p)$ in determining k . As a result the growth model can be expressed as

$$\frac{d(p^\alpha (1-p)^\beta)}{dt} = k p^\alpha (1-p)^\beta \quad \text{..... (13)}$$

where α and β , refer to the modified powers of p and $(1-p)$ that are assumed to be independently fixed.

The differential equation (13) reduces to following function with respect to time.⁴

$$\alpha \ln p - \beta \ln(1-p) = c + kt \quad \text{..... (14)}$$

or

$$p^\alpha / (1-p)^\beta = e^{c+kt} \quad \text{..... (15)}$$

The problem in this context is to arrive at an expression in terms of the ratio $p/(1-p)$ and a practical procedure to fix the values for α and β . This can be considered by decomposing the function as discussed below.

3.1.1 Decomposing the function

As the function of $\alpha \ln p - \beta \ln(1-p)$ with respect to t is linear of the form $c + kt$, it follows that $\alpha \ln p$ and $\beta \ln(1-p)$ taken independently are also expected to be linear and of the same form. Furthermore (due to the additive property of linear equations) the difference between these two separate linear functions has to be equal to $c + kt$. (because of (14)).

Thus we can define k and c as follows:

$$k = k_1 - k_2$$

$$c = c_1 - c_2$$

so that equation (14) can be written as

$$\begin{aligned} \alpha \ln p - \beta \ln(1-p) &= (c_1 - c_2) + (k_1 - k_2)t \\ &= (c_1 + k_1 t) - (c_2 + k_2 t) \end{aligned}$$

⁴

Given
$$\frac{d(p^\alpha (1-p)^\beta)}{dt} = k p^\alpha (1-p)^\beta \quad \text{(i)}$$

it follows that
$$\frac{d(p^\alpha (1-p)^\beta)}{p^\alpha (1-p)^\beta} = k dt \quad \text{(ii)}$$

As
$$d(p^\alpha (1-p)^\beta) = (\alpha p^{\alpha-1} (1-p)^\beta + \beta p^\alpha (1-p)^{\beta-1}) dp \quad \text{(iii)}$$

equation (ii) can be written as
$$\frac{dp(\alpha p^{\alpha-1} (1-p)^\beta + \beta p^\alpha (1-p)^{\beta-1})}{p^\alpha (1-p)^\beta} = d(kt)$$

which reduces to
$$dp[\alpha / p + \beta / (1-p)] = d(kt)$$

This means that
$$d[\alpha \ln p - \beta \ln(1-p)] = d(kt)$$

Since two functions that have equal differentials differ by a constant we have

$$\alpha \ln p - \beta \ln(1-p) = c + kt$$

where c is fixed.

Therefore (14) can be split into the following separate functions:

$$\alpha \ln p = c_1 + k_1 t \quad \text{----- (16)}$$

and $\beta \ln(1 - p) = c_2 + k_2 t \quad \text{----- (17)}$

such that

$$\ln p = \frac{1}{\alpha} (c_1 + k_1 t) \quad \text{----- (18)}$$

and $\ln(1 - p) = \frac{1}{\beta} (c_2 + k_2 t) \quad \text{----- (19)}$

As the following equations

$$\ln p = c_1 + k_1 t \quad \text{----- (20)}$$

and $\ln(1 - p) = c_2 + k_2 t \quad \text{----- (21)}$

refer to the situation when $\alpha = \beta = 1$ (as given by (12) or (8)), it follows that α and β can be viewed as factors that adjust the trend parameters k_1 and k_2 respectively such that

$$\alpha (\ln p_t - c_1) = k_1 t \quad \text{----- (22)}$$

and $\beta (\ln(1 - p_t) - c_2) = k_2 t \quad \text{----- (23)}$

Thus, given c_1 , and k_1 , and c_2 and k_2 , as estimated by fitting (20) and (21) to the time series for p and $(1-p)$ respectively, α and β can be fixed to ensure that the respective curves pass through the relevant base values for the projections by substituting these for p_t and $(1-p_t)$ in (22) and (23) respectively and then solving for α and β .

Having thus fixed α and β , it follows from (22) and (23) that

$$\ln p_t - \ln(1 - p_t) = c_1 / \alpha + (k_1 / \alpha)t - c_2 / \beta - (k_2 / \beta)t = (c_1 / \alpha - c_2 / \beta) + (k_1 / \alpha - k_2 / \beta)t$$

so that $p_t / (1 - p_t) = \exp[(c_1 / \alpha - c_2 / \beta) + (k_1 / \alpha - k_2 / \beta)t] \quad \text{----- (24)}$

Given $k_1, k_2, c_1, c_2, \alpha$ and β , one can obtain p_t and $1 - p_t$ corresponding to a future time point t through (24) and equating the right hand side to v_t as in (9) and (10).

3.1.2 Estimation of the parameters

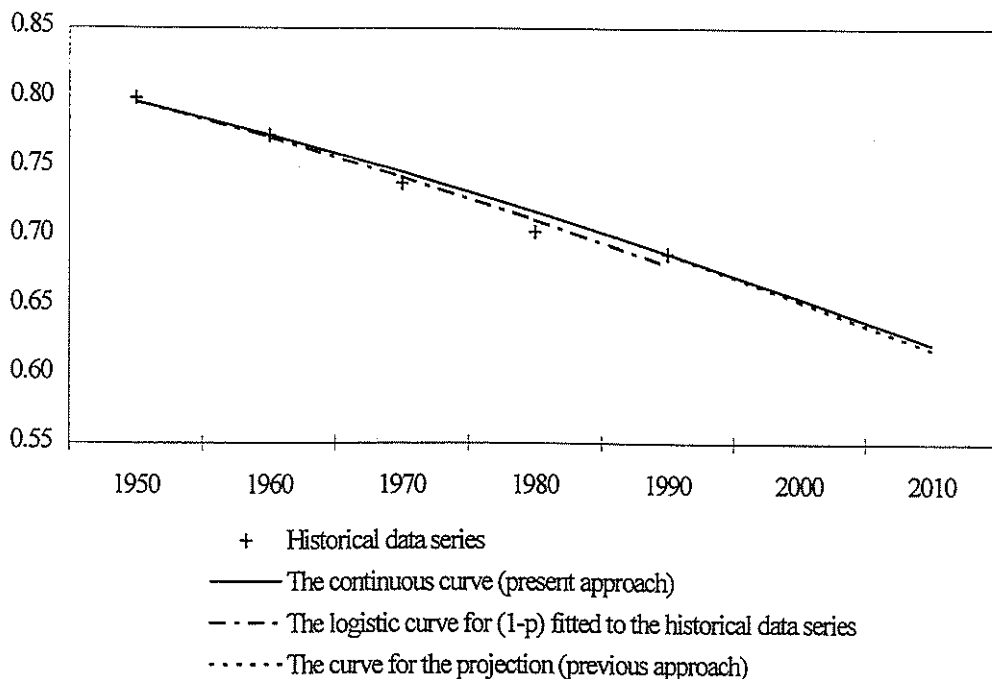
Viewed from the above perspective, the estimation of the parameters involved should be made in two stages:

Stage 1: Estimate (c_1) and (k_1) and (c_2) and (k_2) by fitting the semilog equations (20) and (21) to the historical series for p and $(1-p)$ respectively with $\alpha = \beta = 1$.

Stage 2: Estimate α and β by using relationships (22) and (23) and taking the base values for the projections as p_t and $(1-p_t)$ respectively. It is obvious that if the values (for 1990) estimated by equation (8) are identical to the actual values, α and β will be 1. Therefore the values for α and β will in general tend to be within a fairly close range around 1.

Figure 2 illustrates in the case of Cambodia a) the logistic curve for $(1-p)$ fitted to the historical data series, b) the curve for the projection (previous approach) and c) the continuous curve (present approach). The practical steps involved in the estimation of the parameters are given below in the case of Australia.

Figure 2. Cambodia, proportions of male agricultural labour force, 1950-2010



3.2 Agricultural population projections

The benchmark estimates of the agricultural population are not disaggregated by sex and they have been obtained by applying AP/TP ratios to the UN total population estimates. The AP/TP ratios themselves were indirectly estimated on the basis of the available EAPA/TEAP ratios and a constant *m* value. It is therefore necessary that this approach be continued for the purpose of deriving projections of the agricultural population. Accordingly, projected values of the AP/TP ratios were first obtained by inserting the projected EAPA/TEAP ratios and the fixed value *m* into formula (3). These were then applied to the UN medium variant projections of the total population to obtain the absolute numbers dependent on agriculture.

4. Summary results

4.1 The economically active population in agriculture/non-agriculture, 1950-2010

The discussion relating to the agricultural and non-agricultural breakdowns of the economically active population is focused on the following: (i) the share of agriculture in the economically active population; (ii) the absolute size and growth of economically active population in agriculture and non-agriculture; and (iii) the share of females in the economically active population.

(i) Share of agriculture in the economically active population

The past and projected declines in the proportion of economically active population in agriculture (or the agriculture participation rate) for the world, developed countries and developing countries are shown in Table 2.

Table 2. Percentage of Economically Active Population in Agriculture, 1950-2010

Years	World	Developed countries	Developing countries
1950	67.1	35.7	81.8
1960	61.3	27.1	76.9
1970	56.1	18.1	72.1
1980	52.1	13.3	66.6
1990	48.9	10.2	61.4
2000	44.8	7.3	55.4
2010	40.8	5.4	49.4

For the world as a whole the percentage of economically active population in agriculture, which stood at 67% in 1950, has considerably declined to 49% in 1990. The projections show that the decline will continue so that by the year 2010, 41% of the economically active population will be engaged in agriculture.

In the developed countries the percentage declined from 36% to 10% during 1950-1990. The corresponding decline in the developing countries, i.e. from 82% to 61%, was smaller. The decline projected for the period 1990-2010 is, however, greater in the developing countries than in the developed countries (12 against 5 percentage points). Despite this, the difference in the level of the percentage between these two groups of countries is expected to remain large: by the year 2010 only 5% of the economically active population is expected to be engaged in agriculture in the developed countries, whereas the corresponding percentage in the developing countries is 49%.

(ii) Absolute size and growth of the economically active population in agriculture/non-agriculture.

The absolute size of the economically active population broken down by agriculture and non-agriculture together with the related growth rates are given in Table 3.

The growth of the economically active population in agriculture or non-agriculture obviously reflects the growth of the total economically active population and the changes in the agricultural sector shares discussed above. Thus, because of the growth at increasing rates of the total economically active population, the world's economically active population in agriculture also grew at increasing rates from 809 to 1222 million during 1950-1990 although its share in the total declined consistently.

**Table 3. Economically Active Population in Agriculture and Non-agriculture and Related Growth Rates, 1950-2010
(continued)**

Economically Active Population (millions)									
World			Developed regions			Developing regions			
Agr.	Non-Agr.	Total	Agr.	Non-Agr.	Total	Agr.	Non-Agr.	Total	
1950	809	396	1205	137	247	384	672	150	821
1960	843	533	1376	117	314	431	726	218	945
1970	928	725	1654	89	401	489	840	325	1164
1980	1068	983	2051	75	485	559	993	499	1492
1990	1222	1277	2499	62	547	609	1160	729	1890
2000	1325	1632	2958	48	604	651	1278	1029	2307
2010	1394	2025	3419	37	637	673	1357	1388	2746

**Table 3. Economically Active Population in Agriculture and Non-agriculture and
Related Growth Rates, 1950-2010
(concluded)**

	Average Annual Growth Rate (%)			Net Rate of Inter-sectoral shift (2)-(3)
	Agr. (1)	Non-Agr. (2)	Total (3)	
<u>World</u>				
1950-1960	0.4	3.0	1.3	1.7
1960-1970	1.0	3.1	1.9	1.3
1970-1980	1.4	3.1	2.2	0.9
1980-1990	1.4	2.6	2.0	0.7
1990-2000	0.8	2.5	1.7	0.8
2000-2010	0.5	2.2	1.5	0.7
<u>Developed regions</u>				
1950-1960	-1.6	2.5	1.2	1.3
1960-1970	-2.7	2.5	1.3	1.2
1970-1980	-1.7	1.9	1.3	0.6
1980-1990	-1.8	1.2	0.9	0.4
1990-2000	-2.7	1.0	0.7	0.3
2000-2010	-2.6	0.5	0.3	0.2
<u>Developing regions</u>				
1950-1960	0.8	3.8	1.4	2.4
1960-1970	1.5	4.0	2.1	1.9
1970-1980	1.7	4.4	2.5	1.9
1980-1990	1.6	3.9	2.4	1.5
1990-2000	1.0	3.5	2.0	1.5
2000-2010	0.6	3.0	1.8	1.3

However, during 2000-2010 as a result of the projected decline in the growth rates of total economically active population and the continuous decline in the share of agriculture, the rate of growth of the economically active population in agriculture also is expected to decline. The economically active population in agriculture is expected to reach 1394 million in 2010.

The world picture discussed above hides contrasting trends between the developed and developing countries. In the developed countries the economically active population in agriculture declined during 1950-1990 and this trend is projected to continue so that its size would be reduced from 62 million in 1990 to only 37 million in 2010. On the other hand, in the developing countries, the economically active population in agriculture grew from 672 million in 1950 to 1160 million in 1990. It is expected to reach 1357 million in 2010.

Because of the decline in the agricultural sector share of the economically active population, and hence a rise in the non-agricultural share, the growth rate of the economically active population in non-agriculture is consistently higher than that of the total economically active population. In fact, the difference between the two growth rates (shown in the last column of Table 3) reflects the net rate of shift from the agricultural sector to the non-agricultural sector. This rate is lower in the developed countries as compared to the developing countries obviously due to the low agricultural proportions prevailing in the latter countries. However, in both groups of countries the declining trend observed during 1950-1990 is expected to continue during the projected period.

(iii) Share of females in the economically active population

The percentage of females in the economically active population, calculated on the basis of the distribution of the economically active population and its sectoral breakdown by sex, are presented in Table 4.

**Table 4. Percentage of Females in the Economically Active Population:
Agricultural and Non-agricultural Sectors, 1950-2010**

	Years	Agriculture	Non-agriculture	Total
<u>World</u>				
	1950	39.0	29.1	35.7
	1960	39.8	31.2	36.5
	1970	41.1	33.6	37.8
	1980	42.4	35.6	39.1
	1990	42.7	37.3	40.0
	2000	43.6	38.4	40.7
	2010	44.2	39.2	41.3
<u>Developed countries</u>				
	1950	41.1	32.4	35.5
	1960	43.6	34.6	37.0
	1970	43.8	38.6	39.6
	1980	42.5	41.6	41.7
	1990	38.4	44.0	43.4
	2000	36.2	45.3	44.7
	2010	33.7	46.2	45.5
<u>Developing countries</u>				
	1950	38.6	23.5	35.8
	1960	39.2	26.3	36.2
	1970	40.9	27.3	37.1
	1980	42.4	29.7	38.2
	1990	43.0	32.3	38.9
	2000	43.9	34.3	39.6
	2010	44.5	36.1	40.2

It is noted that female participation in the labour force is estimated to be greater in developed than in developing countries, and the situation is expected to continue until 2010. From 1950 to 1990 the share of females in the agricultural labour force of developing regions was higher than that in the non-agricultural sector. However this was true in the developed regions only up to 1980. The corresponding percentage in the non-agricultural sector showed an increasing tendency - rising from 29% to 37% in the world, from 32% to 44% in the developed countries, and from 23% to 32% in the developing countries during the same period.

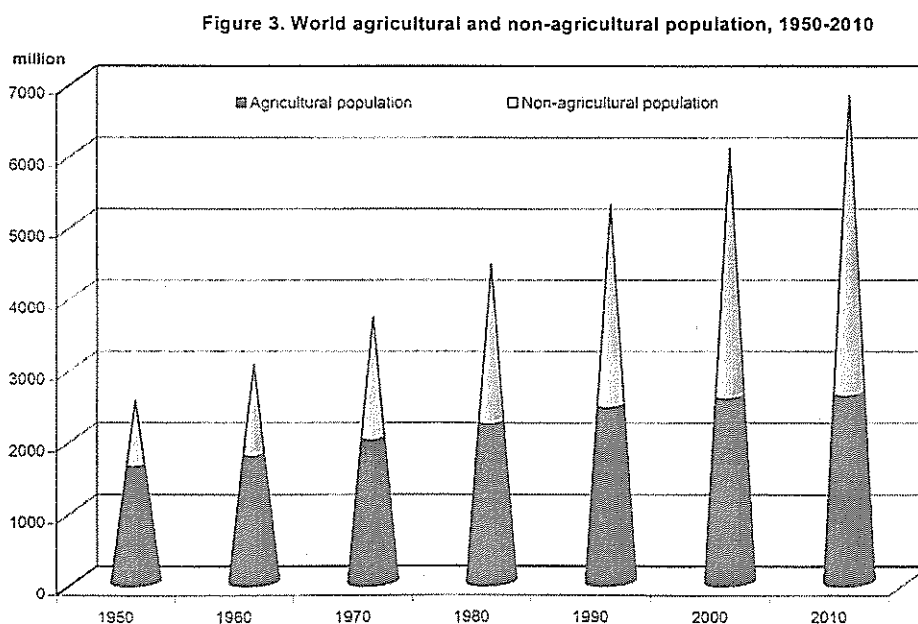
The projections envisage a rather slow decline in the share of females for agriculture in developed countries as compared with the increasing trend in developing countries. On the other hand, there is a continuous rise in that for non-agriculture in both the developed and developing countries, and hence in the world. As a result the agricultural/non-agricultural differential observed during the benchmark period is expected to be narrowed in the developing countries. In the case of the developed countries the situation is actually reversed. In 1990, the percentage for the non-agricultural sector became higher than that for the agricultural sector.

4.2 The agricultural and non-agricultural population, 1950-2010

The presentation of results under this item is analogous to that of the economically active population in the sense that it focuses on (i) the share of agricultural population in the total population; and (ii) the absolute size and growth of the agricultural and non-agricultural population. However, the share of females is not included since no attempt has been made to disaggregate the agricultural/non-agricultural population also by sex.

(i) Share of the agricultural population in the total population

Figure 3 shows the world agricultural and total population over the period 1950-2010. The global trend shows that the world has experienced a continuing growth in the size of the agricultural and total population. However, the share of agriculture in total population has continuously declined, and this situation is expected to continue.



The changes in the proportion of the agricultural population in the total world population, 1950-2010, are shown in Table 5. The proportion of agriculture in total population fell by 17 percentage points to 47% between 1950 and 1990. It will drop down by 8 percentage points to 39% by 2010.

Since the percentage of agricultural population in the total population is closely linked to the percentage of the economically active population in agriculture, the levels and trends shown in this table are similar to those presented in Table 2.

Table 5. Percentage of Agricultural Population in Total Population, 1950-2010

Years	World	Developed countries	Developing countries
1950	64.2	35.4	79.0
1960	58.6	26.5	73.8
1970	54.0	18.0	68.9
1980	50.2	13.6	63.3
1990	46.7	10.8	57.9
2000	42.7	7.7	52.3
2010	38.7	5.6	46.8

(ii) Absolute size and growth of the agricultural and non-agricultural population

Table 6 presents the absolute size and growth rates of the agricultural and non-agricultural population for the world, developed countries and developing countries. Because of the close link between the agricultural/non-agricultural distribution of the total population and that of the economically active population, and the fact that the growth rates of the economically active population and the total population are related, the growth patterns of the agricultural and non-agricultural population closely follow those relating to the economically active population discussed previously. Therefore, comments on Table 6 will be limited to the changes in the absolute size of agricultural and non-agricultural population.

Table 6. Agricultural and non-agricultural population and related growth rates, 1950-2010 (continued)

Population (millions)									
World			Developed regions			Developing regions			
Agr.	Non-Agr.	Total	Agr.	Non-Agr.	Total	Agr.	Non-Agr.	Total	
1950	1620	902	2521	302	551	853	1318	351	1669
1960	1772	1250	3022	257	712	970	1514	538	2052
1970	1997	1699	3696	194	884	1078	1803	815	2618
1980	2228	2212	4440	159	1011	1170	2069	1202	3271
1990	2458	2809	5266	135	1118	1253	2323	1690	4013
2000	2585	3470	6055	100	1206	1307	2485	2263	4748
2010	2630	4165	6795	74	1263	1337	2555	2902	5457

Table 6. Agricultural and non-agricultural population and related growth rates,
1950-2010
(concluded)

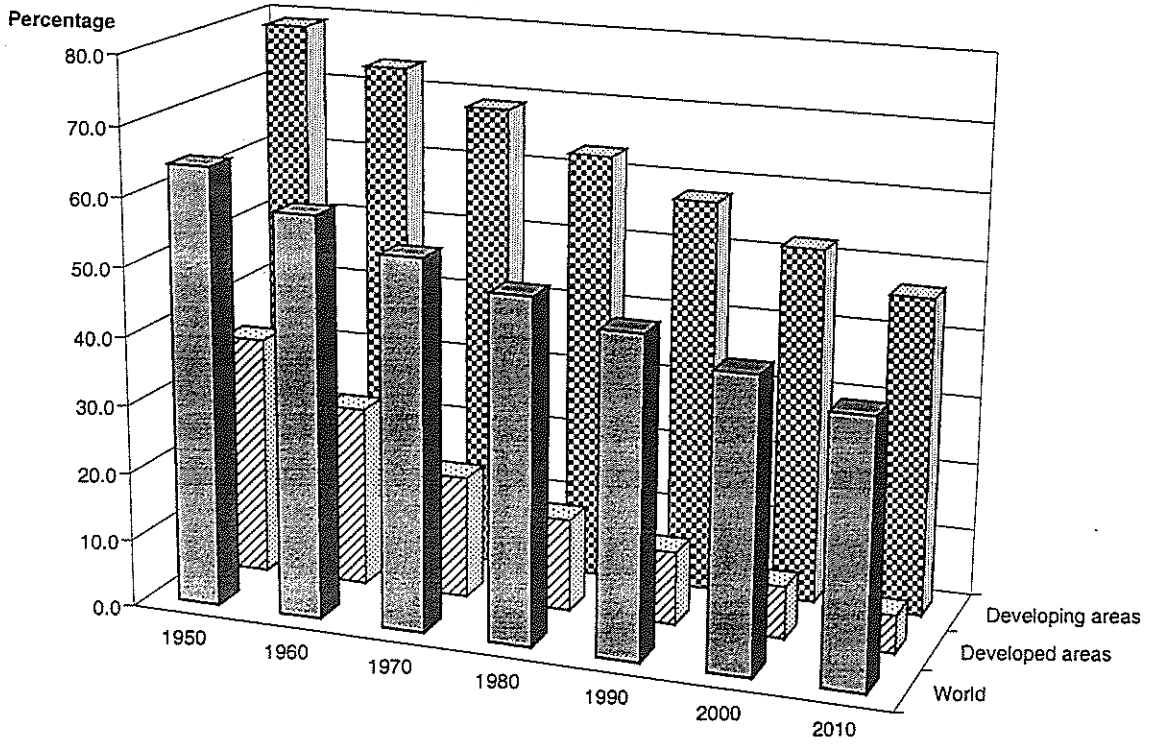
	Average Annual Growth Rate (%)			Net Rate of Inter-sectoral shift (2)-(3)
	Agr. (1)	Non-Agr. (2)	Total (3)	
<u>World</u>				
1950-1960	0.9	3.3	1.8	1.5
1960-1970	1.2	3.1	2.0	1.1
1970-1980	1.1	2.7	1.9	0.8
1980-1990	1.0	2.4	1.7	0.7
1990-2000	0.5	2.1	1.4	0.7
2000-2010	0.2	1.8	1.2	0.7
<u>Developed regions</u>				
1950-1960	-1.6	2.6	1.3	1.3
1960-1970	-2.8	2.2	1.1	1.1
1970-1980	-2.0	1.4	0.8	0.5
1980-1990	-1.7	1.0	0.7	0.3
1990-2000	-2.9	0.8	0.4	0.3
2000-2010	-2.9	0.5	0.2	0.2
<u>Developing regions</u>				
1950-1960	1.4	4.4	2.1	2.3
1960-1970	1.8	4.2	2.5	1.8
1970-1980	1.4	4.0	2.3	1.7
1980-1990	1.2	3.5	2.1	1.4
1990-2000	0.7	3.0	1.7	1.3
2000-2010	0.3	2.5	1.4	1.1

It is noted that the world agricultural population estimated to be 1620 in 1950 and 2458 million in 1990 is projected to reach 2630 million in 2010.

As in the case of the economically active population in agriculture, the above growth in the world agricultural population results from diverse trends in the developed and developing countries. In the developed countries the agricultural population declined from 302 million to 135 million between 1950 and 1990 whereas in the developing countries there was a growth from 1318 million to 2323 million. The projections indicate a continuous shrinkage in the developed countries with the consequence that the agricultural population would consist of only 74 million people by 2010. In the developing countries there would be a continuous, albeit declining, growth until 2010.

In view of the declining share of the agricultural population in the total population (Table 5 and Figure 4), the share of the non-agricultural population is expected to rise continuously in both the developed and developing countries. An important feature of these trends is that the non-agricultural population in the developing countries became larger than that of the developed countries sometime between 1970 and 1980. The projections indicate that this discrepancy will be further increased so that by 2010 about 70% of the world's non-agricultural population will be in the developing countries.

Figure 4. Proportions of agriculture in total population, 1950-2010



Annexes

Annex 1. Ad-hoc procedures used for exceptional cases

This annex briefly discusses the situations where the mechanical application of the model for agricultural labour force projections could not provide satisfactory results and therefore ad hoc procedures had to be resorted to.

The special situations are as follows:

- the proportion of agricultural labour force was equal (or nearly equal) to zero in 1990;
- the proportion of agricultural labour force was constant for the last two (or more) decades of the benchmark period (1950-1990);
- the estimated change parameter k is negative, with, as a consequence, growing shares of agriculture in the labour force;
- the model produced projected proportions of agricultural labour force with a too high or too low rate of change over time.

Where the proportion of agricultural labour force was equal (or nearly equal) to zero in 1990, the level of 1990 was maintained over the projection period (2000 and 2010). Qatar was in this category.

It was noted that the cases where the proportion of agricultural labour force was observed to be constant for the last two (or more) decades of the benchmark period (1950-1990) referred mainly to the female labour force. Therefore the total and male agricultural labour force projections were produced by the model and the projections for females were obtained by subtracting the male projected agricultural labour force from the projected total agricultural labour force. Only Bhutan was in this category.

The cases where the estimated k parameter was negative also refer to the female labour force. The above approach was therefore used in these cases also. The countries in this category are: Burkina Faso, Cuba, Fiji, Nepal, Netherlands Antilles, New Zealand and Switzerland.

The countries where the projected rate of decline in the proportion of agricultural labour force was considered to be too high or too low were Portugal, Botswana and Mauritania. In the case of Portugal, the approach taken was the same as in the second and third categories mentioned above. In the case of the other two countries, the proportions of total and male labour force in agriculture were extrapolated assuming that by the year 2050 they reach the US 1990 level; the female agricultural labour force projections were then obtained by subtracting the male agricultural labour force from the total agricultural labour force projections.

Annex 2. World, Developed Regions, Developing Regions and Continents tables

The following tables present results of the estimates and projections of total and agricultural population and labour force for the period 1950-2010 for the World, Developed Regions, Developing Regions, Africa, North and Central America, South America, Asia, Europe, Oceania, USSR Former Area and for each Continent.

Estimates and Projections of Agricultural Population and Labour Force, 1950-2010

WORLD

	1950	1960	1970	1980	1990	2000	2010
Population							
In Agriculture (000's)	1619889	1771513	1997470	2228040	2457812	2585160	2629514
Total (000's)	2521495	3021908	3696148	4440402	5266442	6055049	6794773
Percentage in agriculture	64.24	58.62	54.04	50.18	46.67	42.69	38.70
Labour Force							
<i>Both Sexes</i>							
In agriculture (000's)	808874	843141	928230	1067864	1222344	1325297	1393941
Total (000's)	1205351	1375813	1653505	2051213	2499015	2957756	3419118
Percentage in agriculture	67.11	61.28	56.14	52.06	48.91	44.81	40.77
<i>Males</i>							
In agriculture (000's)	493406	507349	546443	614609	700153	747628	777990
Total (000's)	774698	873815	1028183	1248366	1500065	1753830	2008344
Percentage in agriculture	63.69	58.06	53.15	49.23	46.67	42.63	38.74
<i>Females</i>							
In agriculture (000's)	315468	335792	381787	453255	522191	577669	615951
Total (000's)	430653	501998	625322	802847	998950	1203926	1410774
Percentage in agriculture	73.25	66.89	61.05	56.46	52.27	47.98	43.66
<i>Female Participation in Labour Force</i>							
In agricultural labour force (%)	39.00	39.83	41.13	42.45	42.72	43.59	44.19
In total labour force (%)	35.73	36.49	37.82	39.14	39.97	40.70	41.26
Average Annual Growth Rates (%)							
	1950-60	1960-70	1970-80	1980-90	1990-00	2000-10	
<i>Population</i>							
Agricultural		0.90	1.21	1.10	0.99	0.51	0.17
Total		1.83	2.03	1.85	1.72	1.41	1.16
<i>Labour Force</i>							
Agricultural		0.42	0.97	1.41	1.36	0.81	0.51
Total		1.33	1.86	2.18	1.99	1.70	1.46

DEVELOPED REGIONS

	1950	1960	1970	1980	1990	2000	2010
Population							
In Agriculture (000's)	301806	257340	194495	159278	134844	100125	74484
Total (000's)	852834	969588	1078195	1169840	1253313	1306551	1337340
Percentage in agriculture	35.39	26.54	18.04	13.62	10.76	7.66	5.57
Labour Force							
<i>Both Sexes</i>							
In agriculture (000's)	137187	116732	88586	74532	62216	47512	36521
Total (000's)	383880	431139	489274	559249	609439	651208	673468
Percentage in agriculture	35.74	27.08	18.11	13.33	10.21	7.30	5.42
<i>Males</i>							
In agriculture (000's)	80848	65810	49807	42820	38317	30334	24205
Total (000's)	247618	271456	295710	325826	344699	360274	367054
Percentage in agriculture	32.65	24.24	16.84	13.14	11.12	8.42	6.59
<i>Females</i>							
In agriculture (000's)	56339	50922	38779	31712	23899	17177	12316
Total (000's)	136262	159683	193564	233423	264740	290933	306414
Percentage in agriculture	41.35	31.89	20.03	13.59	9.03	5.90	4.02
<i>Female Participation in Labour Force</i>							
In agricultural labour force (%)	41.07	43.62	43.78	42.55	38.41	36.15	33.72
In total labour force (%)	35.50	37.04	39.56	41.74	43.44	44.68	45.50
Average Annual Growth Rates (%)							
	1950-60	1960-70	1970-80	1980-90	1990-00	2000-10	
<i>Population</i>							
Agricultural		-1.58	-2.76	-1.98	-1.65	-2.93	-2.91
Total		1.29	1.07	0.82	0.69	0.42	0.23
<i>Labour Force</i>							
Agricultural		-1.60	-2.72	-1.71	-1.79	-2.66	-2.60
Total		1.17	1.27	1.35	0.86	0.67	0.34

**WORLD-WIDE ESTIMATES AND PROJECTIONS OF THE AGRICULTURAL POPULATION
AND LABOUR FORCE - 1950-2010**

26

Estimates and Projections of Agricultural Population and Labour Force, 1950-2010

DEVELOPING REGIONS

	1950	1960	1970	1980	1990	2000	2010
Population							
In Agriculture (000's)	1318083	1514173	1802974	2068762	2322969	2485035	2555030
Total (000's)	1668661	2052319	2617953	3270562	4013129	4748498	5457434
Percentage in agriculture	78.99	73.78	68.87	63.25	57.88	52.33	46.82
Labour Force							
<i>Both Sexes</i>							
In agriculture (000's)	671687	726409	839644	993332	1160128	1277785	1357420
Total (000's)	821471	944674	1164231	1491964	1889575	2306548	2745650
Percentage in agriculture	81.77	76.90	72.12	66.58	61.40	55.40	49.44
<i>Males</i>							
In agriculture (000's)	412558	441539	496636	571789	661836	717294	753785
Total (000's)	527080	602359	732473	922540	1155366	1393556	1641290
Percentage in agriculture	78.27	73.30	67.80	61.98	57.28	51.47	45.93
<i>Females</i>							
In agriculture (000's)	259129	284870	343008	421543	498292	560492	603635
Total (000's)	294391	342315	431757	569424	734210	912993	1104360
Percentage in agriculture	88.02	83.22	79.44	74.03	67.87	61.39	54.66
<i>Female Participation in Labour Force</i>							
In agricultural labour force (%)	38.58	39.22	40.85	42.44	42.95	43.86	44.47
In total labour force (%)	35.84	36.24	37.09	38.17	38.86	39.58	40.22
Average Annual Growth Rates (%)							
<i>Population</i>							
Agricultural		1.40	1.76	1.38	1.17	0.68	0.28
Total		2.09	2.46	2.25	2.07	1.70	1.40
<i>Labour Force</i>							
Agricultural		0.79	1.46	1.70	1.56	0.97	0.61
Total		1.41	2.11	2.51	2.39	2.01	1.76

AFRICA

	1950	1960	1970	1980	1990	2000	2010
Population							
In Agriculture (000's)	181664	217652	265357	312677	374462	437156	494405
Total (000's)	220933	276537	357041	466613	614769	784445	973315
Percentage in agriculture	82.23	78.71	74.32	67.01	60.91	55.73	50.80
Labour Force							
<i>Both Sexes</i>							
In agriculture (000's)	85888	100253	118191	137880	164521	195775	229698
Total (000's)	103711	125832	155819	199776	260207	339639	438460
Percentage in agriculture	82.82	79.67	75.85	69.02	63.23	57.64	52.39
<i>Males</i>							
In agriculture (000's)	49270	56767	65517	74433	88058	102715	118978
Total (000's)	62752	75939	93369	119764	156238	201750	257342
Percentage in agriculture	78.52	74.75	70.17	62.15	56.36	50.91	46.23
<i>Females</i>							
In agriculture (000's)	36618	43487	52675	63446	76463	93060	110720
Total (000's)	40959	49893	62450	80013	103969	137889	181118
Percentage in agriculture	89.40	87.16	84.35	79.30	73.54	67.49	61.13
<i>Female Participation in Labour Force</i>							
In agricultural labour force (%)	42.63	43.38	44.57	46.02	46.48	47.53	48.20
In total labour force (%)	39.49	39.65	40.08	40.05	39.96	40.60	41.31
Average Annual Growth Rates (%)							
<i>Population</i>							
Agricultural		1.82	2.00	1.65	1.82	1.56	1.24
Total		2.27	2.59	2.71	2.80	2.47	2.18
<i>Labour Force</i>							
Agricultural		1.56	1.66	1.55	1.78	1.75	1.61
Total		1.95	2.16	2.52	2.68	2.70	2.59

Estimates and Projections of Agricultural Population and Labour Force, 1950-2010

NORTH & CENTRAL AMERICA

	1950	1960	1970	1980	1990	2000	2010
Population							
In Agriculture (000's)	58039	56060	55696	57657	55492	52791	48150
Total (000's)	225617	273964	323909	374205	427376	482992	532146
Percentage in agriculture	25.72	20.46	17.19	15.41	12.98	10.93	9.05
Labour Force							
<i>Both Sexes</i>							
In agriculture (000's)	21028	18579	18126	20128	20650	20670	19978
Total (000's)	92156	105467	127904	165153	197946	231834	262562
Percentage in agriculture	22.82	17.62	14.17	12.19	10.43	8.92	7.61
<i>Males</i>							
In agriculture (000's)	18693	16337	15463	16635	17260	17116	16434
Total (000's)	68267	75050	85768	102630	117412	133501	147940
Percentage in agriculture	27.38	21.77	18.03	16.21	14.70	12.82	11.11
<i>Females</i>							
In agriculture (000's)	2334	2242	2663	3493	3390	3554	3544
Total (000's)	23889	30417	42136	62522	80534	98333	114622
Percentage in agriculture	9.77	7.37	6.32	5.59	4.21	3.61	3.09
<i>Female Participation in Labour Force</i>							
In agricultural labour force (%)	11.10	12.07	14.69	17.35	16.42	17.19	17.74
In total labour force (%)	25.92	28.84	32.94	37.86	40.68	42.42	43.66
Average Annual Growth Rates (%)							
<i>Population</i>							
Agricultural		-0.35	-0.07	0.35	-0.38	-0.50	-0.92
Total		1.96	1.69	1.45	1.34	1.23	0.97
<i>Labour Force</i>							
Agricultural		-1.23	-0.25	1.05	0.26	0.01	-0.34
Total		1.36	1.95	2.59	1.83	1.59	1.25

SOUTH AMERICA

	1950	1960	1970	1980	1990	2000	2010
Population							
In Agriculture (000's)	59018	69621	78273	79350	68614	63417	56242
Total (000's)	112994	148411	192427	242302	295085	345782	394942
Percentage in agriculture	52.23	46.91	40.68	32.75	23.25	18.34	14.24
Labour Force							
<i>Both Sexes</i>							
In agriculture (000's)	21072	23766	26687	29259	28154	26909	24702
Total (000's)	41090	51322	66070	89332	120756	150754	180742
Percentage in agriculture	51.28	46.31	40.39	32.75	23.31	17.85	13.67
<i>Males</i>							
In agriculture (000's)	18616	20612	22826	24107	23065	21943	19996
Total (000's)	33002	40513	50380	64773	80751	97848	114348
Percentage in agriculture	56.41	50.88	45.31	37.22	28.56	22.43	17.49
<i>Females</i>							
In agriculture (000's)	2457	3154	3860	5153	5088	4966	4706
Total (000's)	8089	10809	15690	24559	40005	52906	66394
Percentage in agriculture	30.37	29.18	24.60	20.98	12.72	9.39	7.09
<i>Female Participation in Labour Force</i>							
In agricultural labour force (%)	11.66	13.27	14.47	17.61	18.07	18.46	19.05
In total labour force (%)	19.68	21.06	23.75	27.49	33.13	35.09	36.73
Average Annual Growth Rates (%)							
<i>Population</i>							
Agricultural		1.67	1.18	0.14	-1.44	-0.78	-1.19
Total		2.76	2.63	2.33	1.99	1.60	1.34
<i>Labour Force</i>							
Agricultural		1.21	1.17	0.92	-0.38	-0.45	-0.85
Total		2.25	2.56	3.06	3.06	2.24	1.83

**WORLD-WIDE ESTIMATES AND PROJECTIONS OF THE AGRICULTURAL POPULATION
AND LABOUR FORCE - 1950-2010**

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Estimates and Projections of Agricultural Population and Labour Force, 1950-2010

ASIA							
	1950	1960	1970	1980	1990	2000	2010
Population							
In Agriculture (000's)	1088113	1223131	1441514	1645449	1844724	1944842	1963570
Total (000's)	1376745	1667997	2101444	2585697	3113808	3610442	4056627
Percentage in agriculture	79.04	73.33	68.60	63.64	59.24	53.87	48.40
Labour Force							
<i>Both Sexes</i>							
In agriculture (000's)	572118	605861	692879	817322	955567	1039952	1085849
Total (000's)	698810	795005	973360	1228588	1530040	1827631	2119172
Percentage in agriculture	81.87	76.21	71.18	66.53	62.45	56.90	51.24
<i>Males</i>							
In agriculture (000's)	344857	361397	402519	463988	539479	579560	600716
Total (000's)	441985	499129	603497	750575	927012	1096189	1260794
Percentage in agriculture	78.02	72.41	66.70	61.82	58.20	52.87	47.65
<i>Females</i>							
In agriculture (000's)	227261	244463	290359	353334	416088	460392	485133
Total (000's)	256825	295876	369863	478013	603027	731442	858378
Percentage in agriculture	88.49	82.62	78.50	73.92	69.00	62.94	56.52
<i>Female Participation in Labour Force</i>							
In agricultural labour force (%)	39.72	40.35	41.91	43.23	43.54	44.27	44.68
In total labour force (%)	36.75	37.22	38.00	38.91	39.41	40.02	40.51
Average Annual Growth Rates (%)							
<i>Population</i>							
Agricultural		1.18	1.66	1.33	1.15	0.53	0.10
Total		1.94	2.34	2.10	1.88	1.49	1.17
<i>Labour Force</i>							
Agricultural		0.57	1.35	1.67	1.57	0.85	0.43
Total		1.30	2.04	2.36	2.22	1.79	1.49

EUROPE							
	1950	1960	1970	1980	1990	2000	2010
Population							
In Agriculture (000's)	139535	116939	88310	67420	51908	35887	24687
Total (000's)	392517	424941	459213	483466	499407	509458	509739
Percentage in agriculture	35.55	27.52	19.23	13.95	10.39	7.04	4.84
Labour Force							
<i>Both Sexes</i>							
In agriculture (000's)	66218	54230	40820	31258	24232	17587	12392
Total (000's)	181503	191318	204251	220175	233765	244541	244464
Percentage in agriculture	36.48	28.35	19.99	14.20	10.37	7.19	5.07
<i>Males</i>							
In agriculture (000's)	41667	33319	24095	17856	14280	10645	7785
Total (000's)	123030	126778	130712	134271	136375	139710	137579
Percentage in agriculture	33.87	26.28	18.43	13.30	10.47	7.62	5.66
<i>Females</i>							
In agriculture (000's)	24551	20911	16725	13402	9952	6942	4606
Total (000's)	58473	64540	73539	85904	97390	104831	106885
Percentage in agriculture	41.99	32.40	22.74	15.60	10.22	6.62	4.31
<i>Female Participation in Labour Force</i>							
In agricultural labour force (%)	37.08	38.56	40.97	42.88	41.07	39.47	37.17
In total labour force (%)	32.22	33.73	36.00	39.02	41.66	42.87	43.72
Average Annual Growth Rates (%)							
<i>Population</i>							
Agricultural		-1.75	-2.77	-2.66	-2.58	-3.62	-3.67
Total		0.80	0.78	0.52	0.32	0.20	0.01
<i>Labour Force</i>							
Agricultural		-1.98	-2.80	-2.63	-2.51	-3.15	-3.44
Total		0.53	0.66	0.75	0.60	0.45	0.00

Estimates and Projections of Agricultural Population and Labour Force, 1950-2010

OCEANIA

	1950	1960	1970	1980	1990	2000	2010
Population							
In Agriculture (000's)	3729	3979	4333	4857	5488	6079	6619
Total (000's)	12612	15728	19309	22682	26412	30393	34179
Percentage in agriculture	29.57	25.30	22.44	21.41	20.78	20.00	19.36
Labour Force							
<i>Both Sexes</i>							
In agriculture (000's)	1739	1809	1965	2207	2566	2889	3201
Total (000's)	5393	6541	8330	10251	12844	15169	17209
Percentage in agriculture	32.25	27.66	23.59	21.53	19.97	19.05	18.60
<i>Males</i>							
In agriculture (000's)	1267	1265	1284	1378	1540	1633	1713
Total (000's)	4001	4696	5623	6475	7570	8575	9479
Percentage in agriculture	31.67	26.94	22.84	21.29	20.34	19.04	18.07
<i>Females</i>							
In agriculture (000's)	472	544	681	828	1026	1256	1488
Total (000's)	1392	1845	2707	3776	5274	6594	7731
Percentage in agriculture	33.94	29.50	25.17	21.94	19.45	19.05	19.25
<i>Female Participation in Labour Force</i>							
In agricultural labour force (%)	27.16	30.08	34.66	37.54	39.98	43.48	46.49
In total labour force (%)	25.81	28.20	32.49	36.83	41.06	43.47	44.92
Average Annual Growth Rates (%)							
<i>Population</i>							
Agricultural		0.65	0.85	1.15	1.23	1.03	0.85
Total		2.23	2.07	1.62	1.53	1.41	1.18
<i>Labour Force</i>							
Agricultural		0.39	0.83	1.16	1.52	1.19	1.03
Total		1.95	2.45	2.10	2.28	1.68	1.27

USSR FORMER AREA

	1950	1960	1970	1980	1990	2000	2010
Population							
In Agriculture (000's)	89791	84131	63987	60630	57123	44988	35841
Total (000's)	180076	214329	242806	265436	289586	291538	293826
Percentage in agriculture	49.86	39.25	26.35	22.84	19.73	15.43	12.20
Labour Force							
<i>Both Sexes</i>							
In agriculture (000's)	40810	38642	29562	29810	26654	21515	18122
Total (000's)	82688	100329	117771	137940	143457	148188	156509
Percentage in agriculture	49.35	38.52	25.10	21.61	18.58	14.52	11.58
<i>Males</i>							
In agriculture (000's)	19036	17651	14738	16211	16470	14016	12368
Total (000's)	41662	51710	58835	69879	74707	76258	80862
Percentage in agriculture	45.69	34.13	25.05	23.20	22.05	18.38	15.30
<i>Females</i>							
In agriculture (000's)	21774	20991	14823	13599	10184	7499	5754
Total (000's)	41026	48619	58937	68061	68750	71930	75647
Percentage in agriculture	53.07	43.18	25.15	19.98	14.81	10.43	7.61
<i>Female Participation in Labour Force</i>							
In agricultural labour force (%)	53.36	54.32	50.14	45.62	38.21	34.86	31.75
In total labour force (%)	49.62	48.46	50.04	49.34	47.92	48.54	48.33
Average Annual Growth Rates (%)							
<i>Population</i>							
Agricultural		-0.65	-2.70	-0.54	-0.59	-2.36	-2.25
Total		1.76	1.26	0.90	0.87	0.07	0.08
<i>Labour Force</i>							
Agricultural		-0.54	-2.64	0.08	-1.11	-2.12	-1.70
Total		1.95	1.62	1.59	0.39	0.32	0.55

References

- UN - DEMOGRAPHIC YEARBOOK (VARIOUS ISSUES), NEW YORK
- UN, 1999 - WORLD POPULATION PROSPECTS: THE 1998 REVISION, NEW YORK.
- UN, 1995 - WORLD URBANIZATION PROSPECTS: THE 1994 REVISION, NEW YORK
- UN, 1958 - PRINCIPLES AND RECOMMENDATIONS FOR NATIONAL POPULATION CENSUSES, STATISTICAL PAPERS, SERIES M, NO. 44, NEW YORK.
- ILO, 1997 - ECONOMICALLY ACTIVE POPULATION, 1950-2010: THE 4TH REVISION, GENEVA
- ILO, 1995/1996 - BULLETIN OF LABOUR STATISTICS (VARIOUS ISSUES), GENEVA
- ILO, 1988 - CURRENT INTERNATIONAL RECOMMENDATIONS ON LABOUR STATISTICS: 1988 EDITION, ISBN 92-2-106433-6, GENEVA
- FAO, 1988 - WORLD-WIDE ESTIMATES AND PROJECTIONS OF THE AGRICULTURAL/NON-AGRICULTURAL POPULATION SEGMENTS, 1950-2025; ESS/MISC/86-2, ROME
- FAO, 1978 (B) - COLLECTING STATISTICS ON AGRICULTURE POPULATION AND EMPLOYMENT, FAO ECONOMIC AND SOCIAL DEVELOPMENT PAPER NO. 7, ROME.
- FAO, 1978 (A) - ESTIMATES AND PROJECTIONS OF THE AGRICULTURAL/NON-AGRICULTURAL POPULATION AND LABOUR FORCE, 1950-2000; ROME
- FAO, 1972 - PROJECTIONS OF WORLD AGRICULTURE POPULATION, BY W. SCHULTE, L. NAIKEN AND A. BRUNI, MONTHLY BULLETIN OF AGRICULTURAL ECONOMICS AND STATISTICS, VOL. 21, NO. 1, ROME.
- FAO, 1965 - PROGRAMME FOR THE 1970 WORLD CENSUS OF AGRICULTURE, ROME
- FAO, 1957 - PROGRAMME FOR THE 1960 WORLD CENSUS OF AGRICULTURE, ROME
- CELADE, 1996 - DEMOGRAPHIC BULLETIN, NO. 56 AND NO. 57, SANTIAGO, CHILE
- BOOTH, A. AND SUNDRUM, R.M., 1985 - LABOUR ABSORPTION IN AGRICULTURE, THEORETICAL ANALYSIS AND EMPIRICAL INVESTIGATIONS, OXFORD UNIVERSITY PRESS