

NV 8201

no 420

H. A. Luning

Economic aspects of low labour-income farming

N08201.420

BIJLAGE  
DE  
BOVENSCHOL  
WAGeningen.

# STELLINGEN

## I

In SCHULTZ' antwoord op de vraag "why is traditional agriculture not substantially increasing its production?" wordt te eenzijdig de nadruk gelegd op de lage produktiviteit van de in het produktieproces betrokken produktiefactoren. Het patroon van behoeften (waarvan 'leisure' een onderdeel is) zoals zich dit voordoet in het verschijnsel van het streefinkomen, kan mede een belangrijke verklaring leveren voor een laag produktieniveau.

TH. W. SCHULTZ: *Economic Crises in World Agriculture*. Ann Arbor, 1965, Chapter II.  
Dit proefschrift.

## II

De door MELLOR en STEVENS gevolgde werkwijze bij de berekening van de marginale arbeidsproduktiviteit leidt tot onjuiste conclusies.

J. W. MELLOR & R. D. STEVENS: The Average and Marginal Product of Farm Labor in Underdeveloped Countries. *Journal of Farm Economics* 38 (1956), pp. 780-791.  
Dit proefschrift.

## III

De door NURKSE, LEWIS e.a. gedurende de laatste vijftien jaar in de internationale literatuur gevoerde theoretische discussie over het onttrekken van het zogenaamde arbeidsoverschot aan de landelijke samenleving van lage-inkomenslanden is weinig vruchtbaar geweest. Meer nut kan verwacht worden van een praktischer aanpak van dit probleem. Daartoe kan de studie van de economische ontwikkeling van landen als Japan, Mexico en Taiwan een belangrijke bijdrage leveren.

## IV

BALOGH's kwalificatie van SCHULTZ' boek "Transforming Traditional Agriculture" (New Haven, 1964) als zijnde onwetenschappelijk lijkt veeleer van toepassing te zijn op BALOGH's bespreking van genoemd werk.

TH. BALOGH: *The Economics of Poverty*. London, 1966, Chapter V.

## V

Het groeiend onbehagen, dat volgens KOOL aanwezig is bij vele economen wat betreft de mogelijkheid de westerse theorie op niet-westerse vraagstukken toe te passen zonder grote fouten te maken, lijkt slechts ten dele gerechtvaardigd. Dat in de toekomst aan de opvattingen van BOEKE opnieuw aandacht zal worden besteed is weinig waarschijnlijk.

R. G. A. KOOL: *L'agriculture tunisienne. Analyse d'une économie en voie de modernisation*. (diss.). Wageningen, 1963. Stelling I.

## VI

De door STEVENS berekende vraag naar voedsel in lage-inkomenslanden gaat geheel voorbij aan de onderlinge afhankelijkheid van bevolkingsgroei en inkomen per hoofd der bevolking.

R. D. STEVENS: Rates of Growth in Food Requirements During Economic Development. *Journal of Farm Economics*, 47 (1965), pp. 1208-1212.

## VII

De opinie van POLLY HILL, wat betreft Afrika, dat "The study of indigenous economics was neglected during the colonial period and is contemptuously regarded by nearly all economists today" is juist.

POLLY HILL: A plea for indigenous economics. The West African Example. *Economic Development and Cultural Change*, 15 (1966), pp. 10-20.

## VIII

Voor een *effectieve* agrarische planning en landbouwpolitiek in Suriname is het noodzakelijk dat men een simpele landbouwboekhouding opzet, althans voor een aantal bedrijven van de belangrijkste typen.

## IX

Ter bepaling van de omvang van de lage-inkomenssector in een dualistische economie is het niet voldoende de grootte van de sector 'klein-landbouw' te kennen.

## X

Gezien het overwegend landbouw-technische karakter van het Netherlands Journal of Agricultural Science verdient het de voorkeur, in afwachting van een eigen landbouw-economisch tijdschrift, de daarvoor aangeboden sociaal-economische bijdragen voortaan eenmaal per jaar tezamen uit te geven.

## XI

HEYN's mening dat voor Nederland het cursorisch massa-college zo spoedig mogelijk integraal afgeschaft dient te worden is te weinig gefundeerd.

F. A. HEYN: Is het lot van de massa-colleges bezegeld? *Intermediair*, 13 januari 1967.

F. A. HEYN: Het onderwijs aan de vooravond van een omwenteling. De massa-colleges zijn ten dode gedoemd! *Intermediair*, 23 juni 1967.

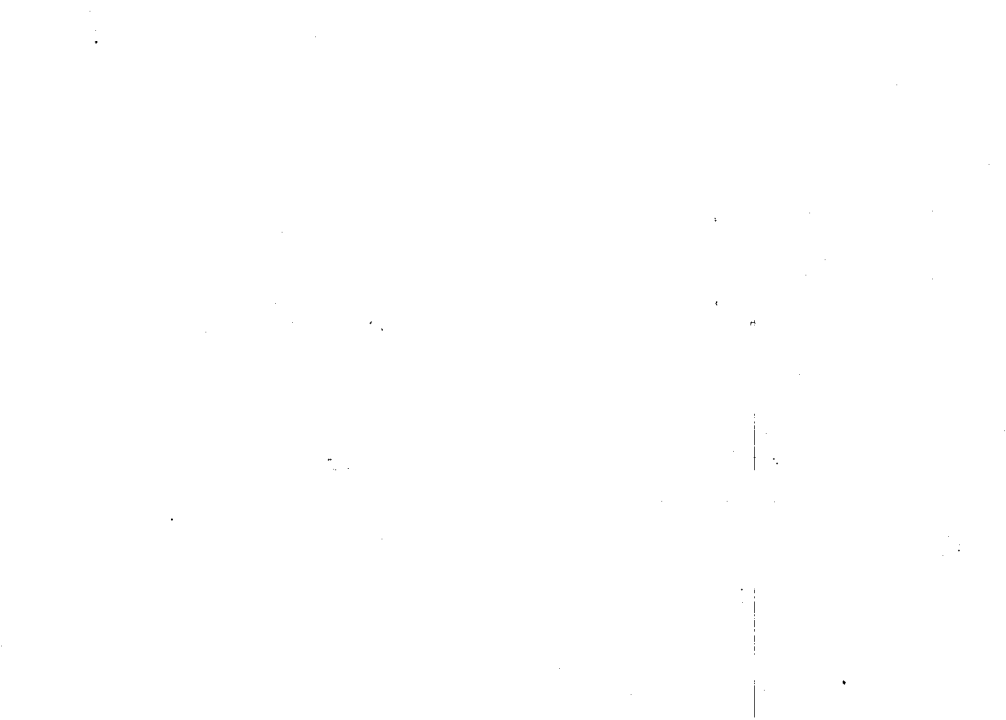
## **Erratum**

In the formulas on pp. 120 and 124 for ' $\ln y$ ' read ' $y$ '.

H. A. Luning

Economic aspects of low labour-income farming.

Pudoc, 1967, Wageningen



## Economic aspects of low labour-income farming



Dit proefschrift met stellingen van

HENDRIKUS ALBERTUS LUNING, landbouwkundig ingenieur,

geboren te 's-Gravenhage, 20 november 1932, is goedgekeurd door de promotor, Ir. J. H. L. Joosten,  
hoogleraar in de landhuishoudkunde van de tropen en de subtropen.

De Rector Magnificus van de Landbouwhogeschool,  
F. HELLINGA

Wageningen, 18 oktober 1967

NN 8201,420

~~no 420~~

2

H.A. Luning

## Economic aspects of low labour-income farming

### PROEFSCHRIFT

ter verkrijging van de graad van doctor in de landbouwkunde  
op gezag van de Rector Magnificus, Dr. Ir. F. HELLINGA,  
hoogleraar in de cultuurtechniek,  
te verdedigen tegen de bedenkingen van een commissie uit de  
Senaat van de Landbouwhogeschool te Wageningen  
op vrijdag 1 december 1967 te 16.00 uur



1967 *Centrum voor landbouwpublikaties en landbouwdocumentatie*

*Wageningen*

ISBN = 104405-03

**BIBLIOTHEEK  
DER  
LANDBOUWHOGESCHOOL  
WAGENINGEN.**

This thesis will also be published as Agricultural Research Reports 699

© Centre for Agricultural Publications and Documentation, Wageningen, 1967.

No part of this book may be reproduced and/or published in any form, by print, photoprint, micro-film or any other means without written permission from the publishers.

*Aan mijn ouders  
Voor Gerda*



## Acknowledgements

The writing of a book, even a moderately small one like this, is far from an isolated act. It gives a great opportunity for a professional exchange of ideas. I have asked and received generous help and advice from numerous colleagues. To name them all would be well-nigh impossible. I hope that all those, to whom I wish to express my gratitude here, will accept that this silence will be repaid by means of personal contacts.

I should like to acknowledge my debt to Professor Ir. J. H. L. JOOSTEN, who has given me the benefit of his critical mind and large field experience as well as the freedom to pursue my own course.

Though perhaps less obvious, the field work was the crux of the present study. I am most grateful to Mr. E. J. GREGORY, Secretary of Field Services, Ministry of Agriculture, Northern Nigeria at the time of this study, for his ungrudging support.

The Wageningen Agricultural University gave me an opportunity to carry out farm management investigations in Surinam. In this country I received much help from Ir. G. P. TIGGELMAN and his co-workers in the Department of Agriculture.

Without the loyal cooperation in the field little or nothing could have been accomplished. In Northern Nigeria the going was often rough, the sweat and dirt are clear memories. I like to record the names of the *mallams* USMAN NAGOMA, MOHAMMED AUGI, MOMMON KYABE and ABDULLAHI SARKI, who worked with me under difficult circumstances.

MESSRS. ADHIN, BHANSINGH, KALIKA, IDOE, JAINANDUNSINGH, SEWNARAIN, SEW-RAISINGH and SITAL JR. were of great help in the actual collection of farm data in Surinam. Their perseverance during two years of twice-weekly recordings has been well noted. As for the supervision of the field work in the latter country, an important contribution has been made by the graduate students W. G. CATH, H. J. HOEFMAN, D. QUIK, A. V. E. SLANGEN, A. TEMPELMAN and K. J. VUURSTEEN. Their personal interest in the problems of peasant farming is much appreciated.

The mathematical assistance of Dr. Ir. M. A. J. VAN MONTFORT is greatly acknowledged and I am grateful to Mr. K. J. ROGANS for improving the English of the text within such a short time. Further improvements were made thanks to Pudoc's careful editing.

Finally I wish to thank Mr. H. HAKSTEGE for his help in making the drawings and Miss ANNEKE NOORDIJK for her able typing of the manuscript.



# Table of Contents

1	ECONOMIC THEORY AND LOW-INCOME FARMING	5
1.1	Dualism in low-income countries . . . . .	5
1.2	A concept of peasant farming in a low-income economy . . . . .	7
1.3	Economic theory and peasant farming . . . . .	8
1.3.1	A brief historical note . . . . .	8
1.3.2	A general controversy . . . . .	9
1.3.3	The foundation axiom of economic theory. . . . .	10
1.3.4	Standard economic theory and the role of quantification in (agri- cultural) economics. . . . .	13
1.4	Economic theory and labour productivity in low-income farming . .	16
2	WAGE THEORIES AND THE DISTRIBUTION OF INCOME . . . . .	19
2.1	The Subsistence Theory . . . . .	20
2.2	The Wage-Fund Doctrine . . . . .	21
2.3	The Marginal Productivity Theory and the distribution of income. .	23
2.4	The demand for labour . . . . .	25
2.4.1	General remarks . . . . .	25
2.4.2	Demand for labour in agriculture in general. . . . .	26
2.5	The labour supply . . . . .	28
2.5.1	General remarks . . . . .	28
2.5.2	The agricultural sector. . . . .	29
2.6	Demand and supply of labour. . . . .	30
3	UN(DER)EMPLOYMENT AND THE WAGE LEVEL IN THE AGRICULTURAL SECTOR	31
3.1	Introduction. . . . .	31
3.2	A macro-economic model . . . . .	33
3.2.1	Phase I: The stage of constant returns for labour . . . . .	35
3.2.2	Phase II: The stage of decreasing returns for labour . . . . .	36
3.2.3	Phase III: The stage of constant total production . . . . .	38
3.3	The concept of disguised unemployment . . . . .	38
3.4	The concept of seasonal unemployment. . . . .	41
3.5	(Disguised, seasonal) unemployment in agriculture and alternative employment opportunities . . . . .	42
3.5.1	Present production . . . . .	42
3.5.2	Future production . . . . .	43

3.6	A micro-economic model. . . . .	45
3.7	The marginal labour productivity tenet, the wage level and employment . . . . .	50
4	PROBLEMS OF METHOD AND MEASUREMENT . . . . .	54
4.1	Maximization of net income . . . . .	54
4.2	The production function approach. . . . .	55
4.3	Measurement problems . . . . .	58
4.3.1	Physical measurement of inputs and outputs. . . . .	58
4.3.2	Pricing of physical input-output data and the problems of cost evaluation. . . . .	65
4.3.3	Sampling procedures . . . . .	66
5	LABOUR AND WAGES IN AFRICAN PEASANT FARMING — A CASE STUDY IN NORTHERN NIGERIA . . . . .	68
5.1	Some demographic data . . . . .	68
5.2	The agricultural pattern. . . . .	70
5.3	Agricultural change under population pressure . . . . .	73
5.4	General description of the labour pattern . . . . .	74
5.4.1	The division of labour . . . . .	74
5.4.2	The farming calendar . . . . .	75
5.4.3	Labour in agricultural and other occupations . . . . .	76
5.4.4	The distribution of labour categories . . . . .	78
5.5	The productivity of agricultural labour . . . . .	81
5.5.1	Types of labour. . . . .	81
5.5.2	Labour and land . . . . .	82
5.5.3	Regression analysis of the Nigerian farm data . . . . .	86
5.5.4	Marginal productivity and the wage level. . . . .	87
5.5.5	Measurement of marginal productivity — stock of labour versus flow of labour . . . . .	88
5.6	Labour productivity in subsidiary occupations. . . . .	89
6	LABOUR PRODUCTIVITY IN SURINAM — A CASE STUDY OF HINDUSTANI RICE SMALLHOLDERS . . . . .	91
6.1	Introduction. . . . .	91
6.2	A survey in the districts of Nickerie and Surinam . . . . .	92
6.3	Some notes on the present agricultural structure in historical perspective . . . . .	95
6.4	The phenomenon of part-time farming . . . . .	99
6.5	The Limited Aspiration Model . . . . .	102
6.6	A general description of the agricultural labour pattern . . . . .	107
6.6.1	The division of labour . . . . .	107
6.6.2	The farming calendar . . . . .	108

6.7 The productivity of labour in rice cultivation . . . . . 110

6.7.1 Input-output analysis . . . . . 110

6.7.2 Marginal productivity of labour and the wage level. . . . . 112

7 THE USE OF AGRICULTURAL LABOUR IN ECONOMIC DEVELOPMENT . . . . . 113

7.1 Major obstacles in economic transformation. . . . . 113

7.2 The absorption of labour into the agricultural economy in the early stages of economic growth . . . . . 116

7.3 A strategy for agricultural labour absorption in the areas studied . . 118

7.3.1 Northern Nigeria. . . . . 118

7.3.2 Surinam . . . . . 121

SUMMARY . . . . . 126

SAMENVATTING . . . . . 128

AUTHORS' INDEX. . . . . 130

REFERENCES . . . . . 132



# 1 Economic theory and low-income farming

## 1.1 Dualism in low-income countries

Two important related features can be clearly discerned in the economically backward countries<sup>1</sup>. Firstly, levels of *per capita* income are low compared with those in Western Europe, North America, Australia and, probably, Japan. Secondly, agriculture is the major economic activity and from 40 to 80 per cent. of the labour force is engaged in agricultural production.

Some elucidation is, however, in order here. In the first place, within the group of these low-income countries there is a large variation as to *per capita* income and resources: these countries thus tend to be situated along a development continuum with very poor and relatively rich ones on either side. In the second place it is necessary to specify the distribution of income within countries characterized by a generally low standard of living.

Now that more detailed economic data are available it is gradually realized that any endeavour to fit the various types of low-income countries into some monolithic development theory is a fruitless and rather misleading procedure. It appears therefore more appropriate to analyse economic backwardness on a national or regional basis.

A striking characteristic of low-income countries is the contrasting form of economic organization in their public sectors. This makes it analytically useful to introduce the concept of dualism.

In virtually all low-income countries, and in quite a few high-income ones as well, two distinct sectors can be recognized: the one consisting of peasant farmers, small traders and artisans and the other comprising plantations, mines, oilfields, large-scale industries and related activities (transport and trade).

Another, but somewhat crude, distinction is between the agricultural and the non-agricultural sectors of a low-income economy. LEWIS (1954) has coined them respectively the 'subsistence'<sup>2</sup> sector, which uses relatively little reproducible capital

<sup>1</sup> In the literature these backward countries are referred to under various terms, such as un(der)developed, developing, poor countries, etc. In this study these countries are called low-income countries, since the latter qualification appears to describe the predominant feature.

<sup>2</sup> The term subsistence is tied here to the level of capital available for production. It does not imply economic selfsufficiency or the fact that people in this sector live at a minimum subsistence level, two concepts used, for instance, by MYINT (1967).

and the 'capitalistic' sector. In the first sector levels of technique and knowledge, productivity and income are low, whereas they are high in the capitalistic sector of such an economy<sup>3</sup>.

The need to raise the standards of living in the large subsistence sector of low-income economies has become a central issue for social scientists, politicians, and others in poor and rich countries alike, especially since the Second World War. Though a modest beginning had been made by the mother countries in their colonies during the Colonial Era, the drive to raise the standard of living has gained momentum only in recent decades. The extent to which this drive has been dictated by particular motives, ranging from the fear of a communist take-over to simple ethical considerations, need not concern us here.

In taking up the study of economic growth and of development in dual economies, the economist has been faced from the start with difficulties in using his notional apparatus. A major point has been the difference in the conditions experienced by the ethnocentric western or western-educated spectator. The latter has been acutely aware of the fact that the beliefs, values and attitudes prevalent in low-income countries were at variance with those encountered in western society. This has led quite a number of administrators and technicians (including economists) working in these countries to believe that those living in the subsistence sector are not very rational in their behaviour.

From a historical point of view, one of the first who noted and occupied himself with dualism as a socio-economic phenomenon was the Dutch economist BOEKE (1953)<sup>4</sup>. Though there is not much in his theories and his analyses that can stand the test of the more recent knowledge gained of development economics, his merit at least has been to have given a penetrating analysis of dualism as he experienced it in the former Dutch East Indies<sup>5</sup>. His study was for the greater part of a socio-cultural nature; he emphatically rejected the use of western standard economic theories as being non-applicable in the pre-capitalistic Eastern World.

This discussion on the use of certain theories, which was started by BOEKE way back in 1910, has apparently not yet been closed, as recent literature indicates<sup>6</sup>.

In the present study the applicability of standard economic theory is discussed with

<sup>3</sup> In a quantitative sense the subsistence sector absorbs usually between 50 and 90% of the labour force in low-income countries. There are pockets of 'subsistence' in most high-income countries (U.S.A., Western Europe), but these comprise less than 25% of the working population. Again, it should be noted that 'low' and 'high' are relative terms which may lose their operational usefulness in conditions of rapid economic growth.

<sup>4</sup> BOEKE, as a writer, has produced a lot. Only a part of it is available in English. Best known is his "Economics and Economic Policy of Dual Societies", New York, 1953. It should be noted that BOEKE has put forward his ideas on 'social dualism' as early as 1910, in his doctoral dissertation "Tropisch-Koloniale Staathuishoudkunde: Het Problem".

<sup>5</sup> For a recent and balanced view of BOEKE's importance as a pioneer exponent in theorizing dualism see YAMADA (1966).

<sup>6</sup> For instance, see articles by DALTON (1961, 1962), POLANYI *et al.* (1957) and MUKHERJEE (1960).

reference to what was earlier defined as the subsistence sector of a dual economy. As mentioned in footnote (2) on page 5, the term 'subsistence' has at least three different meanings in current literature. Therefore this study does not use this notion; Lewis' 'subsistence' sector will now be called the *low labour-income* sector<sup>7</sup>.

Since the low labour-income sector is of a major quantitative importance in low-income countries, the latter group of countries is largely drawn into the analysis. Before setting out to explain the meaning of standard economic theory and to explore the essence of economics, first this low labour-income sector has to be delimited.

This study is confined to peasant farmers, as theirs is the predominant activity in this sector. But it is believed that this restriction in no way detracts from the general force of the argument.

## 1.2 A concept of peasant farming in a low-income economy

As a starting point, the concept of peasant farming is rather elusive. This type of activity may be observed in various forms, ranging from simple forms of shifting cultivation to the well-established types of permanent intensive cropping. Thus, largely depending on the intentions and purposes underlying it, a classification of peasant farming can be made according to various criteria, such as type of enterprise, type of crops, resource use, land use, tenure arrangements, farming techniques, size of the enterprise, to mention just a few.

Rather than make any distinctions of the type presented above, which in any case may have little relevance to the problems under consideration here, it is preferred to pose the following question: Is it possible to attribute to low-income peasant farming (or *traditional farming*) a number of common features which mark it out as a distinct entity and which provide a useful concept for economic analysis?

It is suggested that, within the framework of the present analysis, the following elements taken together present such a concept of traditional farming.

- (1) Peasant farming is carried out as a family enterprise which may range in size from the small nucleus family to the aggregate structure as found in the extended family. Household and farm business activities are strongly interrelated and the factors of production for farming are mainly provided by the household.
- (2) Production is carried out on a low level of aggregate output; it is basically used for the sheer physical maintenance of the family members and, as a rule, there is only a relatively small marketable surplus. There appear to be notable exceptions in cases where cash crop production has become so important (as in parts of Africa) that food requirements are not fully met from the family's own farm. Food is then bought from outside but the final margin between the revenue

<sup>7</sup> In this sector the productivity (income) of the complementary factors of production is usually low also. We use this somewhat narrow concept, however, since the main interest is focussed on labour productivity in the following discussion.

- of production and the expenditure on food consumption usually remains small.
- (3) Generally speaking, peasant societies are traditional; the patterns of behaviour continue with little change from generation to generation. In farming only a few resources are used and innovational changes are small and gradual. The bulk of farming knowledge is derived from age-old local experience and tradition.
  - (4) One of the predominant features of the factors of production is the comparatively small amount of capital used. There is usually a heavy reliance on human labour in the actual production process. Capital formation and its maintenance may be substantial but most of it is accumulated through large labour efforts (clearings, irrigation). The close household-farm business relationship may lead to conflicting interests in the choice of investments.
  - (5) Markets for agricultural produce are limited. As has been pointed out by BAUER and YAMEY (1959, p. 36), "This is the consequence of high transport costs, lack of capital for storage . . . and the poverty of consumers". The last point is significant. In a society where up to 80 % of the families may be engaged in growing their own food there are few outlets for farm products, unless there is scope for export or rapid urbanization coupled with an effective demand for food.
  - (6) The near absence or the defective operation of an infrastructural set of services is another characteristic of traditional farming. Within this context emphasis should be given to those complementary inputs which have been named 'non-conventional' (SCHULTZ, 1956b; JOHNSTON & MELLOR, 1961; MELLOR, 1962b). The main inputs of this nature are agricultural research, extension activities, education programmes, credit facilities and, generally speaking, any organization fostering a particular line of action in rural development which might be conducive to change.

## 1.3 Economic theory and peasant farming

### 1.3.1 A brief historical note

Having set out in a few bold strokes the main economic characteristics of low-income farming, we should now return to the subject of economic theory and its relevance under the conditions described above.

Economists always appear to have been rather involved in the economic problems of their own time, as has been illustrated so well by SCHUMPETER (1961). This often led to the synchronous development of theory in particular fields of current interest.

Only in a few periods in the history of economic analysis has the full light been shed on the peasantry.

The Physiocrats and their precursors were the first who – almost exclusively – studied the agricultural sector. PERRY's well-known utterance that "labour is the father of wealth, as lands are the mother" shows their preoccupation with these two major factors of production. From that time onwards, some attention has been paid

to the agricultural sector by general economists.

Towards the end of the last century agricultural economics had developed as a separate discipline; its birth was undoubtedly promoted by the agricultural crises and related problems of that time. From then on, the economics of peasant farming received full attention in Western Europe, North America and Eastern Europe (CHAYANOV).

As a parallel development, much work (especially of a descriptive nature) was done by agricultural and social scientists in the former British Empire and in the French, Belgian and Dutch colonies before the last world war.

Since the Second World War, peasant farming in low-income countries has become an important and separate field of investigation, the structurally interdependent development of the low labour-income and the capitalistic sectors receiving special attention. This attention seems warranted, as, in terms of sheer numbers, we are living in a rural world in which the low-income peasant predominates.

### 1.3.2 A general controversy

Opposing views regarding the applicability of economic theory as developed in the West to low-income peasant societies have been evident since the time of BOEKE<sup>8</sup>. In the latter's view, economic needs in the precapitalist Eastern world are limited, profit motives are almost absent, the lack of economic organisation is apparent and many other features are completely at variance with standard western economic theory and practice. In recent literature similar views can be found, such as the theories of POLANYI *et al.* (1957, p. 46) that the difference between developed and underdeveloped society would be the absence of a motive of gain from peasant and primitive societies.

DALTON (1961, 1962) maintains that economic theory cannot be fruitfully applied to the study of 'primitive' communities. According to that author, the term 'economic' has two distinct and independent meanings: in the substantive sense it refers to the provision of material goods which satisfy biological and social wants, in its second meaning it refers to the maximization of some end or the minimization of costs. Allegedly, in the second sense this term often yields little insight into the workings of primitive society. It is however not clear what is precisely meant here by 'primitive'.

A President of the Indian Society of Agricultural Economics declared very recently: "my main problem is that the available economic theories do not explain sufficiently usefully the practice of agriculture in the so-called traditional societies and do not offer meaningful guidelines for its development. . . . What is doubted is the behavioural motivation assumed in economic logic; and the ground for doubt is

<sup>8</sup> Though BOEKE is mentioned here as a founder, similar views can be traced in earlier literature deriving from German historical economists such as SOMBART (1916).

provided by observed discrepancies between the actual and the logically rational behaviour . . ." (BHATTACHARJEE, 1966).

From the opposite school of thought BAUER and YAMEY (1959, p. 8) state: "There are no special economic theories or methods of analysis fashioned uniquely for the study of the underdeveloped world. But while the tools of analysis are of wide relevance, in a study of underdeveloped countries the situations to which they must be applied vary greatly".

The above is but a small sample of quotations; it could be easily extended from recent literature. This sample provokes the question as to whether perhaps the foundation axiom of economics is at stake. It is herein that the cause of much confusion may partly lie.

### 1.3.3 The foundation axiom of economic theory

Economics occupies itself, among other things, with the phenomenon of exchange. Many human activities lie within this sphere of (potential) exchange. Things qualify for exchange when they have some value; they are referred to as commodities (goods and services, material or non-material). Commodities are valued since they are scarce and in demand.

From a certain age, man, as a member of society, is called upon to take his share in the responsibility, however small, of that society. This involves the making of decisions. A number of these decisions are linked with the process of the production of commodities, without which the existence of his society and his group (his family) is jeopardized. A more or less well-defined role is expected of him; in his decision-making he is confronted with certain patterns of values, beliefs and attitudes which are held in esteem by his society. Given these patterns, there appears to be a dominant striving in all cultures to reach objectives of satisfaction, however modest these may be.

The foundation axiom of economic theory now is that man attempts to reach these targets of satisfaction – which requires choice due to the scarcity of commodities – with the minimum wastage of effort or, to state it in a slightly different vein, he strives for the maximization of satisfaction. This seems to have its origin in the desire to create a favourable image of himself in his own eyes and in the opinion of others. Whether his striving acts as an inhibitor or as a promotor of economic growth in his society depends on the direction in which this status function develops (BREWSTER, 1961). Thus, economizing does not specifically mean the maximization of profit or family net income, but it refers to "ends and scarce means, which have alternative uses" (ROBBINS, 1952, p. 16).

In low-income peasant societies decisions concerning the production of commodities are affected by social and religious factors to a much larger extent than is the case in the capitalistic sector. An illuminating example of this has been given by NASH (1961). In a descriptive study of Mexican Indians he has shown that "the rationale of economic choice in peasant society follows the same general rule of

maximization as economic activity elsewhere . . . but (within) a social structure and value system which channels economic choice toward economic stability and social continuity”.

In order to clarify the notion of decision making, the following simple model is suggested, in which a choice is presented between income and leisure<sup>9</sup>. In Figure 1, the opportunity curve PP' presents those possible combinations of commodities a and b which can be produced with given fixed resources, say, with available labour. OP units of (a) can be produced with zero production of (b) and OP' units of (b) with zero production of (a) or their combinations. Economic logic suggests that the relationship between these particular commodities (income, leisure) is competitive in nature. Products are substituted at an increasing rate, as illustrated by the shape of PP'.

Maximum satisfaction is reached at the point where the choice-indicator in consumption, the so-called indifference curve I - I, is tangent to the opportunity curve PP'. Indifference curves present the relative values which the consumer attaches to these commodities and illustrate combinations of equal satisfactions or utility. For each individual or group a set of parallel curves can be drawn, the curve which is farthest away from the origin indicating the highest level of satisfaction. In the above situation it is I - I which gives highest utility.

The shape and position of indifference curves vary according to the individual or to a well defined, homogeneous group. Thus I - I may illustrate the average indifference plane of a particular stratum of decision-makers, while I' - I' represents a plane for a stratum of people with different values and attitudes. However, both groups of decision-makers are faced with and have access to a similar (technically determined) process of opportunities PP'. This leads to different levels of 'income

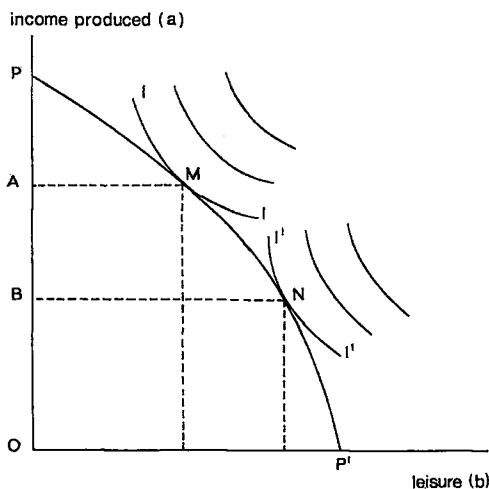


Fig. 1. A simple decision model for income and leisure.

<sup>9</sup> The following discussion is a slightly modified version of the theory of subsistence farming, as presented by HEADY (1952).

produced', namely OA and OB, which are nevertheless in both cases obtained at maximum levels of satisfaction.

Is there any reason to expect that such a static target income, as represented by OA and OB for the two groups, could be a real-world phenomenon?

It is not unlikely that in those societies where change is negligible and slow, man has some well defined ideas as to the standard of living which he is willing and is expected to maintain. As pointed out by LEWIS (1955), the most important limitation on man's incentives is his limited horizon, and extra income may well yield him low marginal satisfaction.

In view of the hard and monotonous physical work carried out by people on rather unbalanced diets, working under sometimes adverse climatological conditions and having modest material wants, it is not unrealistic to assume that leisure may have a considerable attraction. It is often a scarce asset in these societies, as owing to the low level of productivity many days and long hours have to be worked in order to attain the level of output necessary for the farm family's maintenance. Besides, in particular societies work is often considered irksome not just because it is tiresome but because it carries the stigma of servility; therefore it should be done as little as possible.

In low-income peasant farming, which is characterized both by a rather stagnant level of skills and by little change in "the state of preference and motives for holding and acquiring sources of income", this leads to a particular economic equilibrium at low levels of resource productivities (SCHULTZ, 1964, p. 30). This equilibrium is illustrated by points M and N. In a carefully executed field study it was attempted to show that such points of equilibrium, which could be interpreted as a target income, have indeed a real meaning (Chapter 6).

This highlights the fact that the maximization of net returns or profits on farms is not necessarily a relevant concept. Neither is the notion that in heavily populated areas such as in India, available labour should be applied until the maximization of the gross output is reached, the last labour increment thus yielding an almost zero return. It is *a priori* not possible to say to what extent economic opportunities will be exploited, as these may vary greatly. KUSUM NAIR's observations (1962) on the Indian peasantry are illuminating in this respect.

The 'maximization of profit' tenet is therefore not a necessary assumption, but merely an operational extension of the foundation axiom described above which has been found useful under western conditions.

The economist is concerned with one specific aspect of social life: the economic aspect. This does not mean that in traditional societies, cultural, religious and other differences should be ignored, but it is the economist's task to explore whether "differences in work, thrift and industry related to economic activities can be handled as economic variables . . ." (SCHULTZ, 1964, p. 28).

One could imagine the existence of a basic or standard economic theory which has to provide an abstract analysis of purely economic phenomena isolated from the whole complex of social life. Derived therefrom, an operational theory applies the

rules or laws formulated by the basic theory to the concrete facts of economic life, investigating to what extent they are applicable<sup>10</sup>. The latter theory may of necessity have a limited scope in place and time. Rather than ignore the facts which cannot be explained in terms of a specific theory, the theoretician should question the basic postulates and devise a new system. This was precisely what was accomplished by KEYNES and some of his famous predecessors, who also relied on and made use of known concepts and tools which happened to fit into their new theoretical framework. "A plea for indigenous economics", as suggested by POLLY HILL (1966) while describing peasant economies in West Africa, should therefore be given due consideration.

Once the desired level of physical production (due allowance being made for various restraints) has been decided upon by a particular stratum of decision-makers, there seems to be no point in arguing that the actual production process is not carried out in a rational way, i.e. with the least wastage of effort and at the lowest possible cost.

The above reasoning is based upon the foundation axiom of economics. If evidence is brought forward which runs counter to this axiom, the latter should be rejected.

#### 1.3.4 Standard economic theory and the role of quantification in (agricultural) economics

In the previous section the term *standard economic theory* has been used. It is necessary to explain now what is exactly meant by this notion. Broadly speaking, the basic elements at the micro-level are the subjects of production and consumption, demand and supply and the study of prices, revenues and costs. It would seem to be better not to define rigidly what exactly should be included and what left out. A pragmatic approach using operational theories seems preferable. For instance, a peripheral question such as the usefulness of Keynesian economics should be dictated by the validity of the set of assumptions under *ad hoc* conditions.

It is not merely the tenet of profit maximization which is under attack; there are several other issues of standard economic theory under discussion about conditions of low-income farming.

Following BHATTACHARJEE and others<sup>11</sup>, it has to be enquired whether production activity in traditional agriculture can be analysed as a techno-economic process; various elements of economic logic are also queried, such as those relating to the

<sup>10</sup> This notion was developed for application in tropical-colonial economies by VAN GELDEREN (1927). In his view economic theory operates on the basis of ideal-typical constructions, a fact which should be fully realized when the economics of societies, in which the effects of economic laws are obscured by a great number of non-economic factors, are being studied.

<sup>11</sup> See, for instance, GURTA (1966) who also stresses the need for bold departures in the conceptualization and understanding of India's agricultural conditions.

performance of the market mechanism (supply and demand) and the connected subject of the distribution of income.

There may be limitations and constraints which throw doubt on the real usefulness of marginal analysis for handling problems of allocative efficiency in the use of resources; this may especially be the case in respect of inequalities in the supply of resources.

A number of these problems will be discussed in the following chapters. For the moment the discussion will be limited to just one of the above-raised subjects, but it is one which has a major bearing upon the present argument, namely the market situation regarding competition. Previously, it has been stipulated that an important element in economics is 'exchange'. Though not explicitly stated, it was assumed that the exchange of commodities is operated under conditions of perfect competition. Does this theoretical ideal tally with actual conditions in an agricultural economy?

There are four conditions which have to be fulfilled to obtain perfect competition in both demand and supply, *viz.*:

- (1) products and services offered must be regarded as economically homogeneous;
- (2) there must be mobility in respect of production and productive resources;
- (3) from the point of view of both demand and supply there should be complete knowledge (and foresight) as regards prices;
- (4) there should be a sufficiently great number of buyers and sellers who have no individual impact on the determination of market pricing.

As pointed out by MARTIN (1958) the conditions of agricultural production, especially in low-income countries with their many small producers, are indeed reasonably close to those of perfect competition.

Nevertheless, there may be several restrictions to free individual choice: for example, tribal taboos which restrict the choice of crops and the necessity of obtaining the consent of a spiritual superior to start a new planting season. Extreme imperfections may occur, as under certain rigid landlord-tenant systems, and immobility of resources is often the rule.

This has led to the belief that in many situations peasants really have no opportunity to choose and that, therefore, their problems are of secondary importance to the economist. It could, however, be argued that once these socio-cultural and technical limitations have been distinguished, there *usually* is some opportunity of choice left within the remaining production processes themselves. Even if there appears to be considerable immobility, as is often the case with land, additional data may shed light on the degree of choice and competition within the particular industry, though the presence of overall restrictions suggests the existence of imperfect competition throughout the whole economy<sup>12</sup>. In Chapters 5 and 6 examples are given.

<sup>12</sup> An illuminating example is given for Thailand by MUSCAT (1966). He shows that the rice market in that country is really competitive. The government's allegation that local merchants set low prices and put suppliers at a competitive disadvantage, proved untenable. However, government maintains its view as a justification for intervention.

Low-income farming deals for the most part with problems at the micro-economic level. This represents a confrontation with a situation of decision-making, a large part of which is concealed from the view, as agricultural production takes place behind the fences of the farm-firm-household entity. It may be asked whether the theory of the firm is applicable here. How would this theory, which in its original form is considered empty or unrealistic by some economists<sup>13</sup>, stand the test under conditions of low-income peasant farming where a clear view into man's nature and behaviour is often impeded?

This leads to the main argument, namely that it might be more fruitful to abandon this standard economic theory with its abstract treatment of purely economic phenomena, and to concentrate *on the role of quantification* in (agricultural) economics to solve the problems. It may well be found in the end that there was not so much wrong with standard theory as with the measurement and analysis of the underlying data.

The time when in the western countries a few rough departmental statistics were the only data available on the agricultural economy is not long past and in a substantial number of low-income countries this condition still continues. These circumstances are not conducive to the application of certain theoretical concepts.

A preferable approach seems to lie in specific, problem-oriented studies in depth, which are carefully prepared and constructed and carried out in reasonably homogeneous areas. They should be conducted without the prime requirement to be directly useful for development policy, as long as they give a better insight into the problems to be solved.

The many noteworthy developments in contemporary economics in the West have been quite impressive<sup>14</sup>. Whatever the achievements, the big challenge which looms large in our minds remains: how to use these new tools in an environment in which beliefs and values are so totally different.

Moreover, agricultural economics, which is simply economics as applied to agriculture, generally operates in an uneasy environment. In stating the assumptions, one is forced to simplify matters considerably. There may be many functional and complex relations between the host of variables involved; again, there are facets such as risks and uncertainties to be reckoned with. In the final analysis, a host of environmental factors are simply left out. This predicament should not prevent tackling the broad issues of economic theory, problems of quantification and low-income peasant farming. As suggested earlier, the issues should be narrowed down somewhat and analysed more in depth.

<sup>13</sup> See, for instance, BOULDING's attack on firm theory (1952).

<sup>14</sup> The development of game theory has made it possible to discover decision functions which are more meaningful in the face of risk and uncertainty; methods such as budgeting, programming techniques, factor analysis and production function analysis have proved to be extremely helpful in, for instance, production economics. The evolution of the computer has vastly improved the possibilities of handling complex systems in a quantitative way.

The present study is restricted to a set of hypotheses on labour in traditional agricultural production. It is precisely this subject which has given rise to so much confusion and scepticism concerning the validity of classical and neo-classical concepts. It appears to lend itself appropriately to the treatment of the controversial problems outlined above; in grappling with this subject, it should be possible to answer, albeit only partly, the various allegations concerning the use of standard economic theory and analytic techniques in a low labour-income economy.

#### 1.4 Economic theory and labour productivity in low-income farming

Though allocation of resources or the distribution of income in terms of marginal productivity theory has found acceptance by a number of economists, the economic aspects of wage determination have been questioned by others. The latter group holds the view that farm wages in low income societies are tradition-determined. This point of view seems especially to be borne out by the apparent conditions of labour redundancy and so-called 'disguised' unemployment in the low labour-income sector of such an economy.

In the light of this controversy the following questions on labour can be formulated: Is the productivity of labour a determining factor in wage formation and, if so, to what extent, and is it possible to treat the remuneration of labour as an economic variable in all circumstances?

On this subject several negative answers can be gleaned from literature. As HOWARD (1935, p. 189) stated, "wages (of the agricultural wage earners in low-income countries) are customary . . .; they scarcely change at all and are not indicative of the current economic situation".

Or, as MUKHERJEE (1960) has asserted: ". . . in an underdeveloped economy, as in India, the agricultural labour is a 'non-competing' group with other factors of production . . . Here the allocation of total output among different classes of workers is more or less a matter of social convention . . . In this type of economy, agricultural wages have hardly been influenced by the utility of labour to the employer, . . .; On the other hand, RICARDO's Iron Law of Wages had been having full sway; the level of living of the tillers has been continually reduced by a system of 'sweating'."

From the outset, a sharp distinction must be drawn between labour's remuneration in the family farming enterprise (the self-employed) and the rewards of the outside worker, the agricultural labourer. The latter is given a wage which is paid in kind, cash or privileges or in a mixture of these.

The labour pattern in low-income farming is generally characterized by the preponderance of family labour: the head of the household and his dependents. Moreover, systems of mutual self-help often exist among members of certain groups, and at different periods of the agricultural year these members assist each other in

smoothing out any congestion of labour requirements.

A second pattern can be discerned in the employment of labour for wages. With regard to the labour market in these societies, employment of extra labour is a recurrent feature on peasant farms and it is a wide-spread phenomenon throughout the underdeveloped world. The two main reasons for hiring labour are:

- (1) the fact that the cultivated holding is too large for the available family labour to handle with existing techniques;
- (2) the occurrence of a peak season; as HOWARD (*op. cit.*, p. 110) states: "in crop work . . . operations expose the worker to the alternate tyranny of rush work and idleness in constant succession".

The latter point is a general characteristic of the labour pattern in agriculture everywhere: the periodicity of the operations, which can be evened out to some extent (mixed cropping, irrigation, diversified farming) but cannot usually be evaded.

In the following chapters the productivity of labour is related to both self-employed and hired agricultural labour. The analysis of the former category is difficult owing to the pricing of family labour. Full attention will be given to this question in Chapters 3 and 4. As regards hired labour, its prices are usually known and its market is quite visible. Nevertheless, here too there are certain obstacles. When investigating the economic aspects of wage formation, it should be realized that only one particular factor of labour's rewards is covered. There are probably also a great number of social and environmental aspects which determine the pricing of this factor to some extent. To mention a few of them, such aspects as sex, age, race, caste, indebtedness, tradition and bargaining position may be involved.

It is indisputable that certain external factors, some of which have been already mentioned here, have a great bearing on the remuneration of human labour. These factors will be considered as the argument develops. Nevertheless, it should be endeavoured to make the economic aspects of both hired and self-employed labour in low-income peasant farming the subject of study as long as the economic factors provide simple and satisfactory answers to the questions posed.

The forthcoming analysis is presented as follows. In Chapter 2 a review is given of wage theories as they have a bearing upon the concept of peasant farming in a static framework. The main emphasis is on hired labour, as this category has been given more or less exclusive theoretical attention by economists. A more general argument on labour remuneration is provoked by a discussion on the distribution of income. Chapter 3 presents a theoretical structure to cover the borderline case of under-employment and its impact on the level of remuneration in low-income peasant farming. A theoretical answer will be sought to the problem of the connection between labour productivity and wages and the problem of rationality in the case of self-employed family labour.

Before presenting results of field work pertaining to the issue under investigation there is the basic problem of measurement. What concepts are being used in, for instance, the measurement of labour and other factors of production and what

methods are followed? These related problems are treated in Chapter 4. In Chapters 5 and 6 the results of those farm management data are analysed which have a bearing upon this subject. In Chapter 5 labour productivity is studied for a sample of peasant farmers in a heavily populated and rather poorly endowed area in Northern Nigeria. Chapter 6 presents a similar analysis for small-scale rice farms on the coastal plains of Surinam, South America. The concluding chapter deals with agricultural labour's role in a dynamic system of economic growth and development.

## 2 Wage theories and the distribution of income

Labour, 'the greatest source of wealth', attracted early attention on the part of economists. In the history of economic thought there have been many examples of an interaction between socio-economic conditions and the development of related theories. The labour theories which have come to the fore in times of slavery and serfdom differ from those evolved in periods when workers enjoyed greater freedom, in periods of stagnation or in periods of rapid economic growth. In the present western world, it appears that the structure of a general theory of remuneration is more or less complete but for a few details yet to be settled concerning bargaining between unions and employers.

Before looking at the theoretical framework on which current thought on labour is based, it may be of more than passing interest to investigate those wage theories which arose from conditions such as prevailed in 18th Century Europe. Though conditions during this period concur closer with situations encountered in low-income countries today it is not contended *a priori* that the absolute and relative economic position of the developed countries in their pre-industrial phase are identical with the economic situation of the present low-income countries, the differences having been clearly highlighted by KUZNETS (1954). However, there are certain similarities and it will be useful to demonstrate them as the argument proceeds.

At the end of the 18th Century, as Britain was just beginning its 'take-off', the peasant economy still loomed large within the national economies of that time. Half a century later the scene had changed: Britain had become an industrial nation<sup>15</sup> soon followed by other Western European countries. It is within this period, and especially at its beginning, that SMITH, RICARDO and MALTHUS, the main exponents of the new school of economic thought, produced their economic views on society.

Although many of these early economists were not categorical about certain tenets they developed (giving rise to apparently conflicting pronouncements), it is possible to draw from their statements some wage theories, which can be classified into two main types: the subsistence theory of wages and the wage-fund doctrine.

SMITH regarded the aggregate income as being distributed between categories such as merchants, manufacturers, landlords and the working class people. But the outcome of this distribution, which was dependant on the economic power and bargaining strength of the various groups, was considered clearly fixed in advance.

<sup>15</sup> KUZNETS (*op. cit.*) mentions a figure of 23 per cent. of the working force being in agriculture by 1841.

RICARDO was primarily interested in the laws which governed the distribution of the product or income (profits, wages, rent) among landlords and others, but the results were equally gloomy for the lower classes, as is apparent as an undercurrent in the following theories.

## 2.1 The Subsistence Theory

The subsistence theory proposed that wages per head tend to represent a minimum existence level, wages being equal to the amount of commodities necessary for the subsistence of a labourer and his family. This theory leaned heavily on the theory of population, which found its ultimate expression in MALTHUS' Essay, though, as SCHUMPETER (1961, p. 254) has shown, many of his predecessors in the 17th and 18th Centuries had already partly or wholly embraced this theory. This theory posed that any increase in wages above a socio-culturally defined subsistence level would induce labourers to have larger families. With an increased labour supply in a following generation there would be more competition for the available jobs, and as a result wages would drop to, or sometimes even below the subsistence level. This would lead to greater infant mortality and to postponed marriages. Though there might be a time-lag in either direction, in the long run wages would oscillate around this particular level.

The subsistence theory of wages, with its links with the population theory, is a typical long-run theory: the supply would always be increased indefinitely if the price offered for it rose above a certain level. The demand for labour is not considered important, as Figure 2 shows. With ON as the subsistence minimum for worker and family and NN' as the long-term supply curve of labour, it is shown that changes in demand have no lasting influence on the wage level. With dd and d'd' representing two demand curves for labour, the long-term equilibrium wage always equals ON.

In ADAM SMITH's days, apart from long-run population movements, it would have

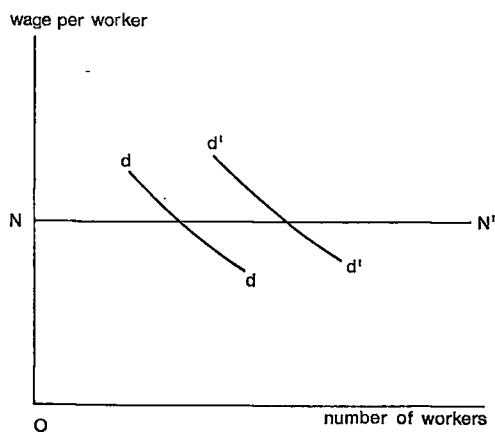


Fig. 2. The subsistence theory.

been impossible for the workmen to obtain a greater share in the product, as their bargaining position was very weak: "The masters, being fewer in number, can combine much more easily, and the law, besides, authorises or at least does not prohibit their combinations, while it prohibits those of the workmen. We have no acts of parliament against combining to lower the price of work, but many against combining to raise it" (SMITH, ed. 1954, p. 71).

MARX did not accept the Malthusian theory of population. He contended, that the accumulation of capital with its concomitant progress in labour-saving techniques, is the cause of the creation of permanent structural unemployment. With the creation of a so-called 'industrial reserve army', brought about by the acts of the capitalists, there would be wage-depression, even on the short run. MARX argued that NN', as presented in Figure 2, represented not only the long-run equilibrium wage rate but also the short-run one.

Differences in wages between countries or regions, or different periods, were explained by both RICARDO and MARX as being "determined by a traditional standard of life" (MARX). Or, as stated by RICARDO (ed. 1955, p. 52) "it is not to be understood that the natural price of labour, estimated even in food and necessaries, is absolutely fixed and constant. It varies at different times in the same country, and very materially differs in different countries".

This kind of reasoning points out the weakness inherent in the use of this theory in an operative sense. In defining the subsistence theory in the manner of SMITH<sup>16</sup>, RICARDO and MARX, one is almost accepting customary wages as an institutional datum, thereby abandoning any purely economic explanation of wage determination.

In retrospect it can be understood quite well that such factors as an increasing population, constant techniques and/or diminishing returns, strong bargaining positions or the capitalistic system have, in a period of deep class conflicts, led to the adoption of this subsistence theory as a useful basis for explaining the economic forces operating in society. Corresponding conditions have no doubt led some economists<sup>17</sup> to believe that these Classical theories could be relevant in present-day low-income countries.

## 2.2 The Wage-Fund Doctrine

The question ignored in the subsistence theory, namely what determined the demand for labour, was answered by the Physiocrats and writers of the Classical School by reference to the theory of the revolving capital fund, from which the maintenance of the labour force was to be provided. The Physiocrats treated capital as consisting

<sup>16</sup> SMITH was doubtful whether this theory worked in all strata of a society: "But in civilised society it is only among the inferior ranks of people that the scantiness of subsistence can set limits to the further multiplication of the human species" (*op cit.*, p. 59)

<sup>17</sup> See section 1.4.

simply of 'advances of wages'. Hence, it seemed natural to regard the demand for labour as being dependent on the existing stock of capital. In agriculture, the Physiocrats' main domain of study, harvesting usually takes place once a year. If the share of one of the participants is enlarged, the others must obtain less. By analogy, the amount of funds to be spent on wages was also considered to be fixed. The wage level was simply found by dividing the amount of capital which was (according to the laws of competition) put aside by the capitalists for labour by the number of wage earners in the population.

Though this would seem a rigid theory, the Classical writers did not rule out the possibility of economic growth. According to SMITH (*op. cit.*, p. 62), with the growth of an economy (depending on capital formation), the wage fund would be enlarged and with a constant population higher wages could be paid: it is "in the most thriving countries or in those which are growing rich the fastest, that the wages of labour are highest", as demand for labour would be higher.

However, SMITH's view of the course of the economy was that, while the stock of capital would grow, the rate of profit for the entrepreneurs would fall. This was considered to be due to the competition of capitalists in the same trade for labour, and the consequent rise in labour rates. The drying-up of investments would ultimately lead to a stationary state, in which the population has to remain constant as the wage fund has become fixed.

For RICARDO also, the extent of profits depended on how much had to be put aside for the maintenance of the labour force. In his opinion, the "natural tendency" of profits was to fall, for in the course of time food production would be more costly owing to the law of diminishing returns. Though technological innovations might counterbalance this trend, it was his contention that technological progress itself was also subject to diminishing returns. Thus, in RICARDO's stationary state an equilibrium would be found for the fixed remuneration of productive factors which is similar to that of ADAM SMITH. However gloomy the prospects, by controlling population growth it would be possible to maintain a reasonable standard of living<sup>18</sup>.

It was not until late in the 19th Century, when some statistics on the subject became available, that it was possible to disclose that, among people with a higher standard of living, the birth rate would not necessarily be higher. Population growth as an endogenous factor in economic development then began to lose its meaning, at least in the western world.

In the middle of the last century attention was drawn to the connection between wage level and efficiency, the principle that came to be known as the "economy of high wages". It was discovered by employers in 19th Century England that higher wages did not merely mean a higher standard of living for the worker and his family, but they also immediately led to a higher efficiency. This was not surprising, as labourers at that time were often undernourished. Higher efficiency could also create

<sup>18</sup> For an exhaustive analysis of the Classicist's theories of economic growth and development, see ADELMAN (1961).

a higher demand for labour on the part of the employer.

Thus a rise in wages was capable of affecting not only the supply conditions of labour, but also the size of the Wage-Fund itself, "thereby shifting the demand for labour in the opposite direction again from what the sponsors of the Wage-Fund doctrine had assumed" (DOBB, 1948, p. 112). There were apparent shortcomings to this theory, as MARSHALL (1925, p. 544) pointed out: "(the Wage-Fund theory) suggested a correlation between the stock of capital and the flow of wages, instead of the true correlation between the flow of the products of labour aided by capital and the flow of wages".

These two theories may be considered as the two parts of the same theoretical body: the subsistence theory highlighting the supply side and the Wage-Fund doctrine stressing the demand for labour. It appears that these theories, obviously based by economists on the experiences of their own society, are complementary to each other. Although they had been rigidly determined in their original form, they were defined more loosely in the course of time, as the real world was found to be more complex.

### 2.3 The Marginal Productivity Theory and the distribution of income

Though RICARDO admitted that in an 'improving' society the market wage might be above the natural wage for long periods, in the end wages would level off to a conventional minimum.

It was not until later in the 19th Century that wages were looked at from a different angle, *viz.*, the relation between the value of the output which labour produces and the actual wage rate. This theory, derived from the utility theories of that period, stated that under conditions of perfect competition the money wage rate of every type of labour equals the physical marginal increment of the product due to the last increment of each type of labour applied multiplied by the equilibrium price of the product<sup>19</sup>.

There are also limitations to this theory. It stresses the demand side on the assumption that a certain supply of labour is seeking employment. It is taken for granted that markets are competitive, bargaining and other institutional factors being largely ignored. Finally, it should be noted that the marginal productivity schedule varies as between the individual firm and the industry as a whole. In the latter case an expansion of output may not leave the price of the commodity unaffected.

A great improvement over the older theories is that it connects wages with the productivity of labour. This aspect had not previously been developed.

<sup>19</sup> In order to include both perfect competition and monopolistic conditions, the marginal product is given a more carefully phrased definition by using the term 'marginal revenue' product, since under monopoly conditions the fall in price affects the entrepreneur's total output.

Another important step was solving the problem of how the distribution of the total product accruing to rents, wages, interest and profit was regulated. This complexity was clarified by the concept of marginal productivity. It was J. B. CLARK, who, around 1890, developed a simple theory of distribution. In his model, wages and rents were taken into consideration, while it was assumed that constant returns to scale prevailed.

As presented in Figure 3, with  $dd$  being identical to the marginal productivity curve for labour, employers would pay workers the equilibrium price  $P$ , which corresponds with the point where the supply line  $ss$ , representing the number of workers in the population, meets  $dd$ . All workers obtain the wage received by the last man added. The remaining portion,  $ABP$ , is the rent which accrues to the landlord. The total wage share is given by the rectangle. The figure clearly illustrates the connection which exists between the total wage share and the wage level. This theorem of marginal productivities provided the clue to the problem of how factors of production are priced in competitive markets.

At this juncture it seems appropriate to pay some attention to this term 'productivity'.

'Productivity' is generally used to denote the ratio of the output to any or all of the associated inputs (KENDRICK, 1961). Ratios of output to particular inputs are considered as measurements of 'partial productivity', such as labour productivity. The latter can be defined as the ratio of total output per unit of labour. This ratio is an average product. It can be determined by the size of the labour input and the volume of production. When interest is centred in the extra product added by one extra unit of input, this is defined as the marginal product.

All inputs entering the production process affect the productivity of labour. It is this interaction, the interdependence of the productivities of the various factors of production, which causes complications. If labour is the relatively scarce factor, the

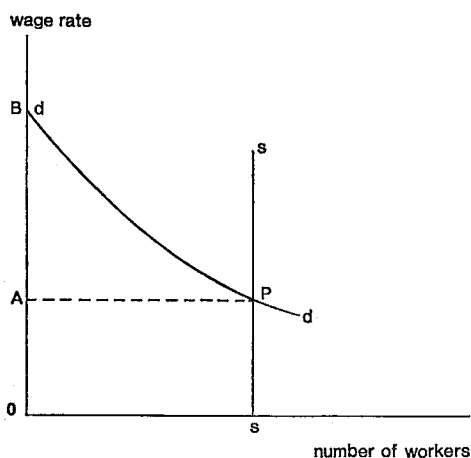


Fig. 3. The distribution of income.

marginal net<sup>20</sup> product of labour will be high; if land/capital is in short supply, this will have a depressing effect on the marginal net product of labour.

Moreover, the efficiency of the production process, the state of techniques and the underlying market situation (for instance, the distribution of consumers' demand between labour-intensive and capital-intensive products), all this will affect the productivity as well.

Notwithstanding these complications it has been possible to assemble the input elements in a meaningful way into one theory of production. This is the concept of the production function, which gives the relation between inputs and output. The production function has been an important instrument in bridging the gap between economic theory on income distribution and factor productivity, on the one hand, and real world conditions, on the other (DOUGLAS, SOLOW). In connecting these theoretical and practical elements, extensive use will be made of production function analysis in the following chapters, in which the productivity of labour is discussed.

Returning to the wage theories developed by the Classical and Marginalists' Schools and their predecessors, it is conspicuous that, although these doctrines emphasized different aspects, neither gave a complete theory. It was MARSHALL who finally tried to combine the forces which affect both demand and supply. He asserted that "wages are not governed by demand-price nor by supply-price, but by the whole set of causes which govern demand and supply" (*op cit.*, p. 532).

The "two blades of a pair of scissors", supply and demand (with particular reference to labour), will be given separate treatment below. This treatment is based on partial analysis. After a more general introduction, demand and supply will be more specifically related to the agricultural sector of an economy.

## 2.4 The demand for labour

### 2.4.1 General remarks

Since COURNOT the demand for a commodity has been considered to be a function of its price. The demand for labour (as a commodity) has a few peculiar features, in that the work of a labourer is usually not desired for its own sake but because it is to be used in the production of something else. As pointed out by MARSHALL, demand for labour is mostly a 'derived' demand.

According to the marginal productivity theory the employer is willing to purchase labour as long as the 'net product of additional labour' (after allowance has been made for the extra equipment required by those employed) is equal to the prevailing wage rate. The marginal productivity theory is derived from the Law of Diminishing Returns, which states that an increased quantity of labour applied to a fixed amount

<sup>20</sup> After allowance has been made for incidental expenses.

of complementary resources will yield a diminishing marginal product.

HICKS (1963, p. 323) holds the 'scale proportion' approach to be the best way of constructing a theory of demand for labour, this approach being another example of partial analysis. If, for instance, a particular kind of labour is only used in a certain industry, then a rise in wages will increase the unit cost of its particular product, which will cause an increase in its selling price. Less may be sold and the demand for this type of labour will then diminish, depending on the elasticity of demand for the product. In addition to the scale effect, the demand for this type of labour is affected by the resources which are substituted for labour. The presence of substitute inputs may be an additional reason for a fall in the demand for labour.

Technical conditions may cause the short-run demand schedule to be inelastic; the same may apply to the demand elasticity for the final commodities produced. Thus, elasticity of demand is connected with the time factor, demand for labour being more elastic, the longer the period since the previous change in wages.

As ROTHSCHILD (1954, p. 21) remarks "... the course of marginal productivity . . . rising smoothly and continuously up to a certain point and then falling off gradually, is only applicable to the long run, when enough time has elapsed to change and reorganize . . . so as to give the best combination with different sizes of the labour force".

#### 2.4.2 Demand for labour in agriculture in general

The demand for labour in peasant agriculture, which is mainly met by the family labour force, is connected with the unavoidable periodicity of the operations. Whenever the family falls short of labour requirements, labour is hired either permanently or, more commonly, on a casual basis. This means that the labour demand schedule<sup>21</sup> often has a discontinuous character for both family and hired labour. Technical conditions are fairly rigid in agriculture generally. This is even more the case in low-income countries where innovational changes are adopted slowly.

In many instances the capacity point is reached quickly for each crop operation (say, weeding or harvesting) and subsequently the marginal productivity of labour drops sharply. This is illustrated in Figure 4, where the demand for labour will be inelastic between the levels AB and AC in the short run.

There are extreme cases, such as mentioned by MUJUMDAR (1961, p. 65), in which cultivators visit their farms on only two occasions, namely for sowing and for reaping. If additional labour is necessary, it is demanded only for short periods, resulting in a discontinuous pattern of demand. The cultivator's decision on marginal changes in the application of labour concerns both hired and family labour. However, hired labour is a more mobile resource and may provide an indication of the adjustment

<sup>21</sup> What is meant here is the demand as a function of time; changes in demand are expressed as a shift of the demand curve.

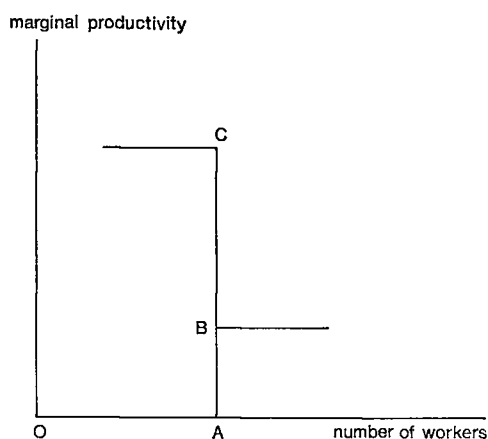


Fig. 4. *The inelastic short-run demand schedule for labour.*

to price changes at the margin. The 'price' of hired labour is the farm wage rate, while the 'price' of family workers is not readily available. Further discussion on family and hired labour will be postponed until Chapter 3.

The farmer's decision on the application of labour in agriculture is furthermore determined by the demand for labour in other occupations to which access is easy in the rural environment. The latter demand may constitute a considerable 'pull' away from farm occupations. As in the case of hiring labourers, this involves marginal decisions. It will be possible to discuss this point more fully later.

Finally, it should be asked whether the demand for labour and its price is connected with the efficiency of labour. Do employers have a preference for the product of a special worker? We have already mentioned the principle of 'high wages', which states that productivity is both the cause and the effect of wage changes. Such a mechanism may be discernible in conditions of great poverty, when a wage increase has an immediate impact on the physical fitness of the worker. LEIBENSTEIN (1957) contends that such a relationship exists at present in low-income countries. In such a case it would also be beneficial to the employer to maintain reasonably high wages.

It is quite conceivable that such considerations are apparent in low-income agriculture, where landowners would benefit by maintaining their workers on such a basis. However, it is unlikely that such a link between wages and efficiency should be easily discernible under an agricultural system in which a multiplicity of employers and casual employment is the rule. The demand for labour is not prolonged enough for such concerted action.

However, in agricultural systems in which 'attached labour' is a characteristic form of rural employment, as, for instance, in Korea, such a relationship might well be pertinent<sup>22</sup> (CHO, 1963, p. 59).

<sup>22</sup> When employer and attached labourer share the same pot, the wage-efficiency relationship may again be negligible.

## 2.5 The labour supply

### 2.5.1 General remarks

The supply of labour to be offered depends on its price on the labour market; it is taken that labour will not be supplied below a certain level of wages<sup>23</sup>. The supply of labour has various components, such as the number of workers, the number of hours and the intensity of work, which is closely linked with the quality of the workers' effort.

The number of available workers can usually be discerned from the size of the population. The secular supply curve of labour, i.e. changes in the size of population, has been considered by HICKS (*op. cit.*, p. 2) and ROTSCCHILD (*op. cit.*, p. 37) as lying outside the scope of wage theory. There is reason to believe, however, that the secular supply curve is of importance for the conditions considered here; this point will be elaborated upon further in Chapter 3. For the present it will be sufficient to assume a population of a given size.

The availability of workers will vary widely with the standard of living. In the case of a family near the subsistence limit, younger sons, daughters and adult females may be forced onto the labour market, while old people are compelled to remain in employment; longer hours may be worked or the intensity of work increased. A wage cut may lead to substantial increases in the aggregate supply but it may also lead to decreases in the number of labourers. The same applies to a rise in wages.

In view of the number of cases of irregular behaviour on labour markets with special reference to low-income economies, it has been contented by authors such as BOEKE (1953) and MOORE (1955) that low want schedules or a high preference for leisure are commonplace features and it has been maintained that the supply of labour is inversely related to the rate of wages.

This phenomenon had already been noted in 18th Century England. As ADAM SMITH remarked: "Some workmen, indeed, when they can earn in four days what will maintain them through the week, will be idle the other three". But he added: "This, however, is by no means the case with the greater part", (*op. cit.* p. 73).

As analysed by ROBBINS (1950, p. 237), the underlying basic pattern which highlights the phenomenon of irregular supply conditions is the fact that the supply of labour depends on the elasticity of demand for income. A rise in wages has both an income and a substitution effect<sup>24</sup>, and the irregular so-called 'backward sloping' supply curve should be read as a normal demand curve representing the demand for income in terms of effort<sup>25</sup>.

<sup>23</sup> In analysing labour-supply in this way, it is implicitly assumed that labour offers its services on the market. Workers (either industrial or agricultural) are all employed for wages.

<sup>24</sup> These effects go in opposite direction.

<sup>25</sup> That preference for leisure in the western world is increasing is clearly demonstrated by the length of the working week which has declined from about seventy hours in 1850 to forty hours in 1960.

In general, supply conditions are rigid on short-run, as far as numbers are concerned. Institutional forces render it difficult for a great part of the workers to change jobs involving a change in wage rate. Within the family it is not very likely that housewives or school children will change their activities on the short run with an increase in the rate of wages.

Supply, even on the short run, is less rigid when viewed in terms of the number of hours supplied. This is a particular feature in agriculture, where the length of a labour day is determined to a considerable extent by the urgency of the operations.

### 2.5.2 The agricultural sector

From the outset it should be made clear what is meant by labour supply in agriculture. This sector has a number of peculiarities which mark it off from others. One of them concerns the supply of labour, which is partly offered on the labour markets (both agriculture and non-agriculture) but for the greater part submerged as an internal supply in the household-farm business entity.

In the agricultural sector the main factors influencing the supply of labour are the following:

- (1) *Level of farm income.* Their farm income being small, members of rural communities are often forced to offer themselves on the labour market for hire in both the agricultural and the non-agricultural sectors. The size of the individual's agricultural business and the level of income derived therefrom are thus data of overall importance. For instance, in some of the heavily populated parts of South East Asia a class of agricultural labourers has emerged which has little or no access to the cultivation of land. Few alternatives are open to them in the rural communities, and, since the agricultural seasons are short, the average worker secures employment for only a limited number of days in the year.
- (2) *The time factor, viz.* the uneven seasonal labour requirements which reflect the seasonal nature of most peasant farming. This factor gives rise to migrations over shorter and longer distances, and agricultural workers find employment either in other agricultural regions or in industrial areas. This factor is closely connected with the third factor.
- (3) *Intensity of the family's (individual's) preference for money over leisure.* Labour allocation can be considered as an intermediate stage in the transformation of leisure into goods and services. The extent to which leisure is transformed into labour for some sort of product is greatly influenced by the cultural environment. The amount allocated, for instance, to agricultural production in relation to other activities depends mainly on the level of the availability of resources, technology and management (MELLOR, 1963), although the level of labour productivity is itself also an important factor. This mechanism has a world-wide implication but it should be of interest to study it in societies where environmental influences are believed to be strong.

BERG (1961), discussing the 'African case' has pointed out that much can be explained by assuming that the individual has in mind a target income the size of which depends on the tax rates and the level of his requirements. It is precisely this process of economic and social change which can change both the income goal and the elasticity of the individual's labour supply curve.

The aggregate labour supply function for any given region may have been sloping backwards over a certain range during the early days of African or Asian development; a rise in daily wages induced few workers to take employment, while it encouraged many of those in paid employment to cut short their stay. But contemporary studies (BERG, *loc. cit.*, ELKAN, 1959) show that, at least in Africa, the curve for the aggregate supply of labour to the economy (including cash-crop farming) has a positive slope throughout most of its range. The target income concept may be losing its applicability as wants increase in frequency and flexibility.

## 2.6 Demand and supply of labour

At this juncture we could combine demand and supply in the well known equilibrium model. However, it would be too simple to suggest that such a presentation could be of much use, in view of the foregoing analysis of the separate elements determining the demand and supply schedules.

As for agricultural labour, continuous shifting of both demand and supply curves has to be expected. Owing to irregularities and changes in the production process over a period of time, simple demand-supply models, as presented in textbooks, have to be ruled out.

In treating some of the aspects of wage theories and the connected subject of income distribution we have strictly limited ourselves to those theoretical aspects of labour which may be of relevance in the following discussion. For instance, no attempt has been made to include bargaining, the influence of technological change or the long-run prospects of labour-capital substitution.

What may be relevant in the following discussion is, on the one hand, the Classical writers' long-term view of wages under (near-)stagnant conditions and, on the other hand, the marginal productivity theory as a tool which connects wages to the productivity of labour.

### 3 Un(der)employment and the wage level in the agricultural sector

#### 3.1 Introduction

The previous chapter presented the outlines of the theory relevant to the problem under discussion. Now it is possible to state more explicitly a working hypothesis as follows:

*Agricultural wages in these low-income peasant economies reflect labour's marginal productivity value to the employer. Moreover, the marginal productivity of family labour in farming is not zero.*

To test the main point, it seems proper to try out this hypothesis in the case where its tenability seems least of all assured, namely under conditions of densely populated areas, poorly endowed with natural resources in which rural unemployment and underemployment abound.

Before testing this case, it is necessary (a) to look for the underlying causes of rural underemployment and (b) to investigate the theoretical foundations of un(der)-employment and its empirical occurrence in real-life situations.

The existence of un(der)employment seems a widespread phenomenon in many low-income countries, especially in South-East Asia, but it is also present in other parts of the world. As for its main cause, it appears to be due to a lack of co-operant and complementary factors of production.

The types of unemployment in rural areas result partly from lack of incentives in the economic system and from other causes<sup>26</sup>, but for the main part unemployment seems to be caused by a "structural disequilibrium at the factor level" (KINDLEBERGER and DESPRES, 1952). This should be understood as an excess of the aggregate labour supply in relation to the supplies of co-operating inputs. This unemployment manifests itself in overcrowding in rural areas.

Broadly speaking, there are two main types of unemployment to be discerned in rural areas, namely seasonal unemployment and disguised unemployment (or underemployment). Other forms of unemployment are known, such as cyclical unemployment, but they do not have an important bearing on low-income peasant economies. The two forms of unemployment mentioned above are the subject of study here.

<sup>26</sup> Lack of incentives due to the lack of demand for agricultural products and the lack of any comparative advantage in agriculture may be an important contributory cause. However, in this context it does not appear to be a primary one; neither is this the case for imperfections in labour markets. For a further discussion of the causes of underemployment see: UPPAL (1965).

Seasonal unemployment will be given treatment in Section 3.4.

As for 'disguised unemployment', since this term is often defined as being identical to zero marginal labour productivity, we should first investigate this phenomenon of underemployment in so far as it affects wage determination in the rural sector of low-income countries.

Despite the fact that so much has been said about disguised unemployment in low labour-income economies, it seems appropriate to elaborate its theoretical content here, as the literature over the past two decades has shown little conformity on this issue. Besides, the question should be asked: if disguised unemployment exists, what exactly is the nature of this phenomenon and how can it be expressed? Again, but most important: to what extent does it affect the validity of the labour productivity tenet?

The concept of disguised unemployment, which was originally coined by JOAN ROBINSON (1936) (albeit in a somewhat different context from that under discussion here<sup>27</sup>) has been subsequently used in economic literature more or less in the following general definition: disguised unemployment or (structural) underemployment is a situation in which the total agricultural output will not fall if some agricultural workers are taken away, under the assumption of *ceteris paribus*. Marginal productivity of labour with respect to land, *ceteris paribus*, is thus zero or, at most, negligible.

According to NURKSE (1953), in these circumstances "even with unchanged techniques of agriculture a large part of the population engaged in agriculture could be removed without reducing agricultural output . . . The term disguised unemployment is not applied to wage labour. It denotes a condition of family employment in peasant communities. A number of people are working on farms or small peasant plots, contributing virtually nothing to output, but subsisting on a share of their family's real income . . ."

A main point of controversy has been the stipulation of 'all other things being equal'. Whereas this term was strictly adhered to in an early study by the United Nations (1951, pp.7-8), others, led by NURKSE (*op. cit.*), considered that the withdrawal of labour is possible only when some reorganization is carried out, especially "in the manner and organization of work, including possibly a consolidation of scattered strips and plots of land".

Once some people have been withdrawn from the land it may be asked if *ceteris paribus* infers that those staying behind have to do more work, individually, in order to maintain the same total output. This question illustrates the need, wherever such a qualification is used for a specific definition of what is meant by disguised unemployment. A confusing point is that 'disguised unemployment' is not applied to hired labour, an allegation also made in the report by the United Nations mentioned above.

<sup>27</sup> ROBINSON maintains that, with a decline in effective demand, men seeking jobs will not always be unemployed in the sense of complete idleness, but they will be driven into inferior occupations. She thus relates disguised unemployment to the difference in productivity between labour in existing industries and that in less productive enterprises.

How does one reconcile this with the observation, as made in farm studies of overcrowded rural areas in India (Ministry of Food and Agriculture, India, 1957-1962; SHASTRI, 1957), that even on very small-sized holdings both hired labour and mutual self-help is encountered, while the family's marginal labour productivity is presumably zero or very near to it?

During the forties and the fifties it appeared to some economists that there was an abundance of labour in, for instance, Southern and Eastern Europe and parts of South East Asia, which would be really surplus in that recruitment for the non-farm sector would not lead to a significant decline in agricultural production. This concept has led to the appearance of a number of economic growth models based on the assumption of 'an unlimited supply of labour'. The first and foremost of those to devise such models was W. ARTHUR LEWIS (1954) who brilliantly adapted the growth models of the English Classical School by means of a two-sector model. With LEWIS' pioneering study as the starting point, certain aspects have been elaborated upon and developed by, amongst others, BARBER (1961), RANIS and FEI (1961), ENKE (1962) and CUMPER (1963).

So far we have been giving a general description and definition of disguised unemployment and we have pointed out some inconsistencies in the subject. The next step is to present a model to explain and illustrate its occurrence under the conditions applicable to low-income peasant economies.

### 3.2 A macro-economic model

In this essentially one-sector model (agriculture), which is classical or, more precisely, Ricardian in origin, it is assumed that two factors of production take part in the production process: land and labour. This is not unrealistic under the conditions applicable to low-income peasant communities. Though capital in its various forms exists, it is often accumulated and incorporated in the land.

Though this treatment appears to be the opposite of that applied in most models in modern economic literature, which consider land to be a part of capital, it is not dissimilar in actual fact, only the emphasis in kind being different.

Furthermore, it is assumed that (1) the growing population has to be absorbed into the agricultural sector, as the capitalistic sector is too small or employs capital-intensive resources, (2) all agricultural land is a fixed quantity and of a homogeneous quality, (3) agricultural techniques are given and constant even for a relatively large period and (4) agricultural production is produced by a constant proportion of the agricultural population.

A short digression is in order here before discussing the model. In the marginal productivity theories of the Neo-Classical School it was implicitly assumed that a market equilibrium existed where the quantities supplied and demanded were equal.

When the price (say labour's wages) was higher than the equilibrium intersection of supply and demand, the quantity of labour offered would exceed the quantity demanded and a downward pressure on wages would set in until a new equilibrium was reached.

However, real-life conditions, especially in densely populated countries point to the importance of the secular change in the supply of labour and its effects on the employment situation in those countries where full employment has not been reached.

The quantity of labour supplied is affected by population growth. The factors determining population growth are births, deaths and (net) migration (migration will be ignored here). KUZNETS (1954) has shown that in Europe from the Middle Ages up to the 18th Century there was a slow secular increase in population and both mortality and birth rates were high. In the transition from agricultural economies to industrialization death rates were the first to fall followed by a decline in birth rates. This theory of 'demographic transition' postulates that economic development has an impact on the size of the population through its births and deaths.

However, as has been pointed out by COALE and HOOVER (1958) with respect to low-income countries, although substantial economic improvement may be a sufficient condition for a decline in mortality, it is not a necessary condition today. For instance, the picture in many countries, especially in South America, Africa and parts of Asia, is one of accelerated population growth which has given rise to sudden and large increases in population, unheard of in the history of, for instance, the Western European countries.

The main cause of this population explosion appears to be the sharp decline in mortality rates, not due to economic improvement but attributable to such exogenous factors as better medical facilities, better sanitary measures and the establishment of law and order (for example, the '*Pax Britannica*' in the former British colonies).

Especially in densely populated low-income countries, the population growth presents an obstacle rather than an asset: with a low propensity for capital accumulation and slow technical progress, these two positive factors in the process of economic growth are usually not sufficient to increase the *per capita* income. This leads to an expansion of the production without a corresponding growth in *per capita* income.

In the agricultural sector, when land and techniques are fixed factors, this situation gives rise to diminishing returns. This is particularly serious, since the potentialities for population growth are large shortly after the exogenous factors make themselves felt through the decline in mortality rates, whereas, as contemporary studies from various countries (Ceylon, Taiwan) show, birth rates remain high and constant for a long time (COALE and HOOVER, *op. cit.*).

This is in contrast to the situation in RICARDO's and MALTHUS' time, for, while neither capital accumulation nor technical progress were very spectacular, the net population growth did not give rise to a similar situation in their time as both birth and death rates were high.

It has been pointed out by BOSERUP (1965) that population growth is itself a major factor determining agricultural development. According to this author, the Malthu-

sians have too often neglected such improvements in agricultural technology as the gradual adoption of more frequent cropping with a simultaneous increase in population.

We will not dispute this point, but we wish to emphasize that we are primarily interested here in the final stage of this development, when the main characteristic of farming is the optimum use of land with known techniques. For the vast majority of low-income peasants, this permanent form of cultivation is the general situation which they have to face rather than that of less intensive land use. It can be objected that this final stage has by no means been reached in countries such as, for instance, India. The scope for the increased adoption of irrigation is a case in point. However, as long as its development is so slow and is bound up with other factors, not necessarily economic (D. and A. THORNER, 1962), which retard it, *the autonomous population increase is very much the decisive factor*.

In the following model the conditions just described have been taken into account, *viz.*, the secular supply of labour, the limited availability of land and the unchanging techniques; the possibility for the more intensive use of land under stagnant conditions has been ruled out. This culminates in a single production function for a particular peasant economy which resembles features of LEWIS' capital-less 'subsistence sector' over a period of time which leads to diminishing returns for labour.

At the very outset, the presence of two different land-tenure systems should be recognized, i.e. the owner-operator and the landlord-tenant systems. These are social data which have some bearing upon the economic causes. However, as the main interest lies in the (more or less) independent small peasant farmer described in Chapter 1, attention will be focussed on his case.

### 3.2.1 Phase I: The stage of constant returns for labour

In the first phase land is plentiful. The amount of land cultivated per worker is as much as he can profitably combine with his labour and other resources. Much depends on the known agricultural techniques, the market and demand structure for agricultural products and the marginal utility of goods and services, once subsistence is met.

Assuming that the agricultural labour force represents a constant proportion of the agricultural population, the output increases proportionally with the population. In a given situation it is noteworthy that during this stage the annual output/head ratio is almost constant<sup>28</sup>.

In underdeveloped countries with extensive regions to which Phase I is applicable,

<sup>28</sup> Reference is made here to DE VRIES' bold but apparently useful calculations for the classification of production into milled rice equivalents per head for a number of Asian countries. In an early stage of development output appears to be around 300-400 kg grain equivalent/person/year (quoted in: CLARK and HASWELL, 1964, p. 51).

few capital assets are usually involved and agricultural skills are traditional and not yet influenced by education and extension services. Hence, the productivity of labour and land is generally low. Moreover, there will be little incentive to produce much in excess of subsistence requirements, as the non-agricultural sector is small and the outlets for the production of an export crop and the introduction of a greater variety of consumer goods are not yet available.

However, in recent decades the possibility of growing crops for cash at reasonably attractive prices has induced many farmers, for instance, in Africa, to extend the areas under cultivation. This has usually been accomplished at the expense of leisure and without any structural changes in the pattern of resource use<sup>29</sup>.

During this stage, with the growth of population, new land is successively being cleared and cultivated, while land use itself becomes more intensified. This clearance and maintenance of the newly opened land is the most important form of capital formation, hence its inclusion in land. The above-described situation exists in a number of regions of Africa and in the more thinly populated and isolated regions of Asia and South America.

The agricultural labour pattern during this stage could be briefly described as follows: The unavoidable peaks of labour demand will be levelled off under this system by means of exchange, communal labour arrangements and the temporary employment of those women, children and old people who would otherwise not take part in farming. Labour for wages is seldom encountered as labour finds free land to work with. Institutional rigidities may prevent certain classes of people within the particular community or outside farmers who may be forced to work as labourers from having access to this land. Other than this, no class or group of agricultural labourers exists. The total annual net product is allocated to family labour, of which the average and the marginal productivities coincide (see Figure 5, Phase I).

In the case of the employment of casual labour for wages, earnings should be expected to equal average net returns, but social customs, institutional rigidities and traditional payment in kind are factors which make it difficult to confirm this.

This particular phase was encountered by the author while studying the Yergam tribe in Central Nigeria (LUNING, 1957). Land being abundant, the labour-land relation followed a straight line; labour peaks were evened out as a result of communal labour arrangements. Labour for wages was not encountered.

### 3.2.2 Phase II: The stage of decreasing returns for labour

While the land area is becoming fully occupied, a point is reached at which the phase of constant returns for labour is transformed into one in which the linear relationship between the number of workers and the annual crop production ends.

<sup>29</sup> Where factor and product markets function smoothly, cash crop production has quite often been expanded at the expense of food crops, especially when income gains seemed attractive.

Once the element of scarcity has been introduced, markets for production factors make their appearance. Land becomes the limiting factor under the present assumptions of more or less constant techniques, more intensified farming and a low level of capital assets. It is supposed that the agricultural population will maximize its output, the technical and socio-cultural background being constant.

At this stage, total production per annum is still increasing but at a diminishing rate up to the point at which the marginal productivity of labour approaches zero. Figure 5 illustrates that during Phase I the agricultural wage level (i.e. the level of remuneration) is constant and identical to the A.P. and M.P. curves, which are, in fact, horizontal lines here.

Upon entering Phase II the marginal productivity curve becomes distinct from the average productivity curve. The wage rate is depicted by the intersection of the demand and supply curves for labour. The various vertical lines,  $S_3$ ,  $S_2$  and  $S_1$ , represent the shifting short run supply curves of labour as the agricultural population continues to grow. The marginal productivity curve corresponds to the demand curve and the intersections,  $A_1$ ,  $B_1$  and  $C_1$ , determine the wage<sup>30</sup> at each point of population growth.

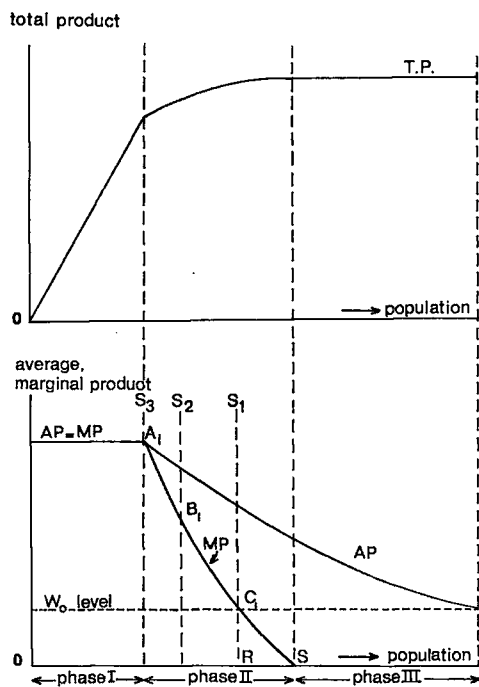


Fig. 5. A macro-economic model of agricultural output and wages with increasing population.

<sup>30</sup> 'Wage' is used in this section in the broad sense of payments to all workers, including the household's working members, out of the total agricultural product. In a system of freeholders, the product shares of both labour and land are received by the owner-operator.

As is well known from real-life situations, there is a limit to which the level of remuneration of labour will be accepted while the marginal productivity of labour is approaching the zero level. This lowest price for which labour is prepared to work is represented by  $W_0$ , the subsistence level, which consists of earnings for subsistence plus some modicum extra. This level is determined by socio-biological conditions. Up to point  $C_1$  in Figure 5 the farm worker has at least contributed his own subsistence (that of himself and his dependants) to the annual aggregate output. Beyond  $R$  the agricultural sector becomes overpopulated, the extra workers consuming more in food than they contribute.

### 3.2.3 Phase III: The stage of constant total production

In the final phase, as shown in Figure 5, total production remains constant, as the marginal productivity of labour is zero from  $S$  onwards. The wage rate is assumed to be the subsistence rate, since from  $R$  onwards the marginal productivity curve has lost all relevance as a determinant of the wage level. The agricultural labour force has become partly redundant; in LEWIS' terminology the stage of an unlimited supply of labour has been reached, and this labour does not contribute anything to output.

## 3.3 The concept of disguised unemployment

Now that we have set out in a few lines the labour pattern occurring under the assumptions of a fixed land area, constant techniques, an intensive land use and a secular supply of labour, the concept of 'disguised unemployment' should be related to the model described above.

Is disguised unemployment merely identical to surplus labour, i.e. all labour beyond point  $S$  in Figure 5? Is the macro-economic model compatible with the micro-economic situation? It is contended that no satisfactory answer can be given until the micro-situation has also been taken into account. This is the more necessary, since peasant farming, especially in low-income countries, is organized on a family basis.

Though often difficult, since kinship relations may blur the concept, it is usually possible to discern a unit or group of people who are working and eating together.

One more assumption concerning the 'theory of the agricultural family firm' is that no outside employment opportunities occur; what will happen in the micro-situation of increasing labour supply and fixed land area?

Beyond point  $R$  total family output may still increase, but the marginal worker's additional output does not equal his personal remuneration as represented by the factor market price. Maximization of output appears to be the aim, subject of course to the particular attitude adopted towards the utility of goods and services in relation to leisure. Beyond point  $S$  in Figure 5 the extra output will even be zero.

In the micro-situation, however, this is not likely to be the case. A sharp distinction has to be made between the marginal productivity of a worker and the marginal productivity of an hour of work; whereas the former may be zero, as presented in Figure 5, the latter is not, since the particular mechanism of 'work-sharing' within the family and the concomitant sharing of output is set in motion.

This may be illustrated by the following (theoretical) example.

Under the assumption of identical production units, let families A, B and C represent three farming families with identical cropping patterns on homogeneous land, with 1, 2 and 3 workers, respectively; the labour quality per worker is supposed to be the same in each family, each worker working an identical length of time per day. Assume the number of calendar days available for this production process to be ten and assume that during these days the full labour force per family works, there being no hired labour or exchange labour. As regards the ten calendar days for one particular operation, such a supposition in general is not unrealistic for agriculture. It should be clear that farming operations often have to be carried out within a limited period. A more relaxed working programme extended over a longer period, may lead to a lower total product.<sup>31</sup>

The input-output process with a fixed land area and variable labour is numerically shown for these three families in Table 1.

*Table 1. Cumulative labour input ( $x$ ) and output ( $y$ ) for a given production process for three families (A, B and C) with different labour force.*

Number of days	Cumulative labour input			Cumulative output			Average increase in output per day			Average marginal product per family per day		
	$x_A$	$x_B$	$x_C$	$y_A$	$y_B$	$y_C$	$\Delta y_A$	$\Delta y_B$	$\Delta y_C$	$\frac{\Delta y_A}{\Delta x_A}$	$\frac{\Delta y_B}{\Delta x_B}$	$\frac{\Delta y_C}{\Delta x_C}$
0	0	0	0	0	0	0						
1	1	2	3	2	4	7	2	4	7	2	2	$2\frac{1}{3}$
2	2	4	6	4	10	18	2	6	11	2	3	$3\frac{2}{3}$
3	3	6	9	7	18	25	3	8	7	3	4	$2\frac{1}{3}$
4	4	8	12	10	24	26	3	6	1	3	3	$\frac{1}{3}$
5	5	10	15	14	26	26	4	2	0	4	1	0
6	6	12	18	18	26	26	4	0	0	4	0	0
7	7	14	21	21	26	26	3	0	0	3	0	0
8	8	16	24	24	26	26	3	0	0	3	0	0
9	9	18	27	25	26	26	1	0	0	1	0	0
10	10	20	30	26	26	26	1	0	0	1	0	0

<sup>31</sup> This point will be worked out more elaborately in 3.6.

To illustrate this process in more detail, the course of the respective marginal product schedules has been set out in Figure 6. The abscis shows the cumulative number of calendar days and the ordinate the marginal productivity of labour represented as an earning per family per average unit of time (calendar day). In this theoretical situation family C would reach the zero marginal product level after  $4\frac{1}{2}$  calendar days, family B after  $5\frac{1}{2}$  and family A after just over 10 days.

When in a family two or three (potential) workers become available instead of one, it is highly unlikely that the additional one(s) will remain idle while the first worker carries the whole burden. In traditional society the idle one(s) will be given a portion of the output but they will naturally be obliged to share in the work. With the introduction of two or three new workers it is difficult to appreciate how, if there were no particular urgency to finish the job in a very short time, the theoretical situation (as shown in Figure 6) could, in fact, occur.

In traditional society, in which the physical condition of the labour force is hardly of the highest calibre for strenuous agricultural work, it is quite plausible that, in the case of a large supply of family workers, work-sharing will occur; this means that less labour hours will be supplied per worker per calendar day. Family C will thus finish the job leisurely, may be just like A. In both families the marginal productivity of an hour of work is then similar and positive.

Having clarified this point, it should now be possible to arrive at a more precise definition of disguised unemployment or underemployment. It will be fairly obvious by now that a micro-model should be added to Figure 5, the macro-model.

Disguised unemployment is the phenomenon of a (socio-economic) retarding mechanism in the allocation and use of family labour, according to which less hours per unit of time (calendar day) are worked than would be worked if a smaller family labour force were available. Applied to agriculture this phenomenon is con-

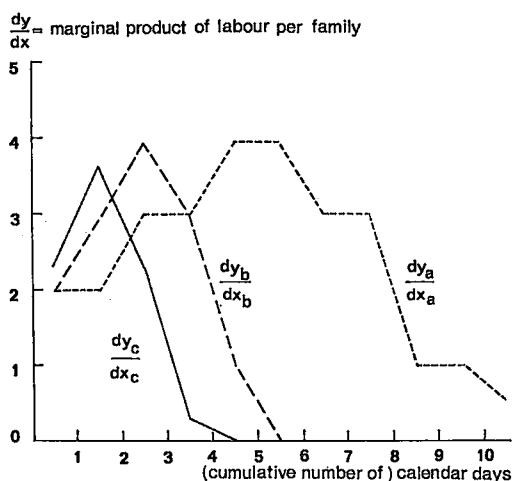


Fig. 6. The case of work-sharing.

fined to certain well defined periods in the production process; it can be regarded as either voluntarily or involuntarily accepted, depending on the worker's physical vigour and particular attitude to work.

To quantify the situation analysed here is not easy, but one may meet it on farm-enterprises with a low land/man ratio. Some evidence of this phenomenon of "work-sharing" appears to be present in the following data, drawn from 'Studies in the Economics of Farm Management, Uttar Pradesh' (Ministry of Food and Agriculture, India, *op. cit.*) and covering three successive years.

*Table 2. Number of days of employment per worker per year on holdings of different size.*

Size of holding in acres	All working days counted, irrespective of whether a part of the day or the full day was worked			Working days calculated from the total hours of work divided by eight		
	1954-5	1955-6	1956-7	1954-5	1955-6	1956-7
below 2.5	284	274	275	62	51	58
all holdings (0-above 25)	309	334	308	178	137	160

In Table 2 the number of (calendar or working) days has been calculated on two bases, as indicated in its text. As is demonstrated, on the basis of *all days of work counted, whether a part day or a full day*, the total number of calendar (or working) days worked is not much affected by the size of the holding. This situation changes when the total of working days is calculated on the basis of hours, actually worked. This indicates that work-sharing takes place on the small-sized holdings below 2.5 acres.

### 3.4 The concept of seasonal unemployment

To what extent is the theoretical framework, as presented in textbooks on wages and employment, really applicable to the agricultural situation? It was stressed earlier that the pattern of employment in the agricultural sector is different from that in the industrial sector. The difference lies in the mode of the organization of production, which is usually a family enterprise in peasant agriculture, whereas in industry the firm operates with the aid of wage-paid labour.

For the present purpose the crucial difference between these two sectors is found in the continuity in demand for labour, which has such an irregular pattern in agriculture. Here the labour requirement over a period of time is often rigid and is dictated by environmental conditions such as climate, cropping patterns, soil conditions, irrigation possibilities, etc. Seasonal unemployment is a temporary feature. The planting of crops has to be completed within a certain space of time, just as do clearing, ploughing, ridging, thinning, harvesting, etc., and all operations require labour for certain specific periods in the season.

It is this time factor which has to be introduced into our model of the labour-product relationship.

In the closed family system assumed so far there are definite spells of seasonal unemployment, especially under conditions of mono-culture, and it is apparent that technical factors are responsible for its existence.

### 3.5 (Disguised, seasonal) unemployment in agriculture and alternative employment opportunities

So far attention has been focussed on the farming family without taking into account the possibility of other employment opportunities. The non-farm sector may play an important role as a source of income, especially in those families in which farm incomes are insufficient to meet the standard family expenses.

In the following it is assumed that under particular circumstances the farm family has a certain relatively fixed income target which it wishes to reach. This target is subject to considerations with regard to the maximization of utility (including leisure) and not to those of the maximization of cash profits. On small and very small farms with a low productivity of available resources, this naturally means that farmers have to hire out themselves in order to supplement their income.

Two somewhat distinct cases can be discerned, the one relating to present agricultural production and the other to future production.

#### 3.5.1 Present production

*Period of seasonal unemployment.* Present production is defined as agricultural activities geared to production for the near future (annual and perennial crops). During periods of seasonal unemployment, no contribution to immediate crop production is made. The farm worker can, however, offer his labour for outside-farm employment. The price which he demands for his labour may be below the market price in force, since his additional income is only of a supplementary nature. As long as his remuneration is sufficient to provide some addition to his income (again determined by his utility schedule), he will continue to compete for jobs, since the opportunity of a return for his labour on his farmholding is zero in any case.

*Period of disguised unemployment.* During certain seasonal operations, which do not need the whole family's labour, there may be an opportunity for one or more family workers to make earnings in outside farm and non-farm occupations, supposing the desire for income is still strong. In this case the decisions made are based on a marginal calculation<sup>32</sup>.

<sup>32</sup> Probably unconsciously.

The competition between these two income-generating categories (barring leisure) is determined by the rate of expected return from either activity. The allocation of labour is now given by the rate of substitution between the return from the two activities. The equilibrium can be expressed as  $\Delta y_1/\Delta y_2 = a_1/a_2$  where  $y_1$  and  $y_2$  are the incomes from either employment category and  $a_1$  and  $a_2$  are the respective wage rates.

The farmer may, for instance, consider that non-farm employment opportunities are more rewarding than extra weeding on his own farm. He will turn to the former type of employment, until this equilibrium is reached and then turn back to his own farm, etc.

In the real-life situation, especially in low-income countries, opportunities which require little skill and capital are quite often open to the agricultural worker. The nature and extent of this phenomenon can be ascertained only by means of micro-studies. As has been so well described by BAUER and YAMEY (1959, p. 37):

“The fluidity of labour between certain occupations arises largely from the fact that only a low level of skill and of capital is required in these occupations in under-developed countries. People can generally move with little sacrifice or difficulty within a wide range of occupations in accordance with changes in prospective net advantages. These activities include various forms of small-scale trading, the supply of the less-mechanised forms of transport service, and the provision of personal services generally. Many farmers are at no disadvantage in small-scale trading provided they have the small amount of capital which is required in this relatively unskilled activity. They will be willing to undertake the sale of their own produce unless they can spend their time more profitably in some other way, or unless they prefer more leisure”.

For instance, there are a number of farming activities which are often of minor importance in a particular farming system, such as livestock rearing, compound farming, fishing, and the gathering of edible plants and fruits. There are also a great number of household activities which are performed by members of the household.

Little time may be devoted to them or else they may be performed by people in the household, who are not normally counted as members of the labour force. Again, labour requirements for these specific activities can often be adjusted to the requirements imposed by major farm operations. In general, it can be said that the gathering of data on input-output in this category often defies proper observation; it is only in micro-studies using time and motion methods that a host of these activities can be duly measured.

### 3.5.2 Future production

There is one item of considerable importance concerning future production which should be given some special attention. This is the amount of labour which is put into capital formation and its maintenance on the farm (fencing, clearing, levelling,

etc.). These represent cases of 'work-making' which can be brought into perspective only through close investigation.<sup>33</sup> The presence of a range of 'minor' activities just mentioned connected with present and future production and its maintenance, should also influence the farmer's decisions. In the latter case it concerns present inputs for future outputs. In this connection it should be noted that input-output analysis is to be related to a certain time period.

Finally, it should be emphasized that there are often a considerable number of goods and services which, while actually purchased in rich countries, are, in fact, produced by the more self-sufficient rural households in low-income countries (the gathering of firewood, oil-production, household repairs). These activities also absorb quite a lot of labour.

There is a paucity of data on this interrelationship between major and minor farm activities, household activities, farm investment and non-farm employment. Some data based on first-hand studies have recently come to the fore. NAQVI and KURIAN (1961) have, for example, mentioned some in the occupational structure of villages in East India; JOSHI and SARMA (1965) have studied the farm-household relationship using data derived from the earlier mentioned Studies in the Economics of Farm Management, India. The latter authors found that on the small farms the outside farm and non-farm income was actually larger than the income derived from the farmer's own farm.

In Chapters 5 and 6 we shall present some further data which have a bearing upon this subject and which have been collected from different continents.

The occurrence of periods of unemployment in agriculture is not necessarily a distressing fact. The agricultural work may be concentrated within only a short period of the year and yet its annual productivity may be so high that strong preference is given to leisure for the remaining period<sup>34</sup>. However, this possibility can be ruled out generally, as such conditions can hardly be expected here, where productivity is often abysmally low.

Patterns of decision-making vary and depend very much on the actual conditions encountered. Caste restrictions may seriously curtail possible sources of additional income and the village may be isolated, which entails the concomitant feature of marketing difficulties. Land tenure arrangements may be such that the farmers with larger holdings may be reluctant to rent their land to small farmers with little land because of the fear of expropriation. Many such cases have been reported from India.

Another factor is the mobility of farm-labour. If a farmer (together with his working dependants) only has to wait a short period before starting a new activity, he may not be inclined to look for work outside his own farm business. This case is not dissi-

<sup>33</sup> It does not seem to be a mere coincidence that the national accounts of low-income countries hardly ever devote any attention to this type of investment.

<sup>34</sup> The story reported concerning the farmers in the U.S.A.'s Mid-West who spend quite a few months on the beaches of California after the harvest has been gathered is a case in point.

milar from that of the "frictional unemployment" in industry, when workers shift from one job to another.

Thus, it is not surprising that landless labourers in India often obtain a higher standard of living than does a cultivator-cum-labourer family because of their greater mobility, while the latter has been more preoccupied with its land. This has been borne out in several case studies (MUJUMDAR, 1961, pp. 231-241). In this respect, such activities as livestock-keeping, small trades and industries may be very important, as their production pattern can often be adjusted to the requirements imposed by agriculture.

### 3.6 A micro-economic model

In the previous section the various employment possibilities and other activities were discussed which may be present in the rural environment. Now an attempt must be made to put them together in a more rigorous form and to elucidate the alternatives facing the farmer and his family. The following assumptions will be made:

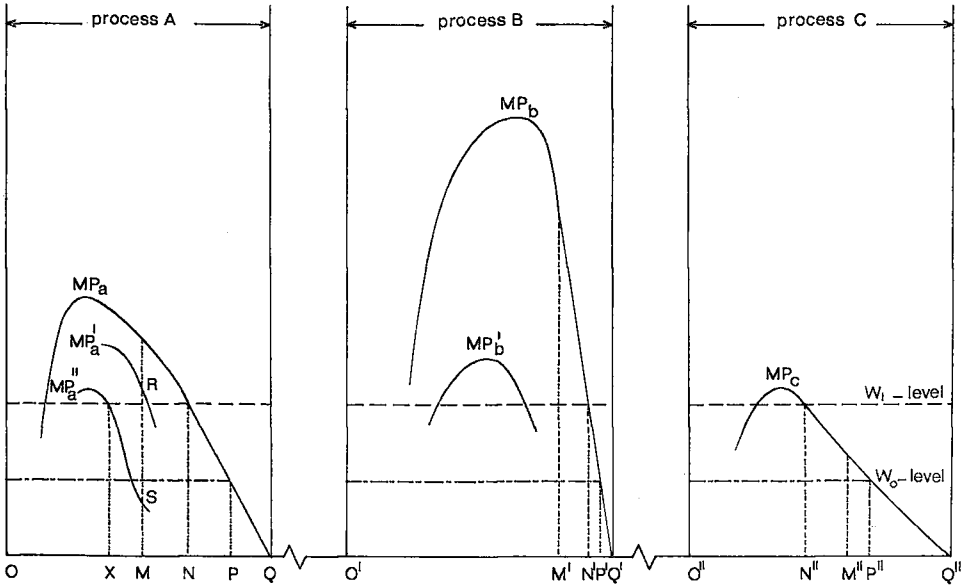
- (1) The presence of one crop.
- (2) The agricultural land is totally occupied and of a uniform quality, the individual family having a fixed amount of land to cultivate.
- (3) A fixed supply of family labour is available which is uniform in quality. Though the liquidity position is often difficult some money is available for the hiring of labourers when deemed necessary.
- (4) The type of farming is assumed to be small-scale peasant farming, as described under 1.1.2.

On the abscissa of Figure 7 the agricultural operations have been subdivided into three successive processes operating over a period of time; A to C represent, for example, the pre-planting, planting and harvesting operations. While there is a fixed amount of land (say, the figure represents the case of a 4-acre farm) and a fixed supply of family labour, there are on the other hand various processes which require various amounts of labour at specific times.

Furthermore, it is assumed that the maximization of the net income is aimed at and that there is one well defined production function to denote this production process. On the ordinate of Figure 7 the marginal productivity schedule of this production process is set out; for convenience, no total production and average productivity curves have been drawn. However, as each of Processes A to C contribute to the ultimate output, we can draw for A to C separate marginal productivity schedules which are of a partial nature. These partial marginal productivities are shown in the figure ( $MP_a$ ,  $MP_b$ ,  $MP_c$ ).

To introduce a realistic element into this model the following set of wage rates are proposed.

$W_1$  is the wage level which is operative in the area for unskilled labour when there is a normal or rather large demand for it; it should be considered an average maximum rate.



Input of labour during the agricultural year  $O-Q''$  ( $O-Q$ ;  $O'-Q'$  and  $O''-Q''$  indicate the number of working hours)

Fig. 7. The micro-economic model of the agricultural firm.

$W_0$  is the absolute price for which labour is willing to work; it is the result of the bidding down of the  $W_1$  rate at periods when the scope for further self-employment opportunities in the agricultural economy is negligible. At that moment a large labour force is suddenly thrown on to the labour market, which force competes for the limited number of existing odd jobs in the area. This occurs particularly when considerations of maximum biological subsistence force people to forsake their leisure. In fact,  $W_0$  is the minimum level of remuneration at which the family worker is willing to work on his own farm.

Thus, the level of wages during a particular year is circumscribed by an average maximum  $W_1$  (wage labour) and a minimum  $W_0$  (family remuneration).

In this farming cycle seasonal farm unemployment occurs. It is marked by the ranges  $Q-O'$  and  $Q'-O''$ . It should be noted that within these ranges the wage level  $W_0$  is non-existent, the opportunity for a return of labour on the farm being zero. Whether  $W_1$  exists depends on the situation regarding employment opportunities outside the family farm.

From the outset it should be made very clear that these separate operations have to be carried out each in a *limited* number of days, say: Process A requires 200 hours

in 2 weeks, etc.<sup>35</sup>. With less hours worked than required per period for maximum net income, the outcome will be a lower output and subsequently lower marginal productivity curves throughout the production process<sup>36</sup>. This is an important feature of peasant agriculture especially in low-income economies, where the possibilities for substitution by labour-saving inputs are small.

It will be evident now that the partial M.P. curves,  $MP_a$ ,  $MP_b$  en  $MP_c$  in fact represent the *ex ante* 'ideal' situation. The timing of all operations is assumed to be correct (i.e. corresponding with maximum net income). The required work will be carried out within the number of days dictated by natural conditions.

It will be fairly obvious that in practice the supply of family labour will not always be sufficient to carry out one or more of these production processes within the above defined 'required period'. It is logical to expect that the marginal productivity of labour will be relatively high during these short, crucial periods. Thus it becomes worthwhile to hire extra labour. This occurs particularly when competitive intra-farm enterprises cause a heavy demand for labour sources.

Let us now study the actual processes in more detail. Starting from the ideal situation of correct timing, Process A should be performed in ON labour hours (Figure 7), given a striving for the maximization of the net income<sup>37</sup>.

If outside employment opportunities exist, the farmer stops at this point and may consider the alternatives if the demand for additional income is present. If no outside employment is available (everybody having finished his farm job around the same time) and there is a strong desire for the maximization of output (up to a certain point, of course, namely to the point when the last addition to labour receives a remuneration, which is equal to the socio-biologically determined minimum, corresponding with level  $W_0$ ) the farmer may devote an extra NP man hours to Process A.

Now, suppose that the particular farmer can arrange for only OM days of work (in the required period) to be devoted to this process. There are now two possibilities open to him; either he may employ additional labour (up to a maximum of MN hours to obtain the greatest efficiency) or he may (be forced to) stop altogether after OM hours.

In the latter case it is unlikely that the ultimate shape and location of the production function will remain the same, as this will be a crucial point in the production process. This production function will be lowered, as will, *ex post*, the total and partial M.P. curves. Say, it is lowered (*ex post*) to  $MP'_a$ ; in that case the last addition of his labour was (*ex post*) even higher than the then current wage rate (see Figure 7); this can be considered efficient only in the light of other commitments yielding a

<sup>35</sup> This is a further elaboration of the simplified concept of the calendar day, used in section 3.3.

<sup>36</sup> For the sake of the argument we exclude the possibility that the farmholder will leave a part of his 4-acre farm uncultivated.

<sup>37</sup> This is, of course, in addition to other income-generating opportunities which yield similar net returns on labour.

similar marginal net return on labour at that very moment or in the case where the borrowing of money (at high interest rates) to employ paid labour would have presented him with a wage rate substantially higher than RM.

If the productivity schedule were to have been lowered to an even more extreme position, say  $MP_a''$  (with OM hours worked in the required period), owing again to the impossibility of mobilizing ON working hours in a fixed period, it would have been better (as an afterthought) to have stopped earlier, namely at Point X. The impression is given that owing to its imperfect knowledge the farm family has accepted a very low remuneration, i.e. MS.

Two points stand out in the above discussion:

- (1) The urgency with which any intake of additional labour is considered in agriculture, as so much may depend on it for the ultimate production level. This explains why outside labour is employed, even on very small-sized farms, such as are known to exist in India<sup>38</sup>, since the temporary level of the M.P. schedule may be very high for short periods and for certain operations.
- (2) The graph shows that the farmer may be at a complete loss at certain junctures in the production period as to what decisions to make concerning the allocation of resources, as he can only guess what the effects of these decisions on the subsequent production processes will be.

A further consideration with regard to Process A is that, in more heavily populated areas with a low land/man ratio, many families face a situation in which their labour supply for Process A is more than ON hours for the seasonal period. If alternative employment is available, labour will be supplied at the  $W_1$  level for outside and non-farm occupations.

When fierce competition exerts pressure on the wage rate  $W_1$ , wages will fall in the direction of  $W_0$ . Farm workers may still prefer this type of employment. Though the return per hour may be the same in farming as in the alternative jobs, the latter may enable the worker to put in more work per day and, thus, obtain a higher aggregate return.

If no job opportunities are available, work on the particular farm may continue, the mechanism of work-sharing coming into operation. Another NP hours are worked within the seasonal period, but each family member works fewer hours than before, as has been discussed in section 3.3.1. The farm activities gradually taper off until seasonal unemployment sets in fully. Farmers then have to wait until Process B starts.

As for the weight to be given to each of the three processes, it is to be expected in real-life conditions that the contribution of each process to the aggregate output will vary. This has also been shown in Figure 7. Process B, with its steep and relatively

<sup>38</sup> In heavily populated areas in Uttar Pradesh, India, for example, it was found in one survey that on the smallest farms with an area of less than 2.5 acres 9% of the total farm labour had still been supplied by casually hired workers (FARM MANAGEMENT STUDIES INDIA, U.P. 1954-55, p. 37). In another study it was found that 12% of the total labour on these small farms had been supplied by casual labour (SHASTRI, 1957).

high M.P. curve (indicating its key role in production), falls rapidly with the addition of labour. The planting operations could well be represented by the Process B figure. Farmers who can command only  $O'M'$  hours within the required period, may well find it rewarding to employ extra labour, since a stop at  $M'$  would entail an *ex post* M.P. curve, which is very low ( $MP_b'$ ). During this crucial operation, which makes a vital contribution to the ultimate output, the farmer in position  $O'M'$  simply must employ extra labour; otherwise he will jeopardize the whole production process<sup>39</sup>.

There are also processes, such as Process C (harvesting), for which the timing of the operation is less urgent. Even the family which had only OM and  $O'M'$  working hours available (within the required period) during Processes A and B, respectively, now has plenty of labour on hand ( $O''M''$  is now larger than  $O''N''$ ). In this production process there may be work-sharing throughout the required period, each family worker working a shorter day.

In addition to the fact that seasonal employment is shown by the ranges  $QO'$  and  $Q'O''$ , the ranges PQ and  $P'Q'$  should also be considered to represent this situation.

It should be pointed out that the picture given here represents one particular farming season only; in the following year, owing to the vagaries of the weather, the M.P. (and A.P.) curves of the partial production processes may be differently shaped and located, entailing drastic adjustments to the labour force. Thus, while in one year the family labour force might be sufficient for Process A (ON or more hours available), owing to the longer period allowed for this activity, in the following year the same family may be in the position of having only OM labour hours at their command in relation to the timely labour requirements for crop production. Many risks and uncertainties are involved, as the farmer has no complete knowledge of the production process at the beginning of the season.

For a great many crops the correct timing of operations is of paramount importance; for example, in the harvesting of rice (late harvesting causes shedding and sun cracks leading to losses in quantity and quality), in the planting of ground-nuts (severe Rosette disease often occurs as a result of late planting) and in the harvesting of this crop (hardening of the soil in dry season leads to considerable losses), in the timely weeding of maize and other cereals, etc. Moreover, if operations are carried out at their proper time it is often possible to include a second crop on the same land in a particular annual cycle. The above is but a small sample and it could be easily extended with many more examples which show the rigidity in timing for agriculture.

So far, we have been moving too far away from reality. What was delineated above as one production process consists in reality of a number of production processes which may all require labour and other scarce inputs at the same time. Each process

<sup>39</sup> Such a set-back during Process B will have its repercussions on the other processes. Suppose that during Process A the farmer managed to recruit OM family hours during the required period, besides, hired MN hours of labour at wage rate  $W_1$ . With an *ex post* curve  $MP_a'$ , owing to this set-back, his money on paid labour has now been largely wasted.

has a different production function with different marginal utilities. When capital outlays are of minor importance, the alternative activities, measured on the basis of the least cost or the best profit, may be selected according to the availability of labour<sup>40</sup>.

Moreover, there is nowadays hardly any place left, where factor-markets are absent. Statistics, even from so-called 'backward' rural areas (such as in Africa), reveal the existence of labour markets. At the moment when work-making or work-sharing commences or a period of seasonal employment arrives, employment opportunities may occur outside the occupier's own farm, either close by or at a greater distance away.

Man/land ratios vary greatly in the agricultural communities as has been clearly shown by the various agricultural surveys and farm management studies cited earlier. Some families will have only small resources, such as land, at their disposal. They will either have to rent additional land and/or offer themselves as paid labourers to meet the 'target income' of the family; other farmers have large farms, cultivate them more extensively, lend pieces to others or hire labour. The real-life situation certainly has a very varied pattern.

### 3.7 The marginal labour productivity tenet, the wage level and employment

Representatives and founders of the original marginal productivity school, such as J. B. CLARK and MARSHALL, assumed a situation of full employment in their models. They took it that the available supply of labour was always absorbed in the productive process, while the pricing system ensured self-correction and adjustment. Whenever unemployment occurred, a downward pressure on wages would set it, thus extending the margin of employment until a new equilibrium was reached at the full-employment level.

Nowadays, nearly a century later, it is realized that such a simple model cannot give a complete and satisfactory representation of the situation. About two decades ago a lively discussion was conducted in the *American Economic Review* on the merits of the marginal productivity theory under real-life conditions. This discussion started when LESTER (1946) denied the applicability of this theory as a guide to actual events by showing how unresponsive employment was to wage rate changes. MACHLUP (1946), in a critical reply, showed that LESTER's conclusions could be valid for the short period during which labour requirements are fixed by technical considerations. Obviously, employment is not an immediate and direct function of the wage level, but any adjustment difficulties are merely short-run ones.

A far more serious charge has been brought against the M.P. theory during the last

<sup>40</sup> For an illuminating analysis of the allocation of labour between food crops and cash crops see: GALETTI *et al.*, (1956), especially Chapter 9.

decade and a half in the course of studies on economic development. The scepticism directed against this theory from several quarters is connected with the phenomenon of rural un(der)employment in low-income countries. Here there is a positive wage, even if it is contended that M.P. is zero or nearly zero. Henceforth, there may be a large quantity of surplus labour usually identified as zero labour productivity (NURKSE, 1953) or defined as labour the marginal contribution of which is less than the rate of wages paid (SARKAR, 1957).

MATHUR (1964), criticizing the marginal productivity tenet, alleges, for instance that only when the marginal productivity theory of wages is interpreted as determining the level of wages in the economy, does the contradiction of the simultaneous existence of positive wages and disguised unemployment make its appearance. We have shown in the previous two sections, at least in a theoretical way, that such a contradiction does not necessarily exist.

LEWIS (1954), in analysing the transfer of labour to the industrial (capitalistic) from the subsistence sector, where the marginal product of labour is zero, alleges that such a transfer can be made at a minimum price which is identical to the farmer's average product. LEWIS (*op. cit.*) asserts: "men will not leave the family farm to seek employment if the wage is worth less than they would be able to consume if they remained at home". However, as rightly pointed out by ENKE (1962), this appears to be a contradiction, since "output per worker is not the same as consumption per head, as there are other dependants in the family".

We agree with ENKE that the supply price of low-income labour to the industrial sector should really be at least the worker's marginal product at home. The loss of a 'marginal' labourer means not only the loss of a consumption unit but also the loss of a working unit to the family.

It can be argued that in this way the amount of work-making and work-sharing decreases, while the marginal product of the remaining workers on the farm increases, but this does not take account of the specific labour requirements of the various agricultural processes, *ceteris paribus*. The family which previously had OP family working-hours at its disposal (Figure 7), may now find itself with OM units during a crucial process, with the result that henceforth the ultimate output may be considerably affected.

Granted that this case seems somewhat extreme, the equilibrium conditions in several instances of low-income farming are such that lower outputs are not unimaginable. Physical conditions in the densely populated poor regions may be such that people cannot work harder for many hours with present low calorie intakes.

DANDEKAR (1962) contends that in the overpopulated low-income countries the capitalistic system (regulated by profit maximization) is usually applicable to the non-agricultural sector; however, capitalism does not provide an institutional structure for the agricultural sector, since the entire rural population relies on agriculture, without reference to the marginal productivity of labour. Accordingly, within the feudal structure of the peasantry, the employment of the family is governed by the maximization of the total family output. Hence the existence of zero marginal

labour productivity. But, it is doubtful whether such reasoning usually tallies with real-life conditions; even on small Indian farms the marginal productivity of labour is not zero<sup>41</sup>, while a capitalistic feature such as labour employment is not unknown on these farms. Again, the maximization-of output tenet ignores the fact that farmers may turn to leisure or other obligatory activities of their own free will. The above reasoning appears to be a normative projection.

In the literature there are many other suggestions that labourers work to the point where no returns are forthcoming while wages are higher than the marginal product<sup>42</sup>, but it is not the aim to give an exhaustive account of such allegations.

As the foregoing discussions have highlighted controversial opinions, we wish to summarize the position as follows:

During the stage of abundant, easily cultivable land and in a closed subsistence economy (Phase I, Figure 5 under 3.2.2.), the marginal (here the average) productivity guides the wage level, where this phenomenon exists. An increase in population, the occurrence of land limitations and the absence of economic growth changes this picture: Figure 5 represents this Ricardian macro-situation. On closer scrutiny, it does not give a full explanation of underemployment and related phenomena, as it bypasses micro-economic reality. It is only by means of an examination on a micro-level (Figure 6 under 3.3. and Figure 7 under 3.6) that a full grasp of this situation can be obtained.

It is contended that marginal productivity determines the level of wages in the long run. There may be periods of no activity (especially with mono-cultures) when there is no wage level in agriculture. With increasing population and a scarcity of land fewer labourers may be wanted, but specific labour peaks always remain, especially in traditional agriculture. There may be possibilities for earning income in outside occupations; this phenomenon of part-time farming may be very important locally. Where such opportunities are limited, the self-employed farmers may work beyond the point at which their productivity is below the average maximum wage rate ( $W_1$ , Figure 7). This basic level represents the need for some additional physical subsistence; it depends on the elasticity of demand for additional income and it may be dictated by various social, biological and cultural factors<sup>43</sup>. Employment may become steadily worse with an increase in population, especially for the landless labourers and farmers with a tiny parcel of land, as they may get less opportunity to

<sup>41</sup> This has been substantiated in several research studies, for instance in MANDAL (1966) and in PAGLIN (1965).

<sup>42</sup> See, for instance: ECKHAUS (1955), who considers 'limited technical substitutability' to be the main cause leading to the zero M.P. of labour. GEORGESCU-ROEGEN (1963) also alleges that the maximization of the total family output is the guiding factor for the peasantry, the marginal productivity theory therefore being irrelevant.

<sup>43</sup> Some interesting information in this respect has been collected by CLARK and HASWELL (*op. cit.* pp. 91-92). Quoting DE FARCY, they state that three kilograms of cereals appears to be the usual minimum reward for a day's work in a low-income economy.

work for others. Their target income may be imperilled as fewer days can be worked for lower wages.

One particular question has not yet been answered: Does surplus labour which can be withdrawn from the agricultural sector without repercussions really exist? If *ceteris paribus* is strictly adhered to, there is probably very little of it; the withdrawal of labour, even from heavily populated areas, always involves some reorganization.

In view of the situation just described, it cannot be maintained that during these stages of population growth no innovational developments occur to offset diminishing returns, such as a more intensive land use. But, as human beliefs and values as expressed through social systems quite often have a powerful inhibiting effect on certain innovational changes, the large population growth experienced today may well outstrip these changes, giving rise to the Ricardian gloom of a situation in which diminishing returns will make themselves felt.

Regarding the Classical 'Subsistence Theory of Wages', it is clear that this theory represents a long run view. As such it is of little immediate value in the theory of the agricultural firm as analysed in sections 3.4, 3.5 and 3.6. Whether it plays a part in shifting the  $W_0$  level (Figure 7) downwards or upwards over a period of time is a point which cannot be easily ascertained.

A possible objection to the argument as developed so far may be that we have not regarded wages as *real* wages; wages should be expressed as money units whose purchasing power in terms of goods is kept constant at the level of a particular year and a particular place. However, since this general survey embraces different places and times and covers conditions in which the composition of the food basket varies greatly, such an approach seems hardly feasible.

Moreover, we are really interested in *ad hoc* productivity measurements, as they are the focal point of this study. Is it possible to analyse the so-called 'wage rate' in a meaningful way as an economic variable which bears some relation to the actual productivity of labour? Such a relation seems to be a particularly critical one under conditions of large underemployment.

So far a theoretical framework has been developed which has put special emphasis on the underlying micro-economic aspects. This method has enabled us to elucidate and to clear up some of the well-known controversies. Now the point is reached where the empirical evidence has to be produced to substantiate the theoretical framework. However, before doing so, first some attention must be paid to the methodological approach to the problems of empirical measurement, for it seems probable that these problems have been an important cause of confusion.

## 4 Problems of method and measurement

### 4.1 Maximization of net income

In Chapter 1 the term 'economizing' was loosely used in the sense of maximization of satisfaction, not in the limited sense of maximizing profit or family net income. Of course, such a model of 'maximum utility', defined as a broad aggregate, is not very useful from an operative point of view.

In the previous chapter (section 3.6) a micro-model was developed under the assumption that the farmer maximizes his net income. Now it must be ascertained whether such an assumption is valid for analysing the factual data collected in these low labour-income economies. Is it permitted to take the easy way-out of equating maximum satisfaction with maximum family net income?

In viewing low labour-income agriculture, farmers seem indeed guided by motives of least wastage or of least costs, a notion which can also be interpreted as maximizing net income. However, in this kind of society these motives are often subject to certain restrictions of a socio-cultural and/or physical nature.

A few examples may illustrate this point. For harvesting rice the Javanese people in Surinam use the 'ani-ani' harvesting knife, which requires a far greater amount of labour than the sickle, an instrument not unknown in the area and used by others. The knife is used in preference to the sickle because the former is the right instrument to use in paying respect to the goddess of rice.<sup>44</sup>

In a regional study of Northern Nigeria it was observed that for ground-nut farmers a 'satisfaction' model based on two variables, namely (a) self-sufficiency in food and (b) cash-income, appeared best to fit the local behavioural patterns (LUNING, 1967). This meant that maximization of net income could well be demonstrated, subject to a carefully defined set of resource restrictions such as used in farm budgeting.

We are indebted to SCHULTZ for clarifying the notion that, as regards the allocation of resources in traditional agriculture, no appreciable increase in agricultural production is to be expected by reallocating the factors at the farmer's disposal. A number of research studies<sup>45</sup>, including the one mentioned on Nigeria, have yielded results which support SCHULTZ's view that in traditional agriculture, the production ex-

<sup>44</sup> VAN WENGEN (1966) points to differences in outlook between generations: while elderly Javanese stick to the 'ani-ani', the younger generation has gradually turned to the use of the sickle. This shows that, in this respect, the society is in a transitional stage.

<sup>45</sup> See for instance: HOPPER (1965), DEAN (1965), WELSCH (1965) and HANSEN (1966).

periences of farmers over a long, stagnant period have led to an equilibrium condition as regards the most efficient factor use under these conditions.

It thus seems plausible (as long as no contradictory information is put forward) that the starting point of maximum net income in the operative model is realistic and not unwarranted. While studying these somewhat stagnant agricultural societies one should do well to suppress for the moment the inclination to view allocative efficiency through foreign eyes.

Even under circumstances of the direst poverty, it is implausible to accept the alternative of maximization of total output. Even in this case, entailing a severe dis-equilibrium at the factor level, decisions whether to put in more effort can be expected to be made at a marginal level, which is not zero.

A quite plausible explanation of the patterns of choice behaviour would seem to be to assume the maximization of family net income. As pointed out in the foregoing chapter, this net income may be derived from agriculture (own farm and outside farm) but, owing to the inability to meet household and other expenses, in practice it is often obtained from both agricultural and non-agricultural sources.

## 4.2 The production function approach

To test the hypothesis that agricultural wages in low labour-income economies reflect the marginal productivity value of labour and that the productivity of family labour in these economies is not zero, use has been made of production function analysis.

The relation between inputs and outputs is called the production function. It is presented as a mathematical expression of a process which is fundamentally of a technical nature. In a subsequent step, the production function is converted into a revenue function by multiplying the relevant input and output data by the imputed prices or values.

The fitting of these data into a mathematical function should be consistent with the true relationship between these data. The exact relation is not known *ex ante* and it is therefore necessary to test any hypothesis which is suggested by the economic logic underlying the production process.

An example of such a relation between inputs and outputs is provided in the theory of the firm. This function includes ranges of increasing, decreasing and negative marginal returns. These marginal returns are denoted by three stages of production, Stage II of which constitutes the stage of rational production, where total product increases at a decreasing rate (see Figure 8). A graphical presentation of the data may, for instance, show that the total product increases at a decreasing rate.

When the choice has been made of the mathematical model, based on economic logic and basic knowledge, further procedures are dictated by such factors as the computational feasibility. The aggregation of input-data has to be done with this requirement in view, as computational work increases more than proportionally with

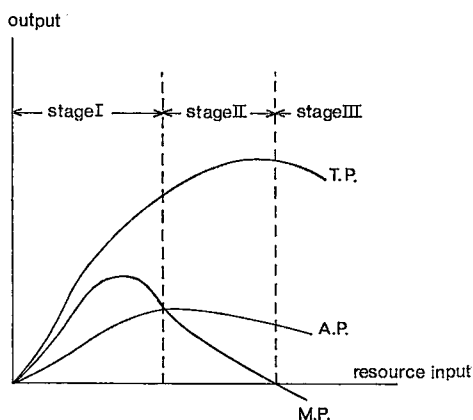


Fig. 8. Total, average and marginal product, and the stages of production.

an increase in variables. In our surveys, for simplicity's sake, we have kept the number of variables small, especially in the case of the rather heterogeneous capital services.

In the last two decades there have been many attempts towards a quantitative verification of the allocation theory by means of this production-function concept. The development of the use of the Cobb-Douglas function with its specific qualities (which reflect quite well the actual conditions in agricultural production) has provided a particularly important stimulus.

The Cobb-Douglas production function has certain advantages and has therefore the widest use in diagnostic analysis. Besides its computational feasibility and its efficient use of degrees of freedom in statistical testing it has the two following major economic characteristics:

- (1) It permits individual factors of production to have diminishing marginal and average products, other factors being kept constant. This function cannot be used satisfactorily for ranges which include both constant, increasing and decreasing marginal productivity; a particular function is confined to only one of the three stages of Figure 8. Marginal products decline at a diminishing rate with an increase of inputs, but this production function never allows a declining total product.

Interaction such as factor substitution is permitted but this may lead to the occurrence of multi-collinearity, a situation in which more than one relationship is to be expected between the variables. Whenever simple correlations between particular inputs are high, the relevant coefficients are deemed to be statistically unreliable. This situation can be avoided for instance by the omission of certain variables and by some other manipulations. We will show cases of these difficulties and possible solutions in the two following chapters.

- (2) The other major economic characteristic is that of 'returns to scale'. The original Cobb-Douglas function fulfils this condition with the constraint that the sum of coefficients is equal to one. The coefficients  $b_i$ , exponentially attached to each

input resource  $x$  are called production elasticities; these coefficients indicate the expected percentage increase (or decrease) in production by 1 %, other inputs being constant. The Cobb-Douglas function has the characteristic of a constant elasticity over the range of inputs to which the function is applied. If the individual elasticities are summed up, the scale effect can be calculated:

$$y = ax_1^{b_1} \times x_2^{b_2} \times x_3^{b_3} \times x_4^{b_4}$$

'Constant returns to scale' is met when  $b_1 + b_2 + b_3 + b_4 = 1$ .

The choice of the type of production function is, *inter alia*, determined after the particular coefficients of multiple determination ( $R^2$ ) have been calculated. These coefficients indicate the percentage of the variation in the input-output data that is explained by the fitted function. Assuming constant returns to scale, the calculation may indicate whether important variables have been omitted if the result is less than unity. If, on the other hand, the result is larger than unity, something may have gone wrong in the process of aggregation.

Though production function analysis has become widely used (especially the Cobb-Douglas type), a word of caution is in order, as the conclusions derived therefrom cover only a limited field. The analysis based on this function explains only something about the allocation of resources in a broad sense and at the mean level for our number of cross-sectional data. Analysis of this nature has little or no practical application in decision-making on individual farms. However, in this study it is precisely the resource productivity at mean levels of input in respect of labour which is of interest to us and not the individual allocation problems as such.

The use of this method of analysis may entail certain pitfalls leading to faulty conclusions. These pitfalls, which mainly centre around the problems of physical measurement and statistical inference, can be divided into four categories:

- (1) Those associated with the aggregation of inputs. Whilst aggregation into certain categories is, on the one hand, imperative from the point of view of computational requirements, it may, on the other hand, tend to blur the importance of certain variables.
- (2) Pitfalls associated with hybridity functions. These pitfalls arise when the number of unobserved variables is large and important. Instead of having one particular production surface the individual points on this surface are, in fact, part of several different production functions. This may lead to a misleading presentation of the actual input-output relationship. This situation is frequently caused by such factors as soil heterogeneity, the presence of irrigated and non-irrigated fields, etc. Such a case of hybridity is discussed in section 4.3.1 where the difficulties caused by heterogeneity in the Surinam rice polders are described.
- (3) Pitfalls caused by the fact that farm data do not adequately cover the production function surface.
- (4) Pitfalls associated with sampling.

There are numerous examples of production function analysis in the literature and quite a few highlight the distortions caused by the appearance of one or more of the

above-mentioned pitfalls. For example, in an analysis of a random sample of farms, HEADY (1946) found a low marginal productivity for labour. One explanation was that, although the input of hired labour had been reported accurately a bias had been caused by aggregating the farm operator's and family's labour into 12-months periods, ignoring the slack season.

In a study of the resource productivity and optimum resource allocation of a sample of Queensland sugar cane farms, ACHARI (1965) found that the marginal productivity value of labour calculated by means of a Cobb-Douglas function was generally lower than the prevailing wage rates. This may have been due to the seasonal nature of sugar cane farming. Labour had not been measured in man-days, but in man-weeks and periods of un(der)employment had been included. Such labour measurements lead to biased and faulty conclusions.

There may also be a bias towards increasing returns to scale. For instance, the spreading of work will be greater on small farms than on large farms and the latter farms would seem to obtain a similar output with a comparatively smaller input. To avoid this bias, in Surinam (Chapter 6) only farms of a certain size were selected.<sup>46</sup> This method was hardly possible in Nigeria (Chapter 5), since it was only possible to ascertain the size of farms after the study had been completed. Generally speaking, the omission of the quality of land, capital and management also tends to impair the use of production function analysis.

But such difficulties may be overcome to some extent by collecting data by means of a survey which has been prepared to avoid the above-mentioned pitfalls as much as possible. Moreover, the method of sampling should also be similarly modified.

## 4.3 Measurement problems

### 4.3.1 Physical measurement of inputs and outputs

#### *General remarks*

The characteristics of peasant farming in low-income countries often give rise to formidable difficulties in obtaining quantitative (and also qualitative) data.<sup>47</sup>

As for the areas considered here (Nigeria, Surinam), it is not the intention to give an exhaustive enumeration of the various obstacles encountered; a few general remarks should suffice.

In the agro-economic surveys conducted in Nigeria, the main trouble stemmed from the physical features of land, land-use and output. For instance, these Nigerian

<sup>46</sup> Only those agricultural holdings qualified for the Surinam sample which had an acreage under rice of between 2 and 3 hectares; other farm activities (horticulture, annual and perennial crops, dairy) played a subordinate role.

<sup>47</sup> A general and admirable summary of the problems involved in fact finding in rural areas is given by YANG (1965).

farmers lacked a specified standard of land measurement. This meant that all farms (often of a very irregular shape) had to be measured by the author, since surveyors were not available. Members of the same family often had separate and individual plots of land which were never shown unless requested.

Most of the cultivated farmland was planted under the system of intercropping and this system usually precludes any normal procedure of crop acreage measurement. Quantities of products were expressed as bundles of grain, bags of ground-nuts, sheets of cotton and baskets of cow peas, the weight, size and volume of which were not always uniform. For example, during harvest time big farmers used to make big bundles of grain, while small farmers made smaller ones in order to be able to boast of an equivalent number.

On the rice farms in Surinam the main problems were related to soil heterogeneity and the quality of irrigation. Though these problems seemed to be trifling ones, they led to quite serious repercussions.

### *The measurement of labour*

Since we are more or less exclusively concerned with this particular type of input, a great deal of attention shall be paid to it now. In fact, the problems surrounding the measurement of labour, more specifically those of labour utilization, have been an important cause of controversy concerning the related subjects of unemployment, disguised unemployment and surplus labour.

It seems therefore convenient, to treat these related subjects of labour measurement and unemployment in a comprehensive manner. By describing the main views on underemployment and by reviewing the various methods used in labour measurement, the causes of this unemployment antithesis may be clarified. After a review of the work done by others our own solution to the measurement problem will be presented.

One of the first field investigations to measure agricultural labour input and its connection with rural unemployment was LOSSING BUCK's study on China (1930). He showed that, although labour shortages existed in the peak agricultural season, a substantial percentage of the labour force was idle for large parts of the year. In other studies by WARRINER (1939) on Egypt and by ROSENSTEIN-RODAN (1943) on South-East Europe, macro-measurements of the labour force were also attempted. These studies indicated that a considerable part of the farm population was either wholly or partially unemployed.<sup>48</sup>

However, these three studies did not reveal anything about labour's marginal product as they were only of a macro-nature. It is clear that no sharp distinction was made between seasonal unemployment (open, due to technical factors) and disguised unemployment (disguised, of a social nature). In fact, the concept of disguised un-

<sup>48</sup> What ROSENSTEIN-RODAN considered to be surplus labour was the (macro-economic) difference between the number of man-hours available and the number of hours actually needed. The trouble is that no distinction is made here between seasonal and chronic surpluses of labour.

employment with a zero marginal labour productivity was an outcome of these studies.

Another set of macro-studies by SCHULTZ (1956a; 1964, p. 63), on South American and Indian data, suggest that there is little evidence of this so called disguised unemployment as defined by zero marginal product of labour under the assumption of *ceteris paribus*.

A different approach was followed by MUJUMBAR (1961, p. 78). Using field data from a survey conducted in Bombay State, India, he argues that the concept of working hours in agriculture is a very elusive one. "Accordingly . . . attempts therefore at measuring underemployment in terms of hours worked do not yield accurate and precise results at all". As a working alternative, he developed the concept of a 'standard holding', which could provide full employment to members of an average family working with a pair of bullocks. The standard holdings have a variable size, depending on the level of techniques and types of farming. Using this operational concept rather than that of marginal productivity, this author concludes that over 70% of the agricultural population in his study area could be removed without any loss in production.

Criticism was levied against this method (KAO *et al*, 1964). They put forward that the 'standard' holding is really an arbitrary unit and that no attempt is made to quantify the labour input. In theory, it is not possible to define full employment for a standard holding without specifically stating a standard for labour productivity.

ROSENSTEIN-RODAN (1957), in a study of employment problems in Southern Italy, made a distinction between 'removable' and 'fractional' disguised unemployment. The labour surplus was calculated on the basis of the following criteria:

- (a) Only small agricultural holdings were taken.
- (b) Labour was defined as people between 14 and 65 years of age. Coefficients of labour efficiency for each crop and labour category were estimated.
- (c) Labour hours required for each crop per month were tabulated and compared with available labour hours.
- (d) As for various forms of underemployment, he distinguished between 'seasonal underemployment' and 'disguised fractional underemployment', *i.e.* labour hours not used during the year but which do not add up to a full labour unit. The latter labour cannot be removed from agriculture. The final residuum is the 'removable disguised unemployment'.

However, this author arbitrarily includes in the removable fraction those individuals who are required at the farm for 50 days or less, which contradicts the originally rigid definition of disguised unemployment. In practice, this may mean a diminished aggregate agricultural production, as has been pointed out in section 3.6 and Figure 7.

DESAI (1963, p. 137), in a pioneering linear programming study of Indian farm management data, finds a 16.5 per cent surplus agricultural population for his area of study (Bombay State). He converts the surplus labour days into equivalent adult units for different farming periods. The minimum of these units is the actual number which should be considered as surplus, and its removal, according to this author,

would not affect production. From the point of view of macro-economics there is surplus labour indeed, but whether it would be possible to withdraw this labour depends on the micro-situation. Converting surplus labour days into adult units one is merely breaking the general problem down into problems of separate, individually operated farms and one is no longer tackling the problem of a cooperative merger under a single organisation.

SRINIVASAN (1957) estimated the surplus man-days in seven villages near Coimbatore, Madras. He divided the available labour into owner-operators, tenants and labourers. He aggregated the annual labour requirements for the various crops and added 5% to allow for permanent improvements. By deducting the labour days potentially required from the days available he found the surplus number of man-days per year. In the light of what has just been said, it does not come as a surprise that the surplus found by this method was as high as 53 to 81 per cent for these villages.

MELLOR and STEVENS (1956), in a study of rice farms in Thailand, measured the input of labour in terms of man equivalents. Labour that was available for farm work but was not making a contribution was counted as part of the input. It was assumed that labour was of a homogeneous quality and that all farms (ranging from 0.4 to 24 acres) had a uniform production function. Their conclusion was that the marginal product of labour is zero. Their approach, i.e. aggregating the stock of labour, is questionable. This method will be expounded in the next chapter.

The above-mentioned studies have either followed the macro-approach or the micro-approach in the measurement of labour. After what has been said in the previous chapter about the time element as regards labour requirements in agriculture, it should be clear that the macro-approach does not generally yield a satisfactory answer to the problem of unemployment and labour surplus.

A meticulous study of the labour market in Greek agriculture was carried out by PEPELASIS and YOTOPOULOS (1962). Their conclusions were that a chronic surplus of labour was almost non-existent but that, where it did exist, it was in any case difficult to remove. Moreover, they pointed out that: "Its size can only be determined through a disaggregative micro-economic investigation based on the direct method of studying a sample of farm households".

In view of the phenomenon of "disguised unemployment", as theoretically analysed in the previous chapter, the micro-approach should be used. Otherwise confusion between the productivity of a worker and of an hour of work will make it impossible to get a reasonable insight into the factual application of labour. In practice this is a tedious task, especially in low-income countries, where the difficulties in studying such samples are great.

Using the *disaggregative micro-approach* in the field, it soon became obvious that, to obtain reasonably reliable information on labour inputs, recordings had to be done twice a week in Surinam and almost daily in Nigeria.

The quality of the family labour force was estimated and the participation of each of the various members of the family in the activities was recorded separately. The actual labour effort of each member was estimated per activity by converting it to

that of an average adult man, who was taken as the standard for the work effort.

The use of the concept of 'man-hour' has been rejected. Adding up the number of hours and then dividing them by eight is permissible only when a constant length of day is envisaged. Such a condition is not met in agriculture, where periods of long working days alternate with slack periods in which the length is considerably shortened. For the Surinam rice farmers the periods of planting and, especially, of harvesting rice meant long days, often starting before daylight or extending into the hours of darkness, whereas during weeding periods, matters were taken more leisurely. The Nigerian farmers, on the other hand, encountered their heaviest demands for labour for their upland crops during the first and second weeding period.

In the light of the above experience it is proposed to use as the standard of labour input measurement the so-called '*man-day*',<sup>49</sup> *which is defined as the amount of work done by an average adult male*<sup>50</sup> *during a day*. We consider this approach to concur best with the situation on peasant farms. The time element is an unavoidable factor in farm labour requirements, as certain operations have to be completed within a certain time span, since, otherwise, the fall in yield may have serious consequences. By using this concept one avoids the pitfalls of the working-hour approach and the misleading, mechanical aggregation presented in the previously mentioned macro-studies. Through this concept of man-day (divided into quarters and halves) one should be able to obviate the occurrence of work-spreading.

It might be objected that work-spreading may still be present especially when shorter working days are considered as full days during the slack season. Workspreading has, however, to be recognized as an indissoluble part of the working pattern as long as alternative opportunities are not available to labour. In any case, even if alternatives are available it may be impossible to take advantage of them, as the employer may demand a continuous supply of labour for a certain number of days per week or hours per day.

#### *The measurement of other resource categories*

As has been pointed out before, the measurement of labour productivity cannot be attempted in isolation, as associated factors are not and cannot be kept constant. Thus, attention has to be paid to the classification and measurement of supplementary and/or complementary resources in farm-firm functions. The conventional classification of the remaining categories is into land, capital and management and this arrangement can be adopted forthwith.

The difficulties connected with land measurement were the following.

In the Nigerian sample, in addition to the sheer physical obstacles encountered

<sup>49</sup> This is in accordance with the practice of a daily wage payment; labour in agriculture is seldom paid on an hour basis.

<sup>50</sup> In the case of women planting upland crops (Nigeria) and transplanting rice (Surinam), 'woman-days' are equivalent to 'man-days', as women achieve the same performance as men (Nigeria) or do this particular job exclusively (Surinam).

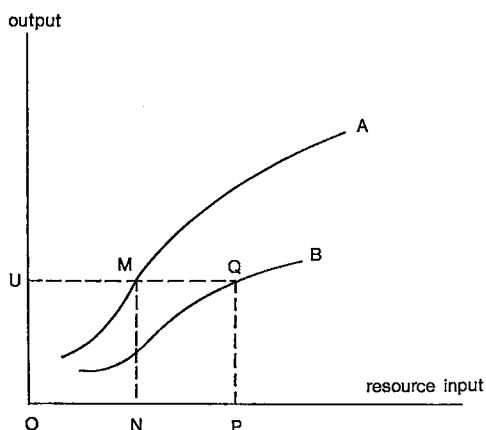
in measuring the area actually cultivated, problems were also created by differences in soil fertility. Generally speaking, farmers had one or more fields near their (nucleus) villages or hamlets and one or several fields further away. Whilst the former land received manure, the latter did not. As all families in the sample cultivated fields both near and at a distance from the village no attempt has been made to make any allowance for possible bias.

Only a few efforts have been made to classify soils and farmlands according to a pertinent scheme. In a study of resource returns on farms in Andhra Pradesh, SURYANARAYANA (1958) made corrections for soil heterogeneity by means of an index of fertility. Unless soil surveys have actually been undertaken on which such an estimate can be based, this type of measurement can be subject to considerable bias. However, it is usually considered an improvement as compared with the mere measurement of land in terms of acres or hectares.<sup>51</sup>

It is realized that the effect of differences in land quality may be profound. The relative share of labour in the input-mix may be different on fertile soils as compared with poor soils. Observations, made by Professor JOOSTEN in Java, indicate that on poor soils more inputs are used to obtain yields similar to those obtained on better land. Wherever this situation is suspected, poor and fertile land should be classified as shown in Figure 9.

Production function A represents favourable conditions (water, soil), while function B indicates poor conditions. Whereas a farmer under A circumstances needs to apply only ON units of input to obtain the production OU, the man on poorer soils needs OP input units to reach the same output level.

Such a situation may considerably complicate the analysis, especially in case farm data have to be aggregated. In Surinam, for instance, in one of the investigated non-irrigated rice areas there was no relation between inputs (variable costs) and output,



*Fig. 9. The input-output relation under different natural conditions.*

<sup>51</sup> In a regional study of the productivities of agricultural inputs RADHAKRISHNA (1964) brought about the standardization of the land input on the basis of land revenue.

though the input range was quite considerable (correlation coefficient 0.02), whereas in irrigated areas a satisfactory correlation was established. Close analysis of the first farm sample showed a great range of soil-water conditions, which had a profound influence on the output level. Not enough information was, however, available to make a soil-water index for the area and its farms. Disaggregation was not possible.

As to the various forms of capital, it is necessary to disaggregate them into a number of categories. As put forward by HEADY and DILLON (1961, p. 220), two rules should be observed in doing so :

1. The inputs within a category should be the most nearly perfect substitutes or complements possible.
2. In relation to each other, the categories of inputs should neither be perfect substitutes nor perfect complements.

Adherence to these rules will reduce the number of those possible intercorrelations between inputs which could complicate a proper analysis. Whereas in early studies the capital factor was subdivided into a large number of categories, nowadays there is a tendency to reduce their number. Emphasis is laid on the flow of capital services (actual maintenance and depreciation costs) rather than on the capital value. These tendencies have been confirmed by HEADY and DILLON (*op. cit.*, p. 221) in their investigation into the historical sequence of a number of farm function analyses.

Turning to the surveys in Nigeria and Surinam, the amount and type of farm capital in the case of the Nigerian farmers was very uniform, covering mainly the value of seed and the depreciation and maintenance of simple tools. In the case of the Surinam farm enterprises many more factor and non-factor inputs could be observed, but their use was quite uniform throughout (see also 6.7).

For both the Nigerian and the Surinam samples the operating expenses (including maintenance and depreciation) could be combined into a single input category. Thus, the present study relates to the short-term situation and is based on observations of the capital services actually used during the period under consideration.

Though the presence of differences in management as revealed in cross-sectional samples of farm data is generally recognized, few attempts to measure this particular input have been described in the literature. In recent times the general tendency has been to consider managerial skill not as a separate input but as a unit "which controls the amounts and combinations of conventional factors of production entering into a conventional production process" (JOHNSON, 1964).

In the Nigerian data, no allowance has been made for managerial abilities, as the traditional outlook prevails so much over all other considerations.

In the selection of Surinam farms it has been endeavoured to obtain some homogeneity as regards managerial skills by including only farmers of a particular age group (25 - 50 years). Though it is realized that such an approach is inadequate, it can at least be considered a first step. But this method stresses management potential rather than actual managerial behaviour.

Finally it should be pointed out that the classification of these farm data is complicated by technological change. Though technological advance is not a factor of

production itself, it determines the position of the input-output relation. Wherever differences due to different technologies (irrigation versus non-irrigation as on the Surinam rice farms) are observed, a new classification is imperative, in order to avoid the incidence of hybridity.

#### 4.3.2 Pricing of physical input-output data and the problems of cost evaluation

The question which looms large in the analysis of poor peasant societies which are only market-orientated to a certain degree is the pricing of the relevant inputs and outputs. Some price must be assigned to those inputs which do not enter factor markets.

As a general rule, input items have to be evaluated either at their production cost, or at the market prices. The choice of the actual method is determined by (1) the objective of costing, (2) the general economy of the particular industry and (3) the need for simplicity in keeping accounts. The overriding principle should be that the choice be made in accordance with economic principles. Though the principle of cost measurement defined as 'opportunity cost' should be applied where possible, its use is often restricted in low-income countries by factors such as imperfections in marketing.

The actual evaluation and apportionment of cost items in low-income countries has thus been found a difficult and often a controversial and arbitrary task. Land values do not always reflect their actual productivity, as is the case in Asia and Africa. As for capital assets such as livestock and farm buildings, their evaluation is often a tedious and arbitrary operation.

A dilemma often lies in the evaluation of labour costs. This is comparatively easy for hired labour, since wages will be known although payment in kind and various perquisites may still make an estimation difficult. However, this is still a trifle compared with the obstacles met in the evaluation of family labour. Though the concept of opportunity return (or cost) is usually applicable here, there are certain complications. Opportunity returns vary with the agricultural seasons and this causes calculation difficulties. Another and far more serious complication is caused by the fact that opportunity costs vary with the position of the labourer. This has not so much to do with his particular status as with the period of the labour engagement, i.e. permanent labour as opposed to casual labour. This contrast is still an oversimplification as compared with real conditions but serves as a useful guide in explaining the complex situation.

In a Seminar on Cost Studies in Agriculture in India (1961), the view was expressed that family labour should be evaluated on the basis of the rate of wages paid to the casual labourer. The employment pattern in both cases is somewhat similar, as both family and casual labour are employed when work is available and remain idle when there is no work on the farm. On the other hand, the family has job security and

only when the family is unable to cope with the work is casual labour hired. Family labour should therefore be rated on the basis of permanent labour. It is a fact that the bargaining position of the casual labourer is definitely better at the moment when his labour is sought after, as demand will be comparatively great at such a time.

Finally, there is the oft-repeated argument that farm family labour should not be included as a cost component, since the opportunity return is, in any case, zero. The fact that full-cost calculations of the type used in the Indian farm management studies often show farm enterprises to be running at a considerable loss seems to support this argument. But even if there is a case for such an argument, it still has to be shown that the actual unemployment situation at a particular time is such that absolutely no alternative opportunity is available <sup>52</sup>.

In the present field surveys these difficulties did not arise as only casually hired labour was encountered. In this case the suspicion arises that, whenever the labour of family workers is evaluated at the casual rate, this may conceal any inflational trends in costing.

We have ventured to use the physical labour input based on the earlier defined concept of man-days. We first computed the labour input actually used and then estimated the quality of labour (i.e. work performance) for the members of each farm household separately. The (average) marginal value of labour productivity has then been calculated and a comparison made with the actual average price of labour.

#### 4.3.3 Sampling procedures

It has been previously stressed that production function analysis is greatly facilitated by careful sampling in collecting cross-sectional data.

In the Nigeria survey a two-stage sample survey design was used. In the first stage a number of villages of various sizes (the primary units) were selected in proportion to the range and incidence of small towns, villages and hamlets of a particular size. It was found impossible to choose villages at random, as many places were inaccessible during the rains, even by Landrover or on horseback. The second stage was conducted in six villages and covered 30 to 40 randomly selected informants per village. For a constant-sized sample the actual sampling factors varied considerably. However, a small constant-sized sample has advantages over a sample of a variable (but often larger) size as in the former case the reliability of the information is substantially

<sup>52</sup> Two factors may be responsible for these financial losses on the Indian farms. Firstly, losses could well be attributed to set-backs, which occurred during the particular farming season. Risks and uncertainties are often extremely large in low-income peasant agriculture.

Secondly, labour costs may have been imputed according to the average maximum wage rate ( $W_1$ ), whereas the minimum remuneration ( $W_0$ ) might have been the more obvious choice; in any case, some sort of weighted average should have been used (See also the previous discussion under 3.6 and Figure 7).

better. In view of the quality of the staff they could be given only a certain limited number of farms for interviewing purposes.

In addition to this main fact-finding survey, a study was made of five families in each of the six villages, daily farm records (including details of daily labour activities) being kept on them from 1st May until the end of December 1962. Selection was made at random and, though there is no proof that the sample was representative, comparison of its results with those of the larger survey sample showed that these cases may be considered representative for each area.

For the Surinam sample the first requirement was homogeneity, as farming techniques are far more advanced here than in traditional African agriculture. Only Indian (Hindustani) farmers were considered, heads of households being taken aged between 25 and 50 years and cultivating farms of between 2 and 3 hectares of rice, so that any effects of variation in farm size was avoided.

Selection from amongst the number of farms which qualified was made at random for each of the two areas studied: one irrigated rice area (Nickerie district) and one unirrigated area near the capital, Paramaribo. In addition, a number of Javanese smallholders in an unirrigated rice area in the district of Saramacca was included, so that it was possible to obtain an insight in the way cultural differences might affect the input-output relation.

## **5 Labour and wages in African peasant farming - A case study in Northern Nigeria**

A study of the economics of peasant farming was carried out by the author in the main ground-nut producing area of Northern Nigeria from the end of 1959 until early 1963 (Figure 10). In the first half of this period an agro-economic survey was conducted in Katsina Province (LUNING, 1963a) and in one location in Kano. In many respects it was a period of apprenticeship.

In the second half of this sojourn in Northern Nigeria similar work was done in Sokoto Province (LUNING, 1963b; 1963c). Profitable use could be made of earlier experience and of the better understanding gained of 'indigenous economics'.

The results of this second survey held in Sokoto Province, in so far as they have a bearing upon our subject, are given below.

In the seven selected village areas data for 30 - 40 families per village were collected during regular interviews throughout the year. In each family the head of the household (informant) was interviewed. In addition, a study was made of five families, whose daily activities were recorded for one complete agricultural year, namely from 1st May until the end of December 1962. To obtain a general picture of the situation the data of the large farm survey sample (consisting of 220 families) will be used and for the detailed analysis of resource-use and production the family studies are available. After scrutiny the records of 34 out of the latter total of 35 farm enterprises were considered suitable for inclusion in the final analysis.

### **5.1 Some demographic data**

Within the framework of the present study it appears awkward - to say the least - to focus the attention on a continent which is so sparsely populated. Though Nigeria carries a much larger population per square mile as compared with Africa south of the Sahara as a whole, this density figure still seems to be quite small.

The total area of Northern Nigeria, the Northern Region of the Federation of Nigeria, comprises some 170 million acres. It supports about 25 million people of whom roughly 80 per cent practise agriculture. Approximately 20 per cent of the land surface is either under crops or fallow, the remainder being forest reserve, unreserved woodland, savannah and waste land. The general pattern, however, conceals very wide variations in population density. In the area of research, the north-western and north-central provinces of Sokoto, Katsina and Kano (the major ground-nut-belt of Northern Nigeria), population density varies from 50 to 800 per square mile in the

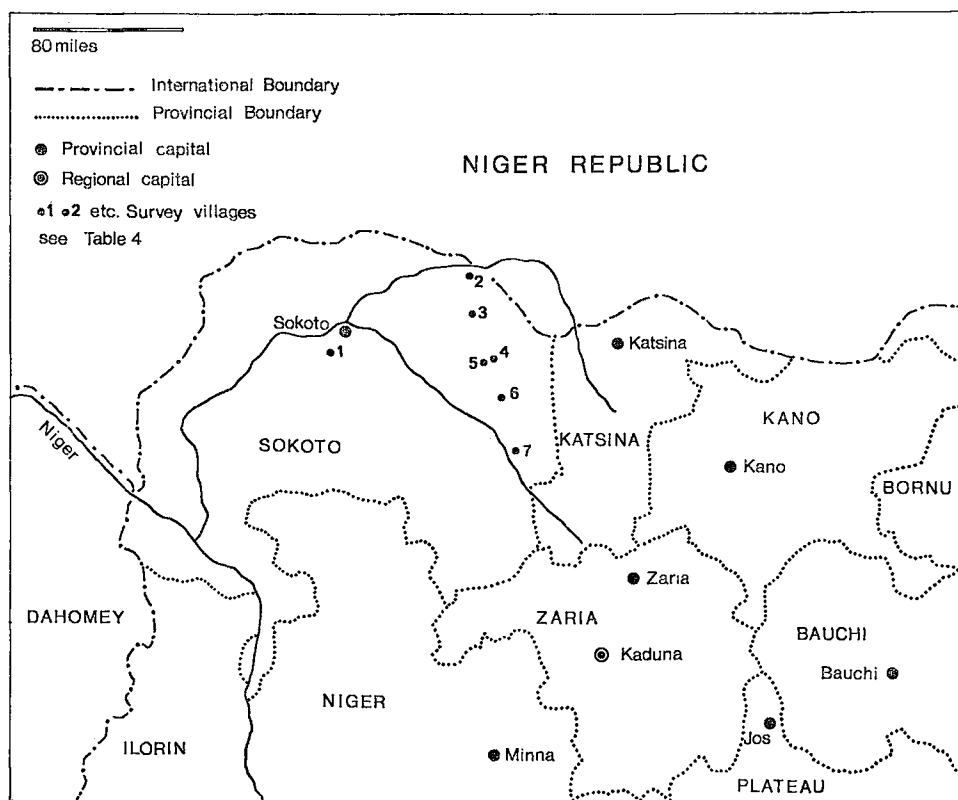


Fig. 10. The northwestern part of Northern Nigeria.

provincial districts. On the other hand, there are vast areas in this country with less than 10 persons per square mile.

The population distribution in Northern Nigeria appears to be the outcome of a number of circumstances (BUCHANAN and PUGH, 1955). Firstly, slave-raiding, which found its zenith in the second half of the Nineteenth Century and which continued into the beginning of the present century, caused the depopulation of large areas. It either drove the refugees into remote inaccessible areas (the Jos-Bauchi Plateau) or made them settle in the areas governed by powerful rulers. A concomitant feature was the occurrence and spread of the tse-tse fly in under-populated and depopulated areas. Another important factor was the availability of groundwater at a reasonable depth during the whole year; its absence rendered and still renders vast areas unsuitable for settlement. Geological formation rather than precipitation is mainly responsible for this state of affairs. Finally, the physical properties of the soil are a determining factor in the choice of settlement.

In the area studied there are very powerful rulers, the tse-tse fly does not occur,

there is abundant accessible groundwater over most of the area and the predominantly sandy soils are easily tilled. These favourable conditions have led to a relatively high population density for this area, which is inhabited by the Hausa people.

## 5.2 The agricultural pattern

The above-mentioned figures on population density are rather meaningless unless related to such factors as the carrying capacity of the land, the intensity of farming (depending on whether there is a long or short fallow period or permanent cultivation), the proportion of land which can be potentially cultivated, the percentage of rural families engaged in crop production and the length of the farming season. A short and necessarily condensed description of the agricultural pattern will now be given, together with the technical factors just mentioned which throw a light on the man/land ratio.

In the seven analyzed villages fallow land is rare; approximately 60 - 80 per cent of the land is permanently cultivated. The remaining area is specifically set aside by the local and provincial authorities for the purpose of grazing and the collection of firewood. A large part of the uncultivated land consists of shallow soils which are in any case unsuitable for farming.

Table 3 summarizes the land use pattern in the seven village areas. The maps from which these data have been derived were prepared from recent aerial photographs and checked against the actual situation in the field. The categories have been calculated on the basis of planimeter readings made by the author.

The smoothly rolling plains consist of sandy soils; at the foot of the slopes loam and clay deposits are usually found, in which water is retained during the prolonged dry season. The latter 'pockets' of soils, called 'fadama' in Hausa, are scarce and they are in great demand for the cultivation of sugar cane, rice, tobacco, maize, onions, peppers, etc. During the height of the wet season rivers are formed in these fadamas;

*Table 3. Land use in the survey villages.*

	Percentages of total village areas						Total area in sq. miles
	upland farmland	fadama land	fallow	upland grazing and forest area	rivers, lakes	settlements, roads	
Tulluwa	89	6	—	2	1	2	3.34
Magajin Dawaki	54	28	5	3	9	1	9.48
Gatawa	51	8	1	35	4	1	24.02
Badarawa-Jangeru <sup>1</sup>	55	21	4	12	7	1	41.71
Banga	63	—	—	32	4	1	27.02
Shemori	63	1	1	33	1	1	15.54

<sup>1</sup> The maps of Badarawa and Jangeru were combined, as they refer to neighbouring villages.

flood control is usually lacking and flood damage often occurs.

As shown in Table 3, the villages of Magajin Dawaki, Gatawa, Badarawa and Jangeru have large fadamas, situated as they are along a main river. Part of this flood plain is left in fallow in the rainy season owing to the danger of flooding; otherwise, there is very little land in fallow.

The upland grazing and forest areas represent the pseudo-natural vegetation and consist of low scrubs in the northern village areas and orchard bush in the south. The whole of the area surveyed is within the Sudan zone of the West African savannah described by KEAY (1959).

The rainy season, which has a bearing on the length of the farming season, lasts from 4 to 5 months and the average annual precipitation varies from 25 to 40 inches. Rainfall starts in May, rises to a peak in August and ends, often abruptly, at the end of September or early in October. The rain is occasionally delayed by one month and sometimes ends early. There is a risk of a bad season about once every five to eight years owing to the uneven distribution of rain in the early part of the season.

Farming is traditional hoe farming and only occasionally do farmers use a plough and bullocks (provided by the Agricultural Department), but such cases were not met in the general survey. In the villages studied, practically no use was made at the time of the survey of artificial fertilizers. The main foodcrops are local varieties of millet (*Pennisetum typhoides*), Guinea corn (*Sorghum*) and cow peas (*Vigna sinensis*), the principal cash crop is groundnuts (*Arachis hypogaea*). Of all these crops local varieties (known for several generations) are used; no improved strains have been introduced. Only in the case of cotton (a cash crop which is grown in two of the southern survey villages) is the research-tested variety universally distributed and cultivated.

Table 4 gives a picture of the proportions of the various crops cultivated during the wet season of the year 1962 on upland farms and the higher fadama land. The figures have been taken from the general survey.

Grain crops cover between 55 and 70 per cent. of the cultivated land, with the highest proportion in the north. The Guinea corn in Magajin Dawaki and Gatawa is nearly all cultivated in the fadama, as unfavourable fertility and/or moisture conditions make it a risky crop on the uplands in this area. In the two southern villages

Table 4. Percentages of main wet season crops per village area.

	Millet	Guinea corn	Ground- nuts	Cotton	Cow peas	Cassava	Others	Total
Tulluwa (1)	65	5	5	—	24	1	—	100
Magajin Dawaki (2)	46	24	18	—	4	1	7	100
Gatawa (3)	53	17	18	1	11	—	—	100
Badarawa (4)	55	15	17	—	12	1	—	100
Jangeru (5)	43	14	25	1	14	3	—	100
Banga (6)	40	17	30	19	9	2	2	119
Shemori (7)	26	29	21	18	13	1	7	115

Numbers in brackets correspond with those in Figure 10.

the total cropping percentage of the farmland is over 100. This is caused by double cropping in the same year. Cotton here succeeds millet owing to the slightly longer rainy season. Mixed cropping is the general rule; between 70 and 90 per cent of the cultivated area is intercropped. The most common combinations are millet—Guinea corn—cow pea, groundnuts—Guinea corn and/or millet, Guinea corn—millet. Detailed information on the frequency of the occurrence of various crops in the 'mix' is given in Table 5. On the sandy upland farms no irrigation is practised.

Besides arable farming, the rearing of livestock is important. It is practised both by the nomadic Fulani people and by the local people. Each family keeps a number of goats, often a few sheep and at least one donkey. Less than half the families had one or more head of cattle.

Animal feeding gives rise to great difficulties in this area. During the rainy season till the harvest of the main crops sheep and goats are tethered in the compound. Fodder has to be cut wherever it can be collected. During weeding in the wet season weeds are collected for the animals. Cattle graze on the areas of low orchard bush and other remaining vegetation. Immediately after the harvest the animals are permitted to roam the fields and they feed on the crop residues. After one or two months (at the end of December), little is left of it and the animals have a hard time during approximately five months.

The maintenance of soil fertility under this system of permanent cultivation poses severe problems. The Hausa farmer realizes this and he collects farmyard manure and all kinds of organic material, loads it on his donkey and carries it to his fields, often the whole year around.

On average, a farmer in the survey had approximately three fields under cultivation, one near the village and the other two farther away. The nucleus village is the commonest type of settlement and the fields adjacent to it receive most of the manure, not enough being available for the distant fields. The nucleus village is usually surrounded by a number of satellite hamlets a couple of miles away from it where the farmers live amidst their fields and the manure is more evenly spread.

*Table 5. Number of wet season fields per location cultivated with various crops.*

	Crops							Total nr. of fields per village
	millet	Guinea corn	ground- nuts	cotton	cow peas	cassava	others	
Tulluwa	86	76	25	—	80	4	—	89
Magajin Dawaki	66	59	59	—	18	2	22	115
Gatawa	107	83	39	4	54	—	4	148
Badarawa	86	64	39	1	72	1	1	100
Jangeru	135	111	113	11	83	14	1	194
Banga	70	66	67	34	56	9	8	89
Shemori	66	91	91	38	87	10	65	165
Total number of fields	616	550	433	88	450	40	101	900
Percentage of fields	68	61	48	10	50	4	11	

In the village areas studied the population density varied from 150 to 800 people per square mile of gross land area. If it is borne in mind that nearly all families are engaged in farming and if the net cultivated area alone is considered, the population depending on this farmland can be assessed at between 200 and 900 per square mile. This is quite a high figure, especially in view of the short farming season and the low initial fertility of the sandy upland soils which are practically devoid of organic matter.

### 5.3 Agricultural change under population pressure

In a survey of this nature, which embraces only a few years, there is hardly any room for observations on agrarian changes. Nevertheless, some comments on this subject should be made here, based on field observations of the various parts of the ground-nut belt and of what is known from local history about such changes.

The picture given of the agricultural economy of the area illustrates near-technical stagnation. True, communications have greatly improved in the course of time, the establishment of marketing boards for the principal cash crops (ground-nuts, cotton) and a greater variety of consumer goods have led to greater efforts on the farmer's part to increase the size of his farm business. However, little has been noticed in the field of technological change; the same kind of crops are still being cultivated (though the percentage of cash crop acreage has undoubtedly increased).

But there is one factor which has profoundly changed over the last thirty years, *viz.* the man/land ratio. Population growth, which is estimated for the area at nearly 3% per annum, has indeed influenced agricultural development. It has caused the fallow period to be shortened and even to disappear. Cropping has been intensified and the use of manure has increased. However, the latter means for counterbalancing soil depletion is limited, being, in fact, severely restricted by the poorness and scarcity of the grazing land. It was suggested by the then Regional Senior Grassland Officer some years ago that not less than 20 - 25 acres of this type of land are required to satisfactorily support one adult head of cattle for one year.

In a review of agrarian development under population pressure, BOSERUP (1965) pointed out that two types of development can be discerned. Firstly, there is the European type of more intensive land use facilitated by the introduction of the plough, followed by the setting aside of land for producing fodder for animals, which in their turn produce the necessary manure. Secondly, there is the Asian type of development based on the increasing use of irrigation. Under the circumstances studied here, irrigation is not feasible on the vast sandy upland farm areas, while the cultivation of fodder crops is still as far away as ever. A suggestion along these lines had already been made as far back as 1937, when an Anglo-French Forestry Commission, which visited these areas recommended that "the same crop yields could be produced under proper methods from a much smaller area, while the remaining country could be profitably exploited as grazing ground and for the supply of forest produce".

Since then, thirty years have passed and the 'proper methods' have still not been applied, being virtually unknown, and questions such as the establishment of grassland and range management are still in the research stage; nor is research likely to produce tangible results in this difficult field for a very long time to come. The distressing signs of both wind and water erosion are seen all over the area and are rapidly increasing. Farmers have not yet learned, or are as yet unfamiliar with the methods to combat these encroaching dangers and appear to be powerless against them. It could be said, optimistically, that agricultural development in Northern Nigeria has reached the same stage as that in Europe in the Middle Ages, but it should be recognized that the population explosion and the socio-psychological attitude towards innovation and technological progress may have a great retarding effect on development in this area <sup>53</sup>.

We have dwelt somewhat longer on this subject in order to show that this particular area of study carries a large and increasing population in proportion to its scarce resources, a situation comparable with that in many parts of South East Asia. It is not typical as such for most areas of Africa. The Malthusian picture of a situation resulting in starvation or migration is still with us in some parts of the world and should not be dismissed as lightly as BOSERUP (*op. cit.*) does. We hope that we have convincingly shown that this area could form an interesting subject for a study of labour productivity in a situation where diminishing returns to resources are present.

## 5.4 General description of the labour pattern

### 5.4.1 The division of labour in agriculture

In the survey area farm work is carried out almost exclusively by men. Being strict Moslems, women take little or no part in it, though this varies from place to place; their tasks are mainly in the household. But quite a number of them earn some pocket money in minor activities such as spinning, hair-dressing and preparing food for sale. Food is sold by small sons and daughters, as the women are prevented by 'purdah' (*kulle*, H <sup>54</sup>) from appearing in public. In the poorer families, however, women do take part in farming at planting and harvest time. Heavy weeding is the man's work; only in areas where paganism is strong (as in the village of Shemori) do women take part in this work. It is customary for boys, from the age of 13-15 years onwards, to work with their fathers in the field; before, they take care of the animals (goats and sheep, sometimes cattle) and do some light farm work. Girls, before the age of marriage (13 - 15 years), assist both in the household and in farming activities, but their contribution to the latter is rather small. Wives and sons are often given small

<sup>53</sup> This Ricardian situation is not merely the author's personal view, as can be deduced from a recent article by WHETHAM (1966).

<sup>54</sup> H stands for Hausa language.

field plots by the head of the household for personal use; this system often made it difficult for the junior survey staff to find out the total area farmed by the family.

#### 5.4.2 The farming calendar

The cultivation of upland farms forms the central rural activity in the area of study and there is one overriding factor which sets the pace for these activities, *viz.* the occurrence of rain.

During the hot season (March, April), when shade temperatures rise to over 100° F and when small, scattered showers often make for almost unbearable conditions, very little is done on the fields, except for the carrying of donkey loads of manure to the farm and the cleaning of the fields. The latter task is not usually a strenuous one, as fields contain only occasional patches of small scrubs, the regrowth of which is cut and burned.

When the first good shower hits the area (May), farm families take to the fields and start planting millet followed by Guinea corn. Owing to its localized distribution, rain is not always sufficient; nevertheless farmers take the risk of dry planting (*bizne*, H). The time of planting appears to be one of the most decisive factors determining crop yields and the occurrence of 'planting rains' is therefore of supreme importance. Whether the good start of the young seedling is due to the high build up of nitrogen at the end of the dry season is not known to the author. Ridging up (combined with the first weeding operation) for ground-nuts and grain crops starts shortly afterwards. Planting and replanting have to be continued as young seedlings die from drought, suffocation as a result of the effects of wind erosion, attacks by the army worm or the mere removal of the seed by ants.

The planting of ground-nuts takes place in June and July and is followed by weeding. During the second weeding operation cow peas are planted in places which are still vacant and towards the end of July cotton is planted between the millet. During August another weeding is done and earthing up of ground-nuts is carried out. Rainfall is particularly heavy during that month and in many years food supplies are low. By the end of August the first millet is harvested. Cassava is planted on new plots, often on millet fields. In September the main farm activities peter out, to be renewed with the lifting and harvesting of ground-nuts in October. Harvesting of other crops starts towards the end of this month and continues for Guinea corn into November. Finally, the cotton is picked in December or at the beginning of January. After that, little farm activities take place except for the grading and marketing of the produce, until the first signs of rain.

### 5.4.3 Labour in agricultural and other occupations

For a closer analysis of the occupational distribution it seems convenient to distinguish between the wet season (identical with the main farming season, including harvest and lasting from, say, the middle of May until the middle of December) and the remaining part of the year, the dry season.

In Tables 6 and 7, in which 'main occupation' refers to the occupation to which most of the man's time is devoted and 'subsidiary occupation' refers to his other activities, an outline is given of the distribution of these occupations over the survey's main labour force for the wet and the dry season, respectively.

Though these tables give only broad indications and do not allow for estimates of actual earnings in the various occupations, a few clear-cut impressions can be derived from them. During the wet season of 1962, 90 % of the labour force considered farming to be their main occupation but another 80 % of all male labour had a subsidiary occupation. In the dry season, a large part of the male labour (over three quarters) again had a main occupation and about one third had a second occupation as well. Farming in the dry season is restricted to the fadamas and varies from village to village, as the table indicates.

This striking fluidity of labour between a number of occupations (some workers testified that they had worked in three to four different kinds of jobs during the previous year) is the outcome of the low level of skill and capital required; job movement is easy<sup>55</sup>.

The occupations, mentioned in Tables 6 and 7, were not necessarily performed in the village area of the informants. The physical movement of labour seeking for jobs is a conspicuous feature, especially during the long dry season (*cin rani*, H; literally: eating the dry season).

A detailed study of the rural dry season labour movements in Sokoto Province has been made by MANSELL PROTHERO (1958). Adult males leave their home areas early in the dry season, seek work for 3 to 6 months and return with the onset of the next rains. This phenomenon is particularly common in the northern parts of Sokoto, Katsina and Kano Provinces, because of the long dry season there.

Two main reasons can be stated for this movement:

- (1) the home area is not attractive for alternative activities such as crafts and trading;
- (2) the small food supplies at home must be conserved.

MANSELL PROTHERO discerns two types of migration: short distance migration (up to 40 miles away), which is mainly family migration for socio-economic reasons, and male migration over long distances. In many instances it was found that the men had gone as far as the Eastern-Western Regions of Nigeria (Enugu, Ibadan), the Plateau Province and even Accra (Ghana). For the farmers in the villages under consideration the frequency of this labour movement is illustrated in Table 8.

<sup>55</sup> For a detailed description of the pattern of labour employment in one particular village area (Tulluwa), see LUNING (1964).

Table 6. *Wet season employment: total number of male workers in various main and subsidiary occupations per village (1962).*

	Village area							Total
	Tulluwa	Magajin	Gatawa	Bada- rawa	Jangeru	Banga	She- mori	
	Dawaki							
Nature of main occupation:								
farming	34	56	59	39	55	42	40	325
farm labour	3	1	—	4	3	1	2	14
fishing	—	—	—	1	—	—	—	1
crafts, trade	2	—	2	—	5	—	2	11
other	1	—	2	—	3	3	—	9
total	40	57	63	44	66	46	44	360
Nature of subsidiary occupation:								
farming	6	1	1	5	5	4	3	25
farm labour	22	10	10	10	17	9	14	92
fishing	—	8	3	4	1	—	—	16
crafts, trade	13	16	19	22	17	11	3	101
other	1	9	7	3	11	7	4	42
total	42	44	40	44	51	31	24	276

Table 7. *Dry season employment: total number of male workers in various main and subsidiary occupations per village (1962).*

	Village area							Total
	Tulluwa	Magajin	Gatawa	Bada- rawa	Jangeru	Banga	She- mori	
		Dawaki						
Nature of main occupation:								
farming	10	38	19	4	12	—	2	85
farm labour	6	—	1	1	—	—	1	9
fishing	—	4	4	8	1	—	—	17
crafts	10	—	11	15	14	5	4	59
trade	6	8	4	8	16	12	9	63
other	2	3	6	4	9	7	8	39
total	34	53	45	40	52	24	24	272
Nature of subsidiary occupation:								
farming	10	4	9	1	13	—	—	37
farm labour	2	—	1	—	3	—	—	6
fishing	—	4	1	1	1	—	—	7
crafts	3	8	9	1	4	4	1	30
trade	3	4	2	2	5	4	1	21
other	1	9	1	2	2	1	—	16
total	19	29	23	7	28	9	2	117

Table 8. Dry season labour migration amongst informants' families (1961-1962).

	Number of families	Number of families of which one or more members took part in migration	Number of males involved	Destination near village	Destination far away from village
Northern villages	90	22	25	9	16
Southern villages	130	39	47	28	19
Total	240	61	72	37	35

Owing to the important dry season farming activities in one of the northern villages, many of its informants stayed at home. Table 8 shows that people from the northern parts moved over longer distances than their southern counterparts. Most of the work done by these dry season labourers is of an unskilled nature, but there is also a category which combines work with Koranic studies at places like Kano and in Bornu, where renowned, learned men live.

#### 5.4.4 The distribution of labour categories

The pattern of rainfall sets the pace for virtually all family activities during the wet season and the other activities are adapted to this rigid timetable as far as possible.

To obtain a succinct analysis, the wet season activities recorded for the 34 families for the months of May-December have been divided into the following five categories:

- (1) Major farm operations: all farm work connected with the cultivation of the main upland crops, millet, Guinea corn, cow peas, ground-nuts and cotton.
- (2) Minor farm work: work connected with the livestock industry (collection of fodder, grazing of animals) and work on dry season gardens, including cassava plots.
- (3) Non-farm occupations: other work, covering, in addition to the household duties done by the man, such activities as hired labouring, crafts and trades, etc.
- (4) Obligations and *force majeure*: a special category created to allow for such aspects as social obligations, the incidence of illness and the occurrence of heavy rains, which cannot be ignored in a close analysis of the labour pattern.
- (5) Leisure time: taken as a residual factor.

In this section only the family's own labour contribution to farm output is analysed. The major farm operations have been described in a general way in a previous section and they will be the subject of a more refined analysis in the following section on input-output analysis.

The sector 'minor farm work' has not been subjected to a detailed economic analysis, as the survey did not last long enough for a detailed and reliable analysis to be made. In view of the scarce survey resources available, full attention had to be

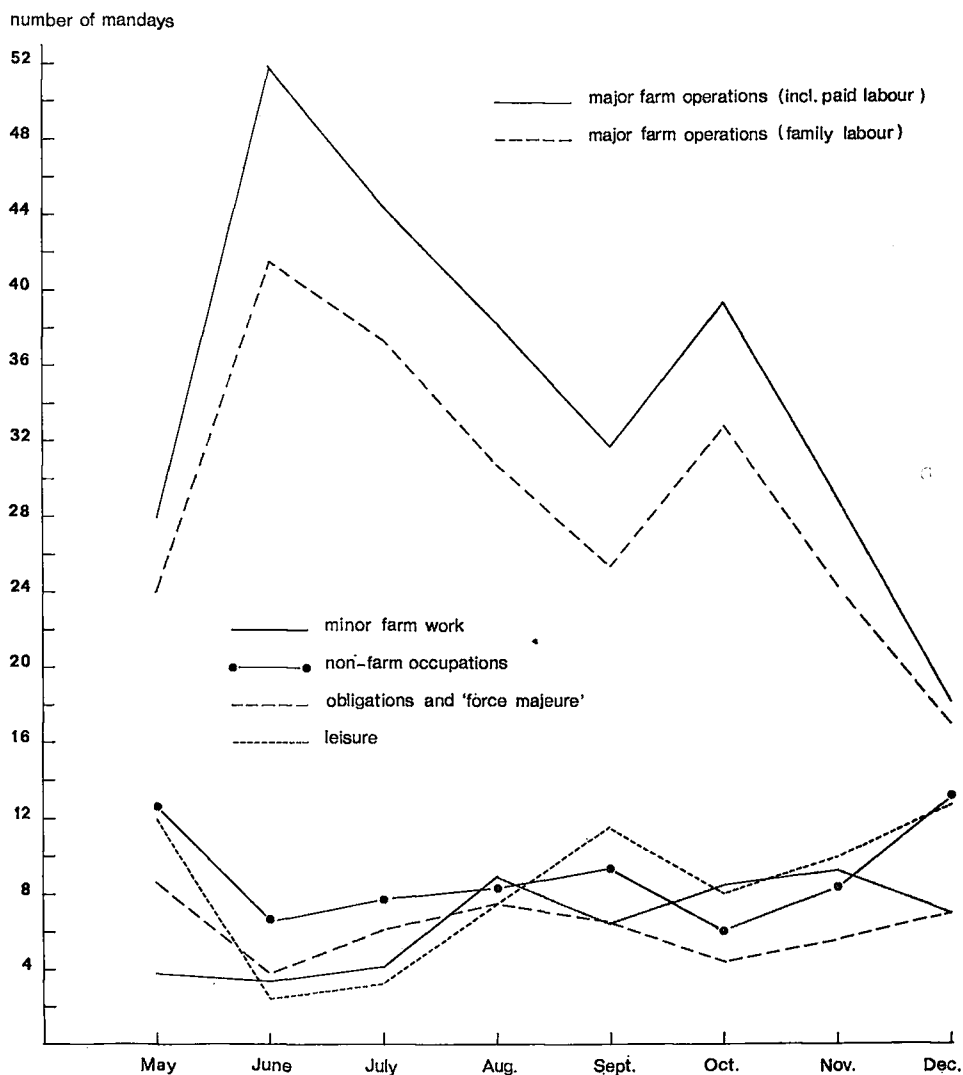


Fig. 11. Number of man-days per month spent on various activities (averages per family).

given to the first-mentioned category. However, the time spent on other farm work has been recorded; this work usually constitutes a small proportion of the total activities and is readily fitted in between the major farm operations. Figure 11 shows that there is no wide month-to-month variation; these activities were least in May (the end of the dry season when everything has become bare) and in June and July, when major farm operations take priority over practically all other activities.

Non-farm occupations cover a very wide range of activities. In this part of the country many local crafts are still performed, such as leather-working, cobbling, mat-

and rope-making, weaving, dyeing, decorating of calabashes, making grinding stones, hat- and mortar-making and the more common crafts generally pursued by house-builders, honey-collectors, tailors, butchers, carpenters, laundry men and blacksmiths. The teaching and writing of Arabic is also a well-known activity; the above list is by no means exhaustive. Many people act as petty traders and brokers who specialize in various trades down to the small retailers who peddle their wares, selling, for example, one cigarette at a time.

The male members of the family are also obliged to take part in a number of household activities, especially in cases where the woman's seclusion is strictly adhered to. Activities which can be listed in this category are the washing of the big household articles, the carrying of water, collecting firewood, sweeping the compound, shopping, etc. These are recurrent requirements which cannot be ignored in a detailed analysis of this rural economy (ABELL, 1962). As is shown in Figure 11, the time spent on 'non-farm operations' is quite considerable, but it shrinks to a smaller proportion during the height of the farming season in June, July and October.

Finally, there is one set of 'non-activities' which have to be faced by the individual even under the greatest stress of work: those caused by illness, heavy rains and social obligations.

Illness is quite severe in this area, where medical facilities are very thinly spread;<sup>88</sup> conditions were especially bad in the riverain villages. At the beginning of the rainy season a common disease in the area (due to water contamination) is the incidence of Guinea worm, which often debilitates many family workers during the very months when farm work is heaviest. Table 9 indicates its nuisance value. Rain especially prevents work in July and August and often provides the only opportunity for (enforced) leisure during these months.

*Table 9. Average number of days on which a farmer could not work (1962).*

Reason for not working	May-June	July-Aug.	Sept.-Oct.	Nov.-Dec.	Total (8 months)
Illness	1.8	2.6	2.8	4.1	11.3
Social obligations	3.4	1.7	1.9	4.1	11.1
Rain	0.7	2.5	0.5	0.0	3.7
Total	5.9	6.8	5.2	8.2	26.1

There is a number of obligations which a man, as a member of his society, cannot afford to dispense with. Illness of relatives, naming ceremonies for new-born children, death and marriage are crises and highlights in people's lives and man is obliged to put in an appearance. Again, there are the festivals, such as the Mohammedan New Year, which in 1962 was celebrated in May. This category of 'social obligations and

<sup>88</sup> Approximately one physician per 400,000 people (1962).

force majeure' showed its lowest figures during the peak agricultural season (Figure 11). In total, as Table 9 shows, it accounted for more than 10% of the workers' time during the busiest time of the year.

The farmer's residual time has been labelled 'leisure'. The details of Figure 11 show that leisure was hardly enjoyed during the critical months of June and July. A mere 2-3 days are noted for these months per average family, even less per worker.

To sum up, Table 10 shows the distribution of family farm labour per family labour unit over the eight months period for the northern and southern survey areas separately.

*Table 10. Distribution of labour time over various categories for two areas during the period May-December (average number of days per worker).*

	Major farm operations	Minor farm work	Other work	Social obligations etc.	Leisure	Unknown	Total
Northern villages	109	31	39	21	33	12	245
Southern villages	120	22	32	32	32	7	245
Weighted average	116	25	35	26	32	11	245

On average, there were four rest days per month, but, as indicated by Figure 11, the variation from month to month is rather large. Table 10 shows that the main farming season is somewhat shorter in the north, owing to the shorter period of rainfall.

It is evident from Figure 11 that all activities, with the exception of major farm operations, are restricted in June and July and, to some extent, in October under the impact of the heavy labour demand for major farm operations.

## 5.5 The productivity of agricultural labour

### 5.5.1 Types of labour

Farm labour is mainly provided by the available family workers, but a considerable amount of paid labour is recruited during peak periods. In the same periods, but usually after their own farm operations have been completed, farmers and/or their sons hire themselves out for agricultural work. Out of a total of 220 families interviewed, 103 employed farm labour during periods of pressure of work and in 98 cases families produced paid labourers themselves; in many instances both forms of work were found to be practised within the same family. The labour contract is usually for one day, occasionally for task work comprising several days. In this survey no labourers were permanently attached to the families. As is illustrated in Figure 11, paid

labour was employed almost exclusively during the major farm operations (especially during weeding), from June until November, the busiest season.

Labourers seeking jobs did not restrict themselves to their own village area. The arrival of the new agricultural year, for instance, is marked by the incidence of scattered and unevenly distributed 'planting rains'. Rumours of favourable rains elsewhere sets in train a kind of wet season labour movement: labour follows the rains.

Out of the 40 workers within the 30 families, 18 left the northern Sokoto village of Tulluwa during one or more periods of the wet season in search of farm work, usually for weeding operations. These expeditions usually lasted 10 - 14 days, but in three cases farmers were away for one to three months. In other northern villages of the Sokoto and Katsina Provinces a similar wet season movement towards the south was noted, especially during August and September when the farm operations in southern villages are still in full swing. This is illustrated in Figure 12, in which monthly 'major farm operations' are given in man-days for northern and southern villages separately. The figures are based on data from the labour analysis and are converted to represent a standard  $7\frac{1}{2}$  acre farm for each stratum. Superimposed on the family labour contribution is that of paid labour.

It is evident from this figure that within the southern orbit of villages the agricultural economy is capable of absorbing much more labour (including hired labour) than the northern area. Moreover, the labour peaks and lows are far more pronounced in the latter area and account for the centrifugal movement of labour away from the home areas.

In addition to the contribution of family labour and hired labour, a small but variable contribution is made by communal labour (*gayyia*, H). Here a number of workers are invited for work-cum-free-meals and are given small presents afterwards; it is especially common in pagan and less market-orientated areas. For example, in a rather isolated area of central Northern Nigeria, the author found a high incidence of this communal type of labour during the weeding periods (LUNING, 1957). In the present survey this type of labour was generally limited to cases in which a prospective son-in-law, accompanied by his friends, assisted his future father-in-law.

### 5.5.2 Labour and land

Under the present system of land tenure in Northern Nigeria, the community, represented by the village head, has a joint control of the land. Under this system the individual has the right to occupy and work the land as a member of the village community and to transfer it to his heirs upon death or retirement. Unclaimed land may also be allocated by the village authority to resident families who require additional land and to newcomers who have been permitted to settle in the particular community. Allocation of land by the village head had ceased in our survey villages, as no stock of reserved land was left. Thus, farm families find themselves in possession of a more or less fixed area of arable land. The size of the holdings of the farm families

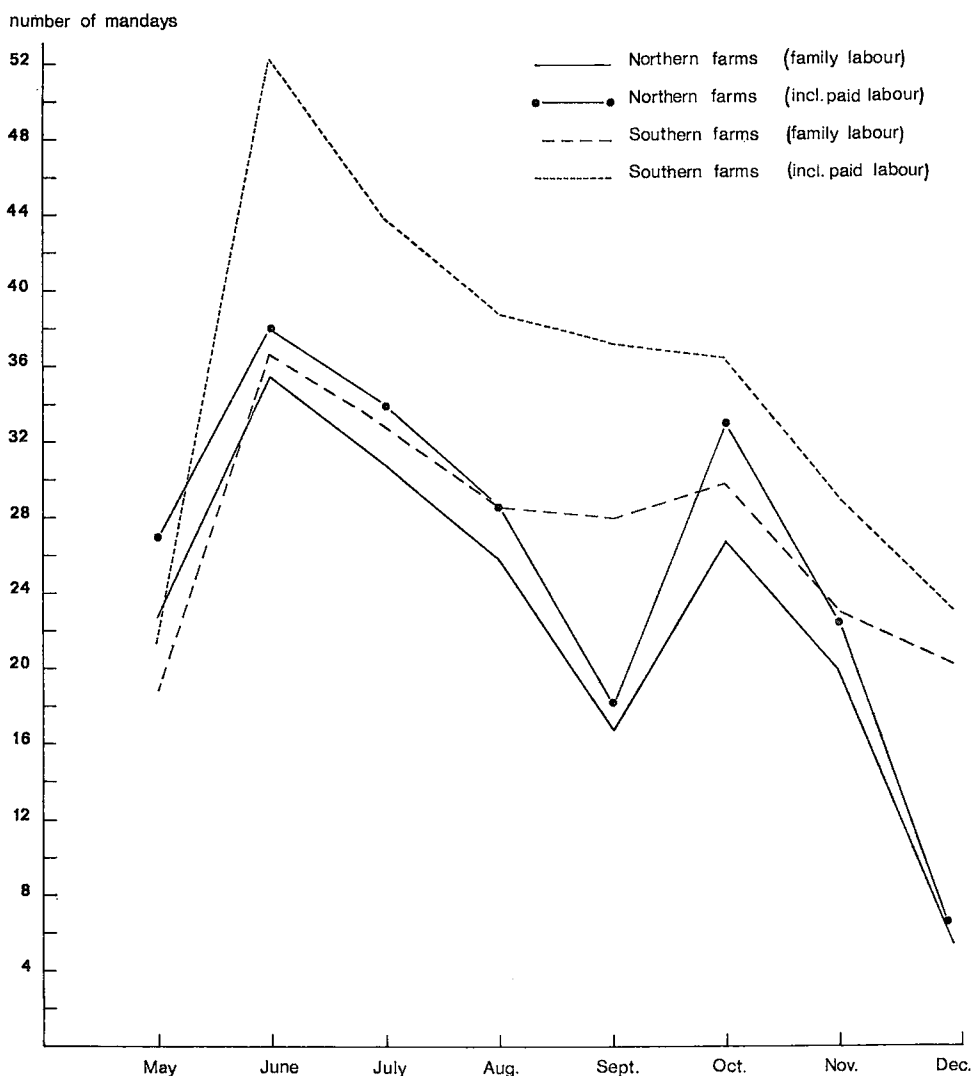


Fig. 12. Major farm operations on a standard  $7\frac{1}{2}$  acre farm in two areas.

subsequently varies, as is demonstrated in Table 11.

Surveys in Northern Nigeria have shown that under natural conditions as found in the savannah an adult male can manage about 4 acres of upland farm (BALDWIN, 1957). If the farmer's holding is large in relation to the family labour at his command, the man may either sell (only when circumstances really force him to do so) or lease a part of it for a farming season. This situation gives rise to a problem of choice, as the original cultivator may also work it less intensively, thus securing a good return per man-day of work rather than a high yield per acre. In addition, he can employ hired labour.

Table 11. Number and percentage of families with holdings of different sizes in the general survey.

	0.51-1.00 acre	1.01-2.50 acres	2.51-5.00 acres	5.01-10.00 acres	10.01-25.00 acres	over 25.00 acres
Number	5	34	71	67	38	5
Percentage	2	16	32	31	17	2

As regards the problems of resource restrictions, it should be emphasized that there are few restraints at the factor level. There are no sharp divisions between small crofters and big landowners. With the growth of a family, the head of the household naturally will attempt to obtain land through purchase or lease. Again, the authorities in a village, such as its head, who may have inherited relatively large tracts of land, often find themselves saddled with impoverished relatives who have to be cared for. For instance, one village head who happened to come into the sample had 47 acres of land under cultivation, but there were 40 people in his household! Up to recent times there has been a satisfactory mobility in land as can be deduced from Figure 13, in which the size of the family is related to the acreage under cultivation<sup>57</sup>. The figures are derived from the general survey<sup>58</sup>.

In the general survey it was found that of the farm land, actually cultivated by those families, 74 % had been inherited, 12 % purchased and the rest cultivated under an annual lease or loan arrangement<sup>59</sup>. It is difficult to judge which arrangement yielded the highest results. Leasing land to others is not all that attractive, as the temporary cultivator is not obliged to maintain the field's fertility. On the other hand, a less intensive cultivation and/or the use of extra labour poses problems. Hired labour requires proper supervision and a money reserve on the part of the employer, since occasional labour demands prompt payment upon completion of the work<sup>60</sup>.

<sup>57</sup> The estimated regression equation was:

$$\mathcal{C}(\underline{y}) = \alpha + \beta x$$

in which  $\underline{y}$  = net arable land in acres  
 $x$  = size of family

The actual regression equation was:

$$y = 1.348 + 0.837x$$

with standard deviations of the estimates  $a$  and  $b$  of  $\alpha$  and  $\beta$  being  $s(a) = 0.300$ ,  $s(b) = 0.078$ , respectively. Both estimates are significant at the 0.01 probability level (217 degrees of freedom).

<sup>58</sup> In case the family labour force, which was actually employed on the main crops, was related to the net cultivated farm land, the following average figures were found: 1 worker = 4.8 acres; 2 workers = 9.2 acres; 3 workers = 12.2 acres; 4 workers = 15.2 acres.

<sup>59</sup> For a more detailed analysis of the land-tenurial arrangements see: LUNING (1965).

<sup>60</sup> A big farmer-trader, interviewed during the Katsina Survey, expressed the opinion that, although he had plenty of money to buy a further number of farm plots, such an investment would not be very profitable. The scattered nature of the plots to be cultivated by paid labour would make the proper supervision of the work a difficult task. This is yet another example that investment in traditional agriculture does not automatically give great benefits.

No exact data are known regarding this choice but hiring of labour undoubtedly prevailed.

In view of this it is not surprising that a comparison of the individual enterprises shows an enormous variation in family labour input per acre. The amount of labour on 34 farm enterprises varied from 26 to 70 man-days per acre. This is illustrated in Figure 14. Curves of a similar nature were produced in an economic survey of Yoruba cocoa-farming families in Western Nigeria (GALETTI *et al.*, 1956).

Turning to Figure 14, the analysis is presented on the assumption that there are two different strata, one for the northern and one for the southern villages, and that farm enterprises in these regions occupy somewhat different production surfaces. This allegation appears to be borne out by the curves shown in this figure. It is obvious that a far greater range of substitution is feasible between land area and labour in the southern villages than in the northern ones. In the former case, agriculture can absorb a far greater input per land area, and production itself is carried out on a somewhat higher plain.

These tentative conclusions, drawn from a small sample, tally with the actual observations of the general study, which indicate that some degree of hybridity in the production function analysis has to be expected. It is evident that individual families differ as regards the principal set of resources at their disposal, i.e. land and labour. Families with 1-2 acres per adult usually turn to farm labour and other occupations, whereas families with relatively large holdings (5-8 acres per adult) either employ labour or work their fields less intensively.

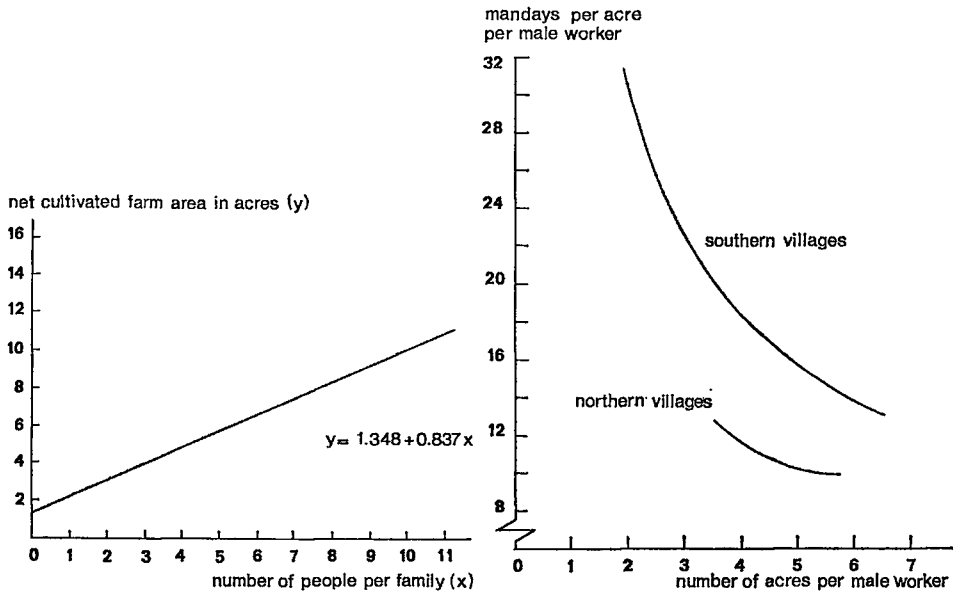


Fig. 13. The relation between family size and net cultivated area.

Fig. 14. The relation between number of man-days worked per acre, and acreage.

### 5.5.3 Regression analysis of the Nigerian farm data

In view of the information so far provided on the economics of the farming system analysed here, it seems likely that there will be a definite relation between the arable land each family cultivates and the output. Another relation indicated is that between labour input and the ultimate output. In view of these trends it is contended that land and labour, together with the recurrent capital expenditure required in farm business, are the principal factors in farm production. In order to test this allegation, linear and curvi-linear functions were applied to the farm enterprise data for the whole sample.

Simple regression models between output and the various inputs are

$$\mathcal{E}(\underline{y}) = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 \quad 5,1$$

$$\mathcal{E}(\underline{y}) = \delta_0 + \delta_1 \ln x_1 + \delta_2 \ln x_2 + \delta_3 \ln x_3 \quad 5,2$$

where  $\underline{y}$  = gross return of major farm crops (in shillings)

$x_1$  = total acreage of major farm crops

$x_2$  = labour used (in man-days <sup>61</sup>)

$x_3$  = recurrent farm expenditures (in shillings)

The least-square method showed high correlations and a large coefficient of multiple determination ( $R^2$ ) in both models.

There was, however, also evidence of multi-collinearity <sup>62</sup>. This could be expected, as the acreage per farm family varied from 0.5 to 25 acres. To obviate this stumbling block, all farm data were put onto a per acre basis by dividing them by the number of acres. The total acreage of the farm enterprise was then added as an independent proxy variable <sup>63</sup>. This was done to include as much variation in output as possible. The procedure led to a production function of the following form

$$\mathcal{E}\left(\ln \frac{y}{x_1}\right) = \beta_0 + \beta_1 \ln x_1 + \beta_2 \ln \frac{x_2}{x_1} + \beta_3 \ln \frac{x_3}{x_1} \quad 5,3$$

The results of multiple regression analysis are shown in Table 12. Student's  $t$  distribution was used to test the regression coefficients  $b_1$ ,  $b_2$  and  $b_3$ , substituting  $\beta_1$ ,  $\beta_2$  and  $\beta_3$  in 5,3;  $b_2$  and  $b_3$  showed to be significant at the 0.01 level, whereas for  $b_1$  the value of  $P$  was about 0.40. As the values for  $b_1$ ,  $b_2$  and  $b_3$  were below 1.0, diminishing returns are yielded for the corresponding inputs.

<sup>61</sup> Including labour days worked by paid labour. Paid labour expenses are therefore not included in recurrent farm expenditure.

<sup>62</sup> For instance, using function (5,1), the following simple correlations between inputs were found:

$$r_{x_1 x_2} = 0.860, \quad r_{x_1 x_3} = 0.861, \quad r_{x_2 x_3} = 0.898$$

Using (5,2) the results were:

$$r_{\ln x_1 \ln x_2} = 0.7995, \quad r_{\ln x_1 \ln x_3} = 0.8167, \quad r_{\ln x_2 \ln x_3} = 0.8892$$

As a general rule,  $|0.8|$  is considered a high incidence of multicollinearity. In the above cases no meaningful judgement could be made for the separate inputs of (5,1) and (5,2).

<sup>63</sup> A similar procedure was carried out by WELSCH (1965).

Table 12. Regression results for 34 farm enterprises in Northern Nigeria (1962/63).

	Land	Labour	Recurrent expenditures
Partial regression coefficient	$b_1 = 0.0170$	$b_2 = 0.3404$	$b_3 = 0.8289$
Standard error	0.0382	0.0780	0.0902
$t$ at 30 degrees of freedom	0.445	4.364	9.190

$R^2$ , the coefficient of multiple determination, was 0.9039; this means that 90 % of the variation in the observed values for  $y$  was explained by the regression equation. This result proved to be highly significant (F table with 30 and 3 degrees of freedom). The constant term  $b_0$  was 1.916.

The sum of the regression coefficients, indicating returns to scale, was 1.1863. With a two-tailed  $t$  test it was found that, at a 5 % level, the null hypothesis (i.e. constant returns to scale) could not be rejected <sup>64</sup>.

Finally, as the main interest was focused on labour's product, its marginal value was calculated at the geometric mean by using the formula

$$\frac{dy}{dx_2} = \frac{b_2}{\bar{x}_2} \bar{y} \quad 5.4$$

With  $\bar{y}$  and  $\bar{x}_2$  (at geometric levels) known from equation 5.3 and  $b_2$  taken from Table 12, it was found that the marginal value product for labour was 1.62 shillings per man-day.

#### 5.5.4 Marginal productivity and the wage level

The next move was to test the original hypothesis that the allocation of the factors of production (with special reference to labour) is in accordance with accepted economic theory.

Under 5.5.3 the hypothesis that the production elasticity for labour is zero was rejected. The following step was to test the hypothesis that labour's remuneration is in accordance with its productivity, i.e. that labour in the farm family is employed up to the point where marginal return equals marginal costs. The ratio

$$\frac{\text{marginal value of productivity}}{\text{marginal factor cost}} = 1$$

indicates perfect efficiency in farm operations and a response to economic incentives in the allocation process. It has already been explained that the problem of resource restriction did not play an important role.

The average price for agricultural labour was taken as the opportunity cost. Actually, the variation in price was not large and fluctuated between 2.0 and 2.5 shillings per man-day, with an average of 2.25 shillings. Thus, the ratio was 0.72.

<sup>64</sup> This was carried out with the use of TINTNER's statistical test of significance. See: TINTNER (1965).

The next procedure was to calculate the variance in labour's marginal productivity, using the formula

$$\text{var} \left( \bar{b}_2 \frac{\bar{y}}{\bar{x}_2} \right) = \left( \frac{\bar{y}}{\bar{x}_2} \right)^2 \text{var} (\bar{b}_2) \quad 5,5$$

This was tested according to Student's *t* distribution with 30 degrees of freedom. For a two-tailed *t* test at 5 %, the calculated value ( $t_{30} = 1.71$ ) indicated that the null hypothesis, i.e. that labour is applied in an efficient way, could not be rejected.

The actual findings do not indicate the perfect efficiency, represented by the ratio 1.0 but this should not be surprising. Such a perfect relationship cannot be expected, in view of the many obstacles in the way of collecting farm data from communities which do not set great store by quantification in the production process. In the previous chapter the built-in bias was noted of exaggerating inputs and underestimating the output. Moreover, as indicated in subsection 5.5.2, the farm data contained some measure of hybridity due to variations in conditions as between the northern and the southern settlements.

#### 5.5.5 Measurement of marginal productivity - stock of labour versus flow of labour

In the previous sections the labour input actually used in the production process has been measured, the productivity of labour being related to the flow of labour and not to the stock. This was done, because it seems that this approach gives a better insight in the mechanism of labour allocation in this particular economy.

As mentioned in Chapter 4, the measurement of labour productivity has been done in many ways and various, often controversial, conclusions have been derived from these studies. In short, the methods of measurement can be divided into those using the macro-approach and those using the micro-approach.

In a study of Thai rice farmers, MELLOR and STEVENS (1956) measured inputs of labour in terms of man equivalents. Labour that was available for farm work but was doing no work was counted as part of the labour input. Thus, this input represented the stock of labour.

To see whether a macro-approach would yield results similar to those of the micro-analysis discussed above, MELLOR-STEVEN'S method was used in the following calculation. Taking the stock of labour, expressed as man equivalents per acre ( $x$ ), and the net returns (the differences between total revenue and total variable costs) expressed in shillings ( $y$ ), the following relation, for 34 farms, was established:

$$y = 0.97 x + 104.2$$

The correlation ( $r = 0.286$ ) is not significant, as *P* is about 0.1.

This leads to the conclusion that the marginal productivity of labour is zero or nearly so, since the slope of the curve does not significantly differ from zero. This conclusion is similar to that of the study mentioned above.

Taking the flow of labour, expressed as man-days per acre ( $x$ ) and the net returns,

expressed in shillings per acre ( $y$ ), the following simple equation was established for the 34 enterprises:

$$y = 3.4 x + 12.3$$

Here, the correlation ( $r = 0.68$ ) is significant,  $P$  being considerably below 0.01.

Using the flow method, it is shown that the marginal productivity of labour is positive and, as has been indicated in the previous sections where the best fitted function was established, the value of labour's marginal product is equal to the wage rate.

It is not contended that MELLOR and STEVENS would have found similar relations to those established here if the flow of labour could have been known. However, it is suggested that a truer picture is obtained by taking the actual labour input used in the particular production process.

In describing the general economy of the area and its people, it has been shown that there are considerable activities in the agricultural field which are not covered by the production function as presented here. Though no actual proof can be given, general observations lead to the belief that labour productivity in *fadama* farming and in animal husbandry is positive and provides a welcome addition to the revenue from major farm crops. Again, many of the services which have to be paid in western economies (water, housing, fuel for cooking, domestic services) are provided by the farm family members themselves. Finally, there are many types of capital formation and improvement which are hardly ever fully reported, not even in a study as detailed as attempted here.

## 5.6 Labour productivity in subsidiary occupations

A final word should be said about productivity in other occupations performed by the rural inhabitants in the survey areas.

Information on this point was difficult to obtain, and what could be collected refers solely to data on average returns per working day. Collection of firewood for sale, for instance, gives an earning of 2.0 to 2.5 shillings per day and weaving from 2.0 to 2.5 shillings. In the crafts much depends on the skill and assiduity of the individual, some weavers earning as much as 3 shillings per working day. Figures on petty trading and brokerage were hardly ever produced and often proved unreliable. Indications are that the level of earnings is about 2.0 to 2.5 shillings per full working day. These data refer to the occupational class of ordinary farmers with engagements in subsidiary occupations, referred to in Hausa as *talakawa* (common man). There are also other categories belonging to different social strata, such as the local aristocracy, office-holders, professional people and big traders, but they fall outside the scope of this investigation <sup>65</sup>.

<sup>65</sup> For an overall picture of the local Hausa economy, see the interesting study by SMITH (1955).

Close examination of the individual labour patterns reveals a marginally motivated shift from major farm operations to other activities, though this shift may take place more or less unconsciously. Many farmers may turn to the various subsidiary occupations as the opportunity return in agriculture approaches zero; net earnings in these occupations may drop considerably owing to the impact of the law of demand and supply on their final products. A movement away from the home area may then relieve this pressure, while at the same time it may enhance the chances of the 'leavers' earning a reasonable return on their labour.

## **6 Labour productivity in Surinam - A case study of Hindustani rice smallholders**

### **6.1 Introduction**

To test the earlier mentioned hypothesis, another field study was undertaken in a completely different environment, namely amongst rice farmers of the Nickerie district situated on the coastal plains of Surinam. Surinam is a small country comprising only 140,000 square kilometres. Furthermore, the major area of human occupation covers only a very small part of the country along the coast, namely some 17,000 square kilometres. It is in this area, the so-called 'young' coastal plain, that over 90 % of the population live. The soils consist mostly of heavy clay usually interspersed with narrow sandy ridges. Further inland, there are strips of an old coastal plain, a savannah belt and a large area of tropical rain forest; the latter extends to the southern border with Brazil.

Surinam has a plural society and its population (apart from some 5000 Americo-Indians living in the interior) of 300,000 originates mainly from Africa, India, Java, China, Western Europe and the Middle East. The present population growth is quite fantastic; over the period 1954-1963 it increased by 3.3 % per year (CHUN, 1964).

In this melting pot numerically the three most important groups are the Creoles, the Hindustani (both Hindu and Muslims) and the Javanese; they form roughly 40 %, 40 % and 20 %, respectively, of the population.

The first settlers were Europeans followed in their wake by slaves imported from Africa. They were used as labourers on the plantations which started in the middle of the Seventeenth Century. The plantation system, though having its ups and downs, formed the country's major economic activity until the sixties of the Nineteenth Century; in 1863 slavery was abolished and from then on it became increasingly difficult for the plantation managers to maintain the agricultural labour force. Labourers were then imported from the Indian Subcontinent (between 1873 and 1916) and from Java (between 1890 and 1939) on 5-year contracts. Free repatriation was provided on expiration of their contract; in the early period a large number of these indentured labourers made use of this right (in total one third of the Hindustani and about one quarter of the Javanese, DE VRIES, 1965). To counteract this movement the Surinam Government allotted parcels of old abandoned estates to those people whose contract had expired. They could establish themselves as small, independent farmers, while it was thought that they would continue to work as part-time labourers on the existing plantations. It was along these lines that agricultural settlements of small peasant farms developed in Surinam until recent times.

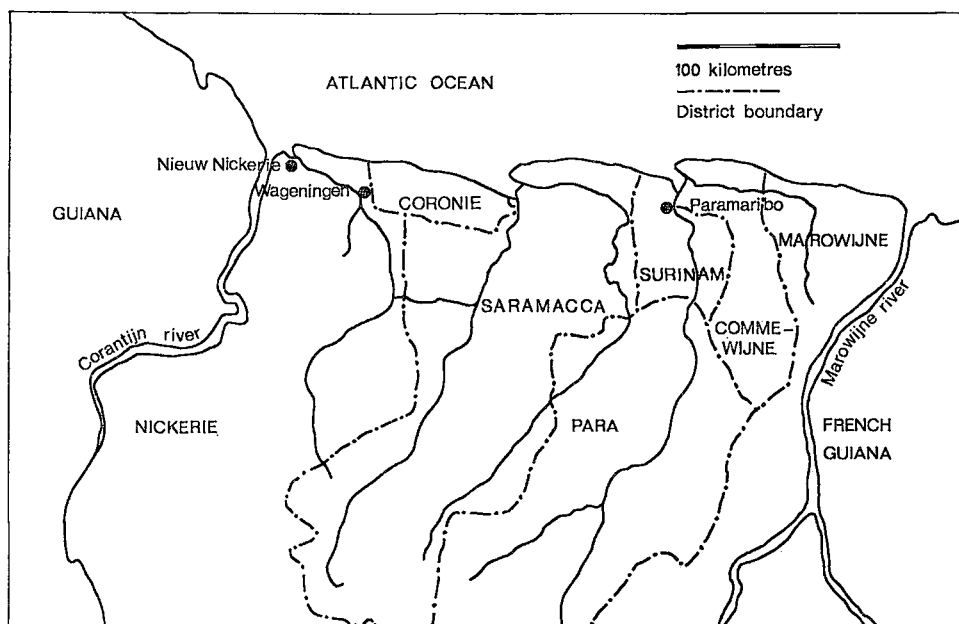


Fig. 15. The northern part of Surinam.

Meanwhile, most Creoles had lost interest in agriculture and had retreated to the city of Paramaribo and to the other larger settlements, where they took up positions in government, industry and trade. Nowadays, the racial distribution of the peasant farmers of Surinam is as follows: Hindustani: 52 %, Javanese: 38 %, Creoles: 10 % (Ministry of Agriculture, 1960).

## 6.2 A survey in the districts of Nickerie and Surinam

This field survey was carried out in two districts during the main rice-growing seasons of 1965 and 1966. One was held in the district of Nickerie, which has a fully-fledged irrigation and drainage system for rice cultivation. A sample of 54 farmers was chosen. Another 40 farms were selected in the Surinam<sup>66</sup> district near the capital of Paramaribo; in the latter area there are no irrigation facilities.

The results after a one-year period of cost-accounting analysis showed for the Surinam district wide variations in the farmers' returns which bore no relation to the input used. Though these 40 farmers all lived within a radius of 1 - 2 miles of each other, the heterogeneity of the soil-water complex proved such an obstacle that even

<sup>66</sup> The district surrounding the capital of Paramaribo is named Surinam district. It should not be confused with the name of the country itself.

the procedure of using weighing factors could not be used. Though the sample set-up was devised in such a way as to facilitate the estimation of production functions, the latter results had to be entirely discarded. It became evident that these results represented points on different production surfaces and therefore could not be considered for inclusion. As for Nickerie, the homogeneity in the physical properties of the soil was such that the expected variations would lie within the accepted confidence limits.

The district of Nickerie is the westernmost district of Surinam. Human occupation is restricted to the north-western corner along the coast, where the Nickerie river meets the Corantijn River which forms the boundary with Guiana. Its main centre is Nieuw Nickerie, a small town with some 6000 inhabitants. Practically all human occupation is concentrated on the southern bank of the Nickerie river. The agricultural settlements are located on the western and eastern sides of Nieuw Nickerie and are known as the western and eastern polders. The rural settlements show a ribbon development along the main roads. Nickerie district is rather isolated from the rest of the country as communications over land are still quite poor.

There is in Surinam one long wet season from the end of April until the beginning of August and a short one from December until February. The long wet season is the main cropping period for lowland rice cultivation. Fresh water for irrigation in Nickerie is supplied by the diversion of inland creeks. The main rivers within the coastal plain have a salt content which is too high for irrigation purposes. Until very recently it was not possible to supply enough fresh water for the irrigation of rice in the short wet season but thanks to improved storage and distribution facilities this state of affairs will be improved in the near future. All rice cultivation in Nickerie district is carried out in empoldered swamps. Dikes protect the land along the sea, as part of the land lies below tide level.

There are a number of large estates and agricultural enterprises (rice, sugar cane), which cover roughly two-fifths of the area under cultivation. The remaining area (about 10,000 hectares) is occupied by small peasant farmers, who mainly cultivate rice, as is shown in Table 13. 'Other annual crops' are nearly all pulses and bananas and plantains form the majority of the biennial crops, while perennials are mostly coconuts. There are two large communal grazing areas in the western polders and one small one in the eastern area; there is practically no grazing area outside this communal land, apart from the abandoned rice fields in the off-season.

*Table 13. Crop distribution (in hectares) for peasant farms in the Nickerie District (1965).*

Rice	Other annual crops	Biennial crops	Perennial crops	Permanent pasture	Total
8,200	160	80	290	1,300	10,030

Source: Department of Agriculture, Surinam, 1966.

*Table 14. Farm size distribution according to gross area occupied (Nickerie District).*

<1 ha	1-1.99 ha	2-3.99 ha	4-7.99 ha	8-20.00 ha	Total number
394	708	633	543	227	2505

Source: Second Agricultural Census, Surinam, 1959-60.

The distribution of peasant farms by size in Nickerie district is presented in Table 14. Since this census no major changes have occurred in this distributional pattern.

Table 14 formed the basis for the selection of the sample. Firstly, the farm enterprises smaller than one hectare were rejected; an earlier survey by HUIZENGA and SALVERDA (1964) had shown that the great majority of these enterprises were run by elderly people. Furthermore, preference was given to the 2 - 4 size class over that between 1 and 2 hectares, as it was felt that recording errors might be larger in the latter case. For instance, a recorded error of 1 man-day in a labour input of 30 man-days as opposed to 1 in 60 man-days in the case of a larger-sized farm would result in only half the error in a larger input quantity. This point often seems to play a role in the samples taken from both small and medium-sized farms and it leads to over-estimate the inputs on the smaller farm units. From a pilot survey it was gleaned that, on farms with a net cultivated area larger than 4 hectares, differences in techniques and management might cause hybrid production functions to occur.

It was not possible to use the distribution figures of Table 14 as a starting point, since they represent the gross area of occupied land per farmer. As rice occupies such an important place in the agricultural economy (see Table 13), it was decided to take the acreage of this crop as a basis; in other words, the selected farms should have a net rice acreage of between 2 and 3 hectares.

In practice it was difficult to adhere to this rule, since farmers sometimes leased or hired out parcels of land without giving prior notice. However, it may be supposed that adequate precautions have been taken and that indeed sufficient homogeneity has been reached within the sample to render the use of production function analysis possible.

The actual net rice acreage for the two seasons under study is shown in Table 15. With two exceptions, the same enterprises were studied in the second survey year. In Table 16 a picture is given of the average land use and cropping scheme on the selected farms for the 1965/66 season.

*Table 15. Size distribution of the sampled rice farms.*

	Net rice acreage					Total number of farms
	0-1 ha	1-2 ha	2-3 ha	3-4 ha	> 4 ha	
1965	1	8	32	8	5	54
1966	1	9	28	8	8	54

*Table 16. Average land use (in hectares) and cropping scheme on the sample farms (1965).*

Rice	Vegetables	Other annual crops	Perennial crops	Fallow and waste land	Total
2.71	0.01	0.01	—	0.36	3.09

Comparisons with Table 13 show that the enterprises under discussion here do not deviate from the general pattern. Neither was much variation found in the existence of other crops besides rice. In fact, Nickerie is well-known for its lop-sided 'one-crop' economy. The study has thus been solely focussed on the economics of rice-growing.

### 6.3 Some notes on the present agricultural structure in historical perspective

Broadly speaking, Surinam, with just over two people per square kilometre, is obviously an underpopulated country. This generalisation is, however, misleading, as large parts of the country are covered with thick jungle and deep swamps which are not merely uninhabited but often uninhabitable.

With the decline of the plantation economy in the second part of the 19th Century the government of Surinam had to find a new socio-economic policy for the agricultural sector. This became especially urgent in the last two decades of that century, as the indented labourers, after the expiration of their contracts, tended to return to their home countries. As it was thought desirable to keep a larger population in this 'empty' country than had hitherto been the case, the government encouraged the ex-contract labourers to settle in especially prepared settlements. The average size of the farm holding in the new areas was small, about 1 to 1.5 hectares per family (PANDAY, 1959, pp. 167-169). Many of these Hindustani and Javanese settlers tried to clear patches of farmland outside these settlements (often abandoned plantations) in order to make a living, little appetite as they had for the continuation of plantation work.

The main diet of the newly imported groups (Indians, Javanese) originally consisted of rice. The quantities of rice produced prior to the eighties of the last century were very small. With the arrival of these Asian workers, a large demand developed for it so that rice had to be imported and, at the beginning, high prices were paid. With the continuous growth of this category of rice-eaters and with their high birth rates, there came a large scope for rice cultivation in the country itself. However, unless they empoldered the coastal swamps, the farmers were completely at the mercy of the vagaries of the climate.

It was evident that the government had to assist these people by helping them to tackle the problems of land reclamation: the small peasant could hardly be expected

to take on this reclamation work himself. For a poor colonial government this meant high investments. It thus became accepted policy to reclaim and set up large areas in the various districts and to settle there as many people as possible who were considered capable of eking out a living in this way. This socio-economic policy, according to which the investment per family was kept as low as possible, resulted in the creation of many small and very small farm enterprises.

The growth of the peasant rice economy is illustrated in Table 17. In 1920 the cultivated area per head of population was only 0.4 hectares. This has hardly increased since, the average rice farmer now having an area of about 2.0 hectares under cultivation. It is clear that one cannot speak of underpopulation as long as farmers have little opportunity for farming outside these crowded empoldered settlements.

In the past these small rice enterprises were not merely desirable units from a social point of view but were also not unattractive from an economic standpoint. Until the Second World War, peasant farmers in Surinam worked their rice lands with simple implements, although there were some who worked with plough and bullocks, an innovation introduced during the twenties from British Guiana. With these limited means at their disposal farmers could handle only small acreages. Sawah rice-farming requires huge amounts of labour during the critical periods of field preparation, planting and harvest time. BÜRER (1956), for instance, mentions that Surinam's labour requirements for sawah rice in terms of manual work amounted to 145 man-days per hectare (without ploughing). A one-man rice enterprise could have handled only 0.4 hectare without outside help, unless the farmer was prepared to accept lower yields arising from late planting and prolonged harvesting (shedding, sun cracks). In practice, there are usually several adult workers per family, including women <sup>67</sup>, and

*Table 17. Rice production (in 1000 kg) in Surinam on small peasant farms.*

Year	Rice production in 1000 kg	Year	Rice production in 1000 kg
1887	10	1922	12,626
1892	24	1928	17,438
1897	134	1932	25,027
1902	374	1940	32,065
1907	1,511	1948	58,395
1912	2,659	1954	56,659
1917	5,118	1960	54,089
1920	9,527	1965	53,769

Sources: PANDAY (1959) and Department of Agriculture, Surinam (1966).

<sup>67</sup> The average number of members in, for example, the Hindustani farm family was 7.2 persons, usually including 3 adults over 15 years of age.

systems of paid labour and mutual help are well-developed.

It gradually became manifest in government circles in the early forties that peasant farms should be considered as self-contained units, as plantation labour had become less attractive or, with the further decline of the plantation sector, virtually impossible. Budget studies, carried out by HEWITT<sup>88</sup> in the early forties indicated that what was then considered as a reasonable farm income could be obtained from a 4 hectare enterprise. In the case of a smaller area the amount of income to be obtained from outside activities (which was calculated to be a mere 8 % for a 4 hectare farm) would increase steeply.

This theory of the 4-hectare farm became the criterion for agricultural policy in the fifties and early sixties. Actual conditions are still far removed from the desired ones; the size of the average cultivated holding still lies between 1.5 and 2.5 hectares for the various districts. Neither have changes in the prices of products given the farmers any comparative advantage during the last twenty-five years.

Meanwhile, great developments had taken place outside the agricultural sector. The discovery of bauxite and its subsequent exploration from the early twenties onwards by foreign enterprises (American, Dutch) led to the establishment of a high-wage sector, to which were later added plywood and some small-scale industries. The Government itself, which employed a few thousand people until the end of the Second World War, absorbed a larger part of the working population in the following years. Whereas the number of government employees stood at 9,000 in 1957, this number had swollen to about 17,000 by 1966. In the latter year the estimated total labour force of the country was 70,000. In this figure female members of agricultural households are not included, as the opportunity to work outside their farm enterprises is not large. The existence of a large governmental sector and a high-wage sector in the mining and timber industries has had a profound influence on the agricultural sector of a small country such as Surinam.

At the beginning of this transitional period, the low level of capital input and their limited needs had made these people (who were for the larger part identical to the rice-growers) pure subsistence farmers who found employment on their farms for a reasonable part of the year. Productivity was low and the income from the small holdings forced the rural inhabitants to look for an additional source of income in their immediate surroundings.

Gradually, with the drying-up of particular sources of additional income<sup>89</sup> in some districts and/or the lack of development in the local agricultural structure (bad irrigation and drainage facilities, transport difficulties, unattractive living conditions), people were attracted to the high-wage sector situated in and around Paramaribo.

Districts particularly hit were Coronie, Commewijne, and to some extent, Sara-

<sup>88</sup> Quoted by BÜRER (1956, p. 170).

<sup>89</sup> So far little attention has been paid to crops other than rice. It should be mentioned in passing that the decline of two rural staple commodities, namely the small-sized peasant cocoa and coffee plantations, was experienced during the same period.

*Table 18. Registered population in the coastal plains of Surinam (per district) as percentages of the total population.*

	Paramaribo + Surinam Distr.	Nickerie	Saramacca	Commewijne	Coronie	Marowijne
1950	70.88	9.12	4.97	10.66	2.12	2.25
1955	71.25	9.68	4.74	9.31	1.90	3.12
1960	72.72	10.07	4.54	8.05	1.60	3.02
1964	75.54	10.18	3.72	6.88	1.30	2.38

Source: LUNING (1966b).

macca. The main migration was to Paramaribo, the overflow going to the surrounding district of Surinam. This population centre thus exercised a 'pull-effect' on these backward districts. Although the population decreased in the Commewijne and Coronie districts, even during a period as short as from 1950 to 1964, there was no decrease and even a slight increase in the Nickerie district, as is shown in Table 18. This phenomenon appears to be connected with the agricultural structure, which has not remained unchanged in the Nickerie district. Whereas the changes in, for instance, Japanese agriculture during its major agricultural development phase (1870-1920) were brought about by technical improvements (land, water) and the results of agricultural research (with special reference to crop selection and fertilizers), the direction in which Surinam has developed has led to the placing of the major emphasis on farm mechanization in rice cultivation, which aspect was developed at a much later stage of development in Japan. It is this mechanization which has made the greatest impact on the developing pattern of rice cultivation in Surinam over the last thirty years.

Recent authors have drawn attention to the distorting pressures of colonialism on indigenous societies, which often lead to retreatism<sup>70</sup> and the perpetuation or strengthening of values inimical to economic growth. Farm mechanization was introduced into Surinam by a Dutch entrepreneur who settled in Nickerie. His family runs a large estate (700 hectares) in this district. It was from this focal point that this innovation spread amongst the Hindustani farmers, who, not being indigenous but settlers themselves, proved to be eager learners in the adoption of new techniques.

During the fifties the use of tractors for ploughing and for the operation of threshing machines became a wide-spread practice on peasant farms. Another stimulus was provided by the Wageningen Rice Project, a large-scale rice scheme situated on the other side of the Nickerie river some 40 kilometres from the regional centre, which started its operations in 1951. It was from Nickerie that mechanization gradually spread to other districts. Recently even combines have reached the small peasant farmer in Nickerie. Most of the machinery is in the possession of the larger farmers but even on smaller-sized farms some tractors can be found; their owners usually plough extensively for others on a contract basis.

<sup>70</sup> For an interesting interdisciplinary discussion see: HAGEN (1962).

Whereas in the early days rice-growing by manual labour took more than 140 man-days per hectare, the introduction of plough and bullocks reduced this to 80 - 100 man-days and the tractor decreased this figure even further to 40-60 man-days. Improved irrigation facilities and better levelling of the land made it possible to use the broad-casting method, which gives a sharp reduction in labour requirements at planting time. The use of these modern methods has in some cases decreased the labour requirement for sawah rice production to 10 man-days and even less per hectare.

How was this transformation (in which labour was substituted by capital to such a large degree) possible without a serious reduction in rural income, there having been no change in the farm size, the cropping pattern or the intensity of farming? As pointed out before, there has been no rural exodus from this district to the large population centre of Paramaribo. Has the labour productivity risen so fast, that farmers can leisurely idle away a large part of the year?

Even in the late fifties it was thought that "the majority of the small farmers will not be able to afford the services of these labour-saving machines" (PANDAY, 1959, p. 199). The fact remains that they can. They are increasingly turning to mechanization: at first sight a puzzling situation.

## 6.4 The phenomenon of part-time farming

In the case of Surinam with its small population there is not much point in relating the sectional percentages of the categories engaged in various occupations to the country's stage of development. As mentioned, the discovery of bauxite and other minerals and the recent activities of the Government on the labour market may well have sudden and large effects on this market.

For example, PANDAY (1959, p. 3), basing his analysis on the 1950 national census, concluded that 84 % of the working population was in agriculture. However, he excluded the service sector which includes the government. According to KOOL (1964, p. 17), 50 % of the labour force was working in the sector of agriculture, forestry and fishing at the end of 1960. His particular presentation of the figures may be objected to since he included the female agricultural workers, who might not be able to compete for other jobs. Excluding the latter category, a figure of 33 % is arrived at. There would certainly be little point in using this kind of figure to illustrate the rural exodus between 1950 and 1960; this exodus is in any case more forcefully illustrated in the population changes per district shown in Table 18.

An important reason why these sectoral percentages provide little insight into the situation is supplied by the widespread presence of part-time farming in Surinam. This phenomenon had already been revealed in the results of the latest agricultural census (1959). According to this survey, 66 % of the country's heads of farm households had farming as their main occupation, 11 % were primarily agricultural labourers and 23 % had a non-agricultural main occupation. Householders whose

Table 19. *Procentual share of net annual income per average family derived from farm and outside sources.*

	Net farm income	Outside income	Number of farmers in sample
Surinam district	35	65	40
Nickerie district	48	52	54

secondary occupation was farming were mainly encountered in the Surinam and Commewijne districts. The occurrence of non-agricultural main occupations was attributed in the case of Surinam district to the proximity of Paramaribo and in the case of Commewijne district to the existence of a number of plantations which are still in operation.

According to this census, 83 % of the heads of farm households in Nickerie district were primarily farmers. Indeed, Nickerie has always been described as the farming district *par excellence* of the country. Owing either to the fact that not all aspects of part-time farming were sufficiently covered in the 1959 questionnaire<sup>71</sup> or to the fact that with the stepping-up of development aid (EEC, Netherlands) a larger flow of capital has recently been injected into the rural areas, it is certain that this part-time farming is now far more wide-spread than can be deduced from earlier statistics. This holds true also for the Nickerie district.

The quantitative weight of part-time farming is illustrated by the data in table 19 which were collected in the course of a cost-accounting analysis during the period April 1965-April 1966 from the selected 2-3 hectare farms in both Surinam and Nickerie districts<sup>72</sup>.

On the other hand, for a sample of 10 similarly sized Hindustani rice farms located in a rural area in the Saramacca district, the annual percentage of outside income was only 13 %. In this particular location there were very few opportunities for earning additional non-farm income. Cash income was provided by the sale of bananas, plantains and some cocoa.

There are several factors which account for the fact that Nickerie's population has not fallen a victim to the attractions of the big city, a feature which is so well-known in many countries of South America. Nickerie has even taken the lead in profoundly changing the countenance of agriculture. First of all, this district is fortunate in having a well-developed drainage and irrigation system, whereas in other districts irrigation and even drainage facilities are often absent. This is reflected in the farmer's cost-price for his paddy. Whereas a minimum price of 10 cents per kg paddy is guaranteed by the Government, it costs the farmers of Nickerie and Surinam dis-

<sup>71</sup> It is often impossible to judge whether the farmer's time is occupied for the greater part with non-agricultural occupations; for such a purpose it would be necessary to amass details on various activities for a whole year.

<sup>72</sup> For a further discussion of part-time farming in Surinam see LUNING (1966a). - It should be borne in mind that a 2-3 hectare farm is above the average farm size, the majority of holdings being below that size.

tracts in an average year 8 cents and 15 cents, respectively, to produce one kg of paddy<sup>73</sup>. This advantage for the Nickerie district has certainly led to greater opportunities for saving and capital formation. Furthermore, in this district the initiation of various agricultural projects (Wageningen Rice Scheme, Governmental Banana Plantations), public works (roads, improvement of the old irrigation system) and an enlargement of the Government's payroll has created employment opportunities which have not only absorbed rural un(der)employment but must also have stimulated the technological change in rice farming described in the previous section.

A third factor is that Nickerie has always been somewhat isolated from the rest of the country. This has greatly stimulated self-help, which is notoriously absent in and around the capital, where the patriarchal attitude of the old colonial government had a large influence on people's outlook. The Government always pays! Even nowadays, in semi-independent Surinam, this difference can still be observed very clearly.

These were some of the important factors. Not many quantitative data are available to substantiate the above statements regarding the factors underlying the agricultural changes but they seem to provide a plausible answer. As for the rest of the country, the attractions of a high-wage industry, the facilities provided by the government sector (including relief work for which unemployed city-dwellers are paid quite attractive wages), the availability of social amenities (electricity, schools, good medical facilities) in and around the country's capital, all these have caused people to move away from the underprivileged rural areas. Apart from these 'pull-effects', people also tend to be 'pushed' from the land when farming becomes a losing business, i.e. the reward to labour becomes conspicuously low.

To return to the starting point, the following intriguing question remains to be answered: Firstly, how is the pattern of outside work affected by the demands made by agriculture and, secondly, is there some kind of relation between income-earning activities (farming, non-farm employment) and a preference for leisure?

Concerning the first point it is possible to be brief. Rice cultivation makes heavy demands on labour during planting and harvesting and observations have led to the conclusion that during peak periods rice-farming always receives top priority<sup>74</sup>. Farmers take leave or just absent themselves from their outside jobs. As was shown in the theoretical framework of section 3.6, the farmer has to mobilize his labour force (including outside help) at the right moment, since, otherwise, he will jeopardize the whole production process. In fact, these farmers of Nickerie, who are really part-time farmers (only in 2 % of cases did a farmer or his male dependants not partake in non-farm work), nearly always call themselves 'farmers' first and foremost, though from a scrutiny of the accounts from a whole year it became obvious that a larger part of their working time had been devoted to non-farm activities<sup>75</sup>.

<sup>73</sup> Including the imputed costs of family labour.

<sup>74</sup> This situation is theoretically shown by the course of the M.P. curve of Figure 7.

<sup>75</sup> To distinguish the primary occupation from the secondary one, the length of the working period has been taken as the criterion.

## 6.5 The Limited Aspiration Model

We shall now turn to the question whether there is a certain pattern of choice behaviour governing the participation in farm work, non-farm work and leisure. Below, an attempt is made to verify the concept of a target income which was given its theoretical foundation in Section 1.3.3.

Many researchers working on the problems of underemployment in densely populated areas have been struck by the under-utilization of land while clearly quite a lot of labour was idle. A case in point found on the larger-sized farms has already been demonstrated in Indian Farm Management Studies. For instance, in the report on Madras (1954-55, p. 129) it is stated that: "productivity can be increased more significantly by increasing the value of other inputs rather than by raising the acreage of the farm"; and in the following year (1955-56, p. 129): "intensity of cultivation is much less on bigger holdings . . . per acre results are much better on small farms below 5 acres in size"; on the larger farms "inputs are too thinly spread, especially human labour". Quite a varied number of attitudes towards the use of resources in production can be found in the literature; a revealing picture is, for instance, given by KUSUM NAIR (1962).

A theoretical explanation of these observations has been given by MELLOR (1963) in his 'limited aspiration model'. The main assumptions of this model are: firstly, that the marginal utility of income drops sharply once some socio-economically determined subsistence level is reached and, secondly, that the productivity of labour is such that aggregate rural incomes fluctuate around this socio-economically determined welfare level.

The reason for such under-utilization (of land on large holdings) while other resources are seemingly over-utilized (labour on small holdings) is that the income incentives in these not very dynamic but traditional societies are limited<sup>76</sup>. This means that a certain amount of potential labour is in fact present which could be used if rigid institutional pressures were relaxed or disappeared.

The Nigerian study might provide some proof for this hypothesis.

At the time of the introduction of ground-nuts and cotton as cash crops in Northern Nigeria (between 1900 and 1940), considerable under-utilization of both land and labour must have existed. This follows from the fact that the enormous expansion in cash crop cultivation has not been at the expense of food crops. Neither can it be said that new methods have been introduced involving considerable savings in effort and cost and thus facilitating the rise of a cash crop sub-economy. There has been no

<sup>76</sup> On the question why so much of the land in large-sized holdings in India is not used more intensively much controversy still exists. Another argument is that the higher costs of hired labour on large farms at peak periods could prohibit large applications of labour on these farms. The higher productivity per acre on the smaller holdings can be attributed to the phenomenon of cheaper labour "acting also on capital through complementarity and direct embodiment of cheap labour". See for an interesting discussion SEN (1966).

improvement of the Guinea corn or millet varieties and no generally adopted use of artificial fertilizers and/or mechanization.

It could be argued that the labour used in cash crop cultivation has been diverted from service activities, including local crafts and trading, rather than from leisure activities<sup>77</sup>. The observations on the latter activities, albeit covering only a limited number of villages in Northern Nigeria, nevertheless indicate that local industries still provide very important sources of income for the villages and these sources do not seem to have shrunk conspicuously under the influence of cash crop cultivation. As described by BAUER (1954) the cash crop buying agents at the same time provided the farmers with new import goods. The demand for the new goods no doubt led to a greater use of resources (including land and labour) at the expense of leisure.

To return to Surinam, it should be noted that there has been no increase in the average farm size in Nickerie over the last twenty to thirty years, but that non-farm employment has certainly expanded. Part of the earnings from the latter activities has been used by the Hindustani farmers for investment in rice-farming, such opportunities having been provided by the initial example of the Dutch settler family. Another part of the extra earnings has apparently been used for the purchase of new consumption goods (better housing, refrigerators, motor cycles).

In contrast to traditional agriculture (represented by the above mentioned case study in Madras, India) where preferences and motives do not seem to change very much over the years, it is likely that preferences and motives will change quite rapidly in the transitional type of agriculture as found in Nickerie.

Although, generally speaking, this may be quite true, where exactly are these changes taking place? A study of the changes in this area suggests that they have occurred especially in the case of the big land holders with farms having a gross area of more than 8 to 10 hectares. It is here in particular that new techniques have been introduced and the great extent of capital formation on the larger farms in such categories as agricultural machinery is clearly illustrated in Table 20.

In the following an attempt has been made to use MELLOR's 'limited aspiration model' to find out whether quantification of this abstract notion is possible. An ana-

*Table 20. Average value of agricultural machinery for groups of 10 holdings with different farm size (1959).*

	Gross area				
	<1 ha	1-1.99 ha	2-3.99 ha	4-7.99 ha	8-19.99 ha
Net area of rice land in ha	0.39	1.25	2.46	4.58	8.25
Average value of machinery in Sf	—	6.50	67.50	485.00	1729.50

Sources: HUIZENGA and SALVERDA (1964), Tables 14 and 40. Sf = Surinam guilders.

<sup>77</sup> This is a point made by HELLEINER (1966).

lysis of this concept might greatly enlarge our understanding of the peasant's behaviour on the labour market.

Without attempting to provide a complete answer which might satisfy a sociologist, the field observations suggest the existence of three definite strata:

- (1) The small crofters and old people, farming a small acreage (below 1.5 hectares of rice, see first two categories of land area, Table 20).
- (2) The big farmers (last category, 8-19.9 hectares, Table 20) who form the entrepreneur class in Nickerie.
- (3) The numeratively large group of farmers with a rice area of between 1.5 and 4.0 hectares.

It would be logical to expect that, if such a phenomenon as a target income really existed, it could be found only amongst the third stratum since the first consists of very heterogeneous elements, while the entrepreneur class, which earns an annual income far above the socially defined welfare level can be expected to have acquired different and more unlimited wants.

Before any attempt is made to analyse the relationship between farm and non-farm occupations, it should be pointed out that, thanks to the irrigation system, the difference between expected and actual returns (on the basis of equal efforts, of course) is not significant for ricefarming under Nickerian conditions. As the acreage under rice has been kept more or less uniform in this sample (see Table 15), it will be obvious that the single most decisive factor having a bearing on the need to find non-farm employment will be the number of consumption units per family.

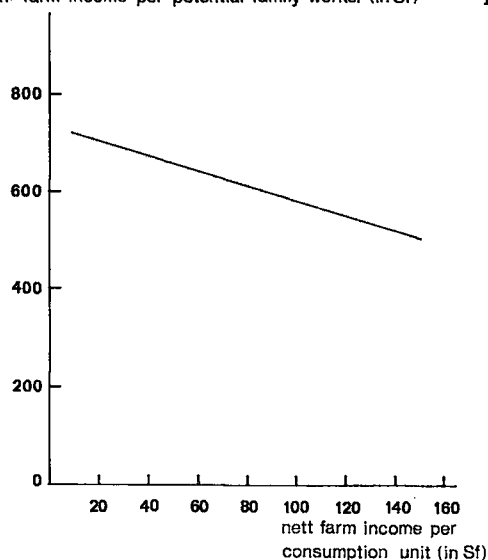
The hypothesis is developed that, if net agricultural income per consumption unit is low (i.e. many mouths have to be fed from the limited agricultural land), then a great pressure is exerted on the potential family workers to attain a certain non-farm income. If there really is such a phenomenon as 'limited aspirations', then the incentive to find outside employment will diminish as soon as a higher agricultural income per consumption unit is achieved.

This hypothesis was tested on the previously mentioned farms<sup>78</sup> with the aid of linear correlation analysis. For each family the net annual farm income per consumption unit and the non-farm income per potential worker (women excluded) were computed for the year 1965/1966. The coefficient of correlation ( $r$ ) between net farm income per consumption unit and this non-farm income was  $-0.425$  and the relation was clearly significant at  $P = 0.01$  (Figure 16). For the calculation of the consumption units, other essential needs in addition to basic food requirements were

<sup>78</sup> Of the 54 farmers in the original sample 50 were included in the correlation analysis. In one case of an old man and another of two elderly people, the data were discarded as they were typical of the first stratum. In a third case, illness had struck the head of the household during the year and he had not been able to do as much non-farm labour as he considered to be necessary. Finally, in the fourth case, the head of the family apparently belonged to the entrepreneur class, since, in addition to 3 hectares of rice, he owned a large shop. He was also a member of the polder water management committee and held political office.

non-farm income per potential family worker (in Sf)

Fig. 16. *The phenomenon of 'limited aspirations'.*



included; for this reason adults were taken as one full consumption unit, children between 7 and 14 years as three-quarters and those between 2 and 7 years as half a consumption unit.

This hypothesis attempted to reveal in a quantitative way the existence of limited aspirations within a certain more or less homogeneous stratum. As such, this stratum has a limited value but this group of people is numerically very important. Its uniformity can probably be ascribed to the lack of any great differentiation in outlook, its place in the social scale and its educational background <sup>79</sup>.

Some additional quantitative data shed further light on the existence of a target income. As mentioned before, similar detailed cost-accounting data have been collected from a number of Hindustani farms in the Saramacca (10 farm households) and Surinam (40 farm households) districts which comprised the same type of farmers as those found in the analysed stratum from Nickerie.

It is probably no coincidence that the annual net income (farm plus non-farm) per average family <sup>80</sup> in all three locations was between Sf 1250 and Sf 1335, which does not constitute a great variation in range if account is taken of such factors as differences in soils, the cropping pattern, the non-farm opportunities and the distance from the main markets. But what really did constitute a great difference between these locations was the number of labour days worked. To attain this annual net income, workers in Surinam and Saramacca districts worked on the average per year

<sup>79</sup> All farmers had at least one or two years of primary school education but none had any schooling beyond the primary school level and thus could not compete for higher paid jobs.

<sup>80</sup> The average size per family did not vary greatly per district sample.

336 and 303 days, respectively, whereas in Nickerie only 231 days were spent in labour (including self-employment). And yet only in the latter district were there any vacancies on the labour market. Daily wage-rates did not differ significantly between districts.

Although the information given above shows that Nickerie has a surplus labour economy, it is difficult to ascertain its actual nature, not to mention the manner of its mobilisation. The small Hindustani farmers of Surinam are known for their thrift and zest for work, but when they attain a certain income level, the marginal utility of work decreases while the utility of leisure increases.

It was also observed during the course of the field investigation that many of the informants in Nickerie were quite finical in choosing non-farm work. If a farmer/carpenter who had just finished a particular job could not find similar work, he would rather wait than take up some unskilled or semi-skilled job. In Surinam district, with its low productivity for agricultural labour, the urgency to find any kind of additional employment was much greater. A parallel case of even greater poverty was found amongst the Nigerian farmers, where potential workers took up any employment which showed some prospective reward.

Now that the case of Hindustani farmers has been analysed in three districts, it seems possible to determine the shape and position of the indifference curve for each group; the point of contact with the opportunity curve therefore shows the amount of 'income produced' together with a quantitative and apparently desired level of leisure.

An analogous, though less detailed, study was undertaken amongst small Javanese peasant farmers in Saramacca district during the 1966 rice season.

Javanese, like Hindustani, form a rather closed group. This particular community lived close to a large swamp, which, unfortunately, could not be irrigated or even drained. Rice growing thus became a risky business. Apart from swamp land, people had small patches of sandy ridges on which they cultivated ground-nuts. Only few opportunities of work were available outside farming. During 1966 a detailed input-output account was drawn up for rice growing. Owing to physical set-backs a very large quantity of labour had to be used and little leisure was recorded. The agricultural labour productivity was obviously very low. This was clearly reflected in the agricultural wage level; daily wages were, on the average, only two third of what they were among Hindustani in the same district (Saramacca). Apparently, this is a group-determined wage level, which is low because productivity is low as a result of factors beyond the people's ability to change.

These Javanese farmers are faced with an unfavourable production function for rice, a situation not acceptable to their Hindustani neighbours. The Javanese had to make a greater effort to obtain a socially satisfactory income level. This level was nevertheless apparently much lower than that in the surrounding areas which at least have drainage facilities.

It was therefore not surprising to find that the centrifugal forces exerted on this pocket of traditional agriculture were great. This was evident from the age and

family structure, which revealed a considerable number of aged couples, their children having moved away to an economically more viable climate.

## 6.6 A general description of the agricultural labour pattern

### 6.6.1 The division of labour

Work in rice cultivation is carried out by both men and women amongst Hindustani farmers<sup>81</sup> in Surinam. The arrangements for dividing up the labour tasks in agricultural work follow rather well-defined patterns. For instance, the pre-planting operations are the man's task. Most of the rice is transplanted by women and older children, while the heavy work of pulling out the young seedlings from the seed bed is the man's work. What little maintenance and other work is required after transplanting, is performed mostly by the men; harvesting is done by the entire family of adults and grown-up children, while mechanical threshing, bagging and transport is taken care of by adult male members of the household.

In a substantial number of farm families the agricultural operations are so organized that men who have a regular job can continue in it even at peak periods. This often means the employment of a considerable number of paid labourers and helpers. Of the 54 heads of households interviewed, 12 carried on normally with their non-farm occupations during planting and/or harvesting time in 1965 as did 8 sons who were regularly employed. In the majority of cases the planting and harvesting operations were compressed into very short periods, thus enabling those employed in non-farm work to spend their weekends or a short leave in assisting in the operations at home. The success of these arrangements can be attributed to the use of paid labour and the aid given through the institution of reciprocal assistance.

This system of mutual aid (called *hûr* in Hindi) mostly involves grown-up male and female members of the household and is applied mainly in the planting and harvesting of rice. An equivalent work performance is obviously claimed in return. If a certain required effort cannot be achieved in the same agricultural period (say, planting), then this claim is either carried over to the following peak period (harvesting) or the difference is made up by a cash payment.

Often this spreading of work cannot be fully exploited, since, if the rains arrive late, everyone wants to start planting. In the case of rice, this means that the harvesting operations tend to show a similar peak, there being a more or less fixed number of days between planting and subsequent ripening of the crop for each variety<sup>82</sup>. Fear of grain losses forces the farmer to harvest his crop as quickly as possible.

<sup>81</sup> It applies also to the women in Moslim households; 'Purdah' is not observed in Surinam.

<sup>82</sup> The trouble in Nickerie was that nearly all farmers planted the same variety, namely *Skrivimankoti*. In many rice areas of the world this seasonal labour shortage is met by a system of staggered ripening dates. Farmers sow different varieties, the difference involving the length of time necessary for ripening.

For the purpose of this analysis this exchange labour is considered to be part of the family labour, the 'family' here also implying the inclusion of 'neighbours and relatives'.

### 6.6.2 The farming calendar

Periods of idleness alternating with rush activities characterize sawah rice cultivation. In Nickerie the first activity in a new agricultural year consists of dry-season ploughing, which is done shortly after the previous crop has been gathered from the field (end of November, beginning of December) or at the end of the short second rainy season (February, March). The decision depends on the moistness of the soil, as its upper layer has to be quite dry. HASSELBACH and VAN AMSON (1965) have shown that, for the clay soils of the young coastal plains of Surinam, on average, an increase of 300 kg paddy/hectare can be expected when this method of cultivation is applied.

In April and also in May a small seed bed is laid out and prepared in that corner of the field which is nearest to the irrigation canal. Dikes are weeded and irrigation ditches cleaned. In Nickerie the seed bed is usually harrowed by tractor.

In 1965 there was plenty of water in the irrigation reservoir and farmers could make their seed beds in April and at the beginning of May. As a rule, a period of six weeks separates the planting and the transplanting operations. Rains were late in 1965 (third week of May) but, thanks to the early work on the seed beds, transplanting could start at the beginning of June. Before planting, the fields are harrowed once or twice and in several instances levelling is carried out by agricultural machinery.

Some farmers do not make seed beds but broadcast their fields as soon as a reliable continuous supply of rainfall can be expected. This method saves much labour. However, pre-planting preparations have to be quite strict, as otherwise weeds may smother the young rice seedlings.

After planting, just over three months are left before harvesting. In that period some water control, weeding and pest and disease control are carried out. Fertilizers are applied by some farmers either on the seed bed or on the standing crop. These activities are carried out only when deemed useful or necessary by the farmers. On broadcast fields some re-supplying of seedlings has usually to be done and weeding also takes up more labour here than in transplanted rice-fields.

Harvesting is generally done by hand (sickle), after which the paddy is bundled and put on small heaps, to be gathered later into big stacks. In Nickerie, threshing is almost everywhere done with a hired threshing machine which is tractor-operated. The latter task is carried out in one or two days at the most and farmers have to wait their turn. One sample-farmer hired a combine during the 1966 harvest. As the cost-output relation in such a case seems to be quite different from that applying when more conventional techniques are used, this particular farmer had to be excluded from the production function analysis.

In 1966, planting operations were postponed, as there was little water in the

irrigation reservoir. Again, rains did not arrive until the end of May, so that harvesting was once more later than usual. This is clearly brought out in Figure 17, which shows the number of man-days worked per month, on the basis of an area of 100 hectares of small peasant farms.

As is shown in Figure 17, the planting peak in 1965 occurred at the beginning of June, whereas in 1966 it was in July. In 1965, harvesting started at the end of September and it was completed by the end of October. In 1966, however, harvesting was carried out from the second half of October onwards and lasted until well into November; no threshing was done in most cases until the beginning of December. Fortunately for the farmers, the lateness did not adversely affect the yields.

In the field survey the farming operations were noted under the following headings:

R<sub>1</sub>: pre-planting activities (including weeding and maintenance)

R<sub>2</sub>: labour used in planting (including transport of transplanted seedlings)

R<sub>3</sub>: labour used after planting and prior to harvesting (water control, weeding, application of fertilizers, pesticides, etc.)

R<sub>4</sub>: harvesting

R<sub>5</sub>: threshing, including bagging.

In this study the production process was followed up to the moment when the paddy left the farm; hulling, etc., was not included.

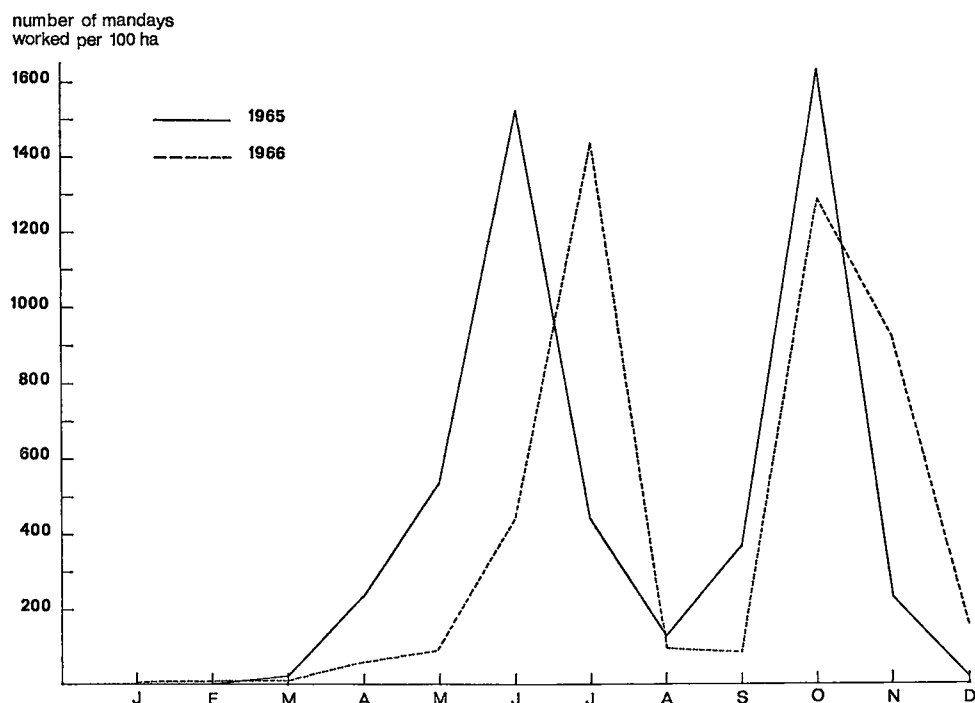


Fig. 17. Monthly labour requirements on smallholders' rice farms (seasons 1965 and 1966).

*Table 21. Number of man-days per hectare employed on various operations.*

	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	R <sub>total</sub>
1965	8	18	4	19	3	52
1966	5	15	3	21	3	47

Table 21, which should be read in connection with Figure 17, gives the number of man-days used for the various operations in 1965 and 1966 per hectare on an average farm. In 1966 the short January wet season failed to appear and rain did not fall until the end of May. Thus, there were no weeds in the field and ditches had become dry. This explains the smaller number of R<sub>1</sub> working days. In 1966 more rice land was broadcast than in the previous year, causing a drop in the average number of planting days recorded (R<sub>2</sub>). On the other hand, the harvest in 1966 was thwarted by large showers of rain which caused lodging in the standing crop, thus necessitating extra labour.

Finally, to give some idea of the importance of paid labour in the rice farming in our sample, Table 22 is presented.

*Table 22. Average number of man-days worked per hectare in rice cultivation.*

	Family labour <sup>1</sup>	Paid labour	Family + paid labour
1965	41	11	52
1966	36	11	47

<sup>1</sup> Including mutual aid.

## 6.7 The productivity of labour in rice cultivation

### 6.7.1 Input-output analysis

After what has been said about the general pattern of agricultural labour it is now possible to proceed to the analysis of the functional relation between inputs and output.

A new feature has been introduced here, in that the observations were made during two successive years, namely in the rice seasons of 1965 and 1966, so that it will be possible to compare labour productivity in both years.

Functions of a linear and curvilinear form were again applied to the farm data. Simple correlations between output and various inputs were high. R<sup>2</sup> was high for functions (5,1) and (5,2), but low for (5,3)<sup>83</sup>. The latter is not surprising, since, in selecting the Surinam samples, the farm size had already been narrowed down to the 2 to 3 hectare class.

<sup>83</sup> See under 5. 5.3.

The final selection was (5,2); which, in the usual notation, can also be written as

$$\mathcal{O}(\underline{y}) = \beta_0 \times x_1^{\beta_1} \times x_2^{\beta_2} \times x_3^{\beta_3} \quad 6,1$$

where  $\underline{y}$  = output (in bags of paddy)

$x_1$  = net area under rice (in hectares)

$x_2$  = labour (in man-days)<sup>84</sup>

$x_3$  = recurrent capital expenditure (in Surinam guilders).

As regards  $x_3$ , a few comments are in order here. Firstly, certain costs such as those for threshing and for transport of the paddy were excluded, as these costs do not determine the rice production but are themselves determined by the level of output and, therefore, should not be included in  $x_3$ . Furthermore, a study of the correlation matrix showed a high intercorrelation between  $\ln x_1$  and  $\ln x_3$  (0.922). A closer scrutiny showed that this was caused by the ploughing costs, which are actually paid on a hectare-basis. As there was little evidence of a varying intensity of ploughing, this cost was dropped from the particular resource category. Ultimately,  $x_3$  consisted of the (imputed) costs of rice seed, fertilizers and pesticides.

The final calculations showed that the problem of multicollinearity had been solved, whereupon a multiple regression was carried out, using the function 6,1. The results for 1965 and 1966 are shown in Table 23.

The partial sample regression coefficients are, with the exception of the estimate of  $\beta_3$  ( $b_3$ ) in 1965, positive and significantly different from zero at the 1 % level of probability; moreover, these positive coefficients are each all smaller than 1.00, indicating diminishing returns to the individual inputs. This means that the actual production process is carried out in the rational stage. As expected, the  $R^2$  values for 1965 and 1966 were highly significant and a large part of the variation in the observed  $y$ -values was explained by using the particular equation concerned.

Table 23. Regression results for rice enterprises in Surinam: 1965 (54 households) and 1966 (50 households).

	Land		Labour		Recurrent expenditure	
	1965	1966	1965	1966	1965	1966
Partial regression coefficient	$b_1 = 0.7470$	$b_1 = 0.5470$	$b_2 = 0.4372$	$b_2 = 0.3417$	$b_3 = -0.0847$	$b_3 = 0.0972$
Standard error	0.1259	0.0866	0.1331	0.0972	0.0444	0.0401
$t$ at, respectively, 50 and 46 degrees of freedom	5.93***	6.32***	3.28***	3.69***	1.90	2.42**

Year	$\Sigma b$	$b_0$	$R^2$
1965	1.0995	2.2203	0.755
1966	0.9859	2.4174	0.915

<sup>84</sup> See footnote 61.

A  $t$  test was used to test the null-hypothesis that constant returns to scale occurred in rice production. In neither case (1965, 1966) could the null-hypothesis be rejected.

Finally, the marginal value productivity of labour was calculated at the geometric mean:

$$\frac{dy}{dx_2} = \frac{b_2}{x_2} y \quad 6.2$$

With  $y$  expressed in bags of paddy, the marginal physical product was multiplied by the average price per bag. Following the same procedure as outlined in Chapter 5, the marginal value product of labour was calculated; it amounted to Sf 3.14 per man-day for 1965 and Sf 3.01 per man-day for 1966.

### 6.7.2 Marginal productivity of labour and the wage level

In the previous section it has been shown that all partial regression coefficients, with the exception of one, were significantly different from zero for the 1965 and 1966 farm data. They all had each a value less than 1.00, indicating that firms are operating in the stage of diminishing returns to the factors of production.

The next procedure is to test the hypothesis that, as regards the application of farm labour, marginal costs equal marginal returns, i.e. that labour is employed up to the point of greatest efficiency.

Therefore, the average market price for agricultural labour has to be taken as the opportunity cost. This posed some problems, as labour remuneration varies somewhat per operation. During transplanting, which is mostly carried out by women and grown-up children, the price for labour is Sf 2.50 to Sf 3.00, while at harvest time the same prices prevail for reaping. During mechanical operations such as threshing and transport which is done by men, labourers working with these machines earn as much as Sf 4.- or Sf 5.- per day. The latter figure is very high, even in comparison with semi-skilled non-farm work. The average earning per day in non-farm work in Nickerie amounted to f 3.60 per day during 1965. By calculating a weighted average for the whole year for agricultural labour one arrives at a figure of f 3.30 per man-day. There were no differences in actual wage levels between the two years.

The ratio  $\frac{\text{marginal value of productivity}}{\text{marginal factor cost}}$  for labour for 1965 and 1966 was found to be 0.952 and 0.912, respectively.

According to equation (5,5) in section 5.5.4, which was used in calculating the variance of labour's marginal productivity, and using STUDENT's  $t$  distribution with 50 and 46 degrees of freedom, respectively, it was found that the null hypothesis, i.e. that labour is applied efficiently, could definitely not be rejected. In fact, the results indicate a rather close agreement between the theoretical and the real values for this particular input. Moreover, the theoretically calculated values for the marginal product did not vary greatly between the two years.

## 7 The use of agricultural labour in economic development

### 7.1 Major obstacles in economic transformation

Chapter 3 discussed the central place of the traditional agricultural sector in an economy with a growing population and fixed land resources. In the final stage of this process the occurrence of disguised unemployment causes *per capita* income to decline, especially when no alternative production possibilities are available. Disguised unemployment, which was defined (under 3.3) as low-productivity employment arising from the need to work shorter or fewer working days, is not confined to agriculture. There are other low labour-income sectors, such as the trades, the crafts and local industry, to which this particular low productivity is also applicable.

The fundamental problem is how to transform a low-labour economy, to which such a large share of the population in these countries is confined, to a high-productivity economy. It requires a major transfer of labour to a burgeoning capitalistic sector, while the agricultural sector is also required, where possible, to contribute to the capital formation for the expanding new sector.

Development strategists, who are at present endeavouring to absorb a larger percentage of the working population in the capitalistic sector, are faced with a number of difficulties which did not occur in the economic development of a number of European and other countries during the 19th Century.

- (1) To start with, the absolute size of the population base is very large in some countries such as China, India, Pakistan, Java and Egypt and in some regions of other countries (Brazil, Nigeria, West Indies). This means that the population density prior to economic development is already large. According to KUZNETS (*op. cit.*), England and Wales, for instance, were relatively 'empty countries' prior to economic development; the total population between 1750 and 1800 was only 7 million.
- (2) The present-day population growth in low-income countries is much larger than it was a century ago in the European countries, where it amounted to only 10 per cent. or less per decade, the only significant exception being England and Wales, where the rate was near to 15 per cent. during the first half of the Nineteenth Century. In low-income countries this growth is at present at least 15 per cent., but more usually between 20 and 30 per cent., per decade. It is conceded that the figures for 19th Century Europe conceal the flow of emigration to the U.S.A. during that period, whereas it should be recognized that the possibilities of emigration are rather negligible for any country nowadays.

- (3) Though late-comers in economic development can draw upon the stock of inventions and innovations developed elsewhere, this is not always to their benefit. Present development in low-income countries follows a pattern of capital-intensive investment which may not be at all suitable for a country with an abundant supply of labour. This also seems to have a bearing on the pattern of foreign aid, since its effect may be to use scarce resources for projects with low social marginal productivity.
- (4) The governments of these low-income nations find it difficult to harness individual or group behaviour for collective action, as there is so little national coherence. The crucial point in the case of Japan seems to have been<sup>85</sup> the existence of a progress-oriented government which was able to mobilize resources for development, combined with the fact that the feeling of social togetherness prevalent amongst the rural inhabitants helped to sustain this government effort. In many low-income countries a basis for such concerted action seems to be completely lacking. In Latin America there is an enormous gap between social classes and in Africa "balkanization" has thrown together a variety of ethnic groups into nations which were arbitrarily formed as a result of arrangements between former colonizers.

As stated earlier, the economic transformation of a low-income country depends on the rate of increase of the non-agricultural sector.<sup>86</sup> This rate is closely bound up with two factors: the initial percentage of the population in the non-agricultural sector and the rate of increase of the total labour force.

As had been demonstrated by DOVRING (1959), both the share and the absolute size of agriculture in the transformation of such an economy remains large in the early development stages.

The actual relationship between the total, the agricultural and the non-agricultural labour force and the initial share of the labour force in either sector can be presented by<sup>87</sup>

$$y = \frac{100x - az}{100 - a}$$

where  $y$  = rate of growth of the agricultural labour force

$x$  = rate of growth of the total labour force

$z$  = rate of growth of the non-agricultural labour force

$a$  = portion of the population employed in the non-agricultural sector.

This may be illustrated with the following example.

Assuming that the labour force in the non-agricultural sector grows faster than the

<sup>85</sup> For a lucid account of the various important elements in Japan's approach to economic development, especially as regards the role of agriculture in it, see JOHNSTON (1966).

<sup>86</sup> In the following arguments, for simplicity's sake, the non-agricultural sector is considered to be identical with the capitalistic sector.

<sup>87</sup> This is a slightly modified form of a formula used by MELLOR (1966, p. 25).

total labour force of a particular country (4% and 2.5%, respectively), then the percentage share of the non-agricultural sector will go up by 1.5%. If 30% of the working population is in non-agricultural employment, then the share of this sector will increase to 30.45% for the particular year. Nevertheless, the actual size of the agricultural sector is growing at a rate of

$$y = \frac{250 - 30 \times 4}{70} = 1.86\% \text{ per year.}$$

Though the sectorial percentage for agriculture decreases, the actual labour force still increases at a sizeable rate. In order to keep the agricultural labour force really constant (a feat which Japan succeeded in accomplishing during more than half a century of economic growth<sup>88</sup>) the country in the above position needs a growth rate for the non-agricultural sector during the initial years of 8%. This high percentage is the minimum to offset the increase in the agricultural population and is hardly realistic. In a country with a highly successful 'take-off' such as Mexico, the rate of increase of the non-farm sector was nearly 4% between 1950 and 1960. The rate of increase in Southern Europe (Italy, Greece) after the war was notably lower (1.5 - 2.5 per cent)<sup>89</sup>.

From the above simple arithmetic, supported by historical records from the richer countries (including Japan), it can be deduced that it is quite impossible to obtain a reduction in the absolute number of workers which depend for their livelihood on the low-income sector, when there is a rather high natural population increase while the proportion employed in the non-capitalistic sector is still large.

The above example resembles the case of India, though the increase in the non-agricultural sector for that country has in fact been lower than 4%. This means that in India between 1 and 2 million workers have now to be absorbed each year in agriculture.

This example clearly demonstrates the importance of the agricultural sector in the early development stages of an economy as the provider of employment opportunities. In these stages a still increasing number of low-income earners have to be absorbed in a sector already bearing the marks of underemployment in the more heavily populated countries or regions.

<sup>88</sup> This was possible because the total population grew at a low rate (0.8-1.3 per cent. per year) during this period.

<sup>89</sup> For an exhaustive discussion of various conditions with hypothetical growth paths see JOHNSTON (1966, pp. 270 ff).

## 7.2 The absorption of labour into the agricultural economy in the early stages of economic growth

The preceding section has shown a critical period during the growth of an economy, especially in densely populated regions, where the position of the agricultural labour force (in terms of *per capita* income) may actually become worse, even with some growth in the non-agricultural sector.

It seems to be impossible to break through this barrier formed by a large population base, a large low-income sector, rapid population growth, a bias towards the use of particular capital services, the absence of a strong, smoothly working governmental bureaucracy and the lack of centripetal forces for moulding national coherence. There are, however, two points in the low-income sector which are noteworthy and which form a starting point for economic development. Firstly, there is the agricultural subsector (which will be discussed below), secondly there is the much neglected segment consisting of family enterprises which concentrate on small-scale trading, crafts, services and industries.

As to the latter, the field studies in Chapters 5 and 6, which were conducted in areas labelled as agricultural regions proper, revealed a surprisingly large incidence of non-farm employment. These two examples from Nigeria and Surinam are by no means isolated cases; though our overall knowledge is rather sketchy in this respect, some other detailed surveys in rural and urban areas point in the same direction (FRAUENDORFER, 1966).

The part-time farmers and self-employed people in (semi-)urban areas deserve greater attention. They may become the instruments of an economic development which is more rapid than that in the overwhelming, often unwieldy peasant sector, especially when the new enterprises are capable of absorbing a relatively large amount of labour. A strategy of decentralized industrial development (including trades, crafts and services) should especially stress the expansion of small and medium-sized enterprises. The conscious emphasis which has been laid on the development of this subsector in Japan during the early planning stage seems to be of importance for other countries as well.

Turning now to the agricultural segment of the low labour-income sector, we should for simplicity distinguish two extreme cases: the 'land-surplus' and the 'labour-surplus' situations. In the rather empty 'land-surplus' countries or regions it is of paramount importance that any development strategy should emphasize the complementarity of new input factors with the abundant land resources.

However, at present the main interest must be focussed on the 'labour-surplus' situations. Here the use of (new) inputs should be based on their complementary character in relation to the abundant labour supply. A case can be made for an agricultural strategy which endorses the introduction of technological changes as a result of research of the yield-increasing type. In this respect the agricultural development of Japan provides an interesting lesson for all heavily populated developing countries. The latter feature was also Japan's fate at the beginning of its development.

The impressive increase in agricultural productivity in Japan, especially during the period 1880-1920, can largely be ascribed to the above-mentioned type of research. JOHNSTON (1951), in retrospect, has put the main emphasis in the Japanese case on the use of fertilizers in combination with the selection and propagation of new varieties which responded most efficiently to heavy doses of fertilizers. OHKAWA and ROSOVSKY (1960), noted the importance of the previous points, but laid the greater emphasis on the improved methods of soil-water management (reclamation, irrigation, drainage) during this country's early development.

The latter type of improvement required governmental help and participation, but the former kind could be made by the farmers themselves with comparatively little capital requirements of their own. The use of better varieties and other inputs could of course never have been accomplished without active government support in the establishment of agricultural research stations and of a well-organized extension and rural credit service. As has been pointed out by GRILICHES (1958), the social returns on agricultural research, when applied to an important and reasonably high valued product, can be quite large in relation to costs. Improvement in the human agent was another important feature in Japan's economic development: agricultural schooling took over 90 per cent. of the combined investment in agricultural research, extension and schooling during the period 1880-1938 (TANG, 1963). The social rate of return to these investments combined was 35 per cent. per year, which is very impressive. Finally, in Japan the development of mechanization, which requires a comparatively larger capital outlay, did not start until much later (after 1920).

A conspicuous feature of technological change in the direction of yield increases per acre may be the increased returns to labour. This is evident from irrigation schemes, but it also applies to the use of new strains, fertilizers and other factors.

At this point mention should be made of an interesting investigation by HERDT and MELLOR (1964). From a comparison of the response of rice to nitrogen between India and the United States the authors conclude that the optimum level of fertilizer application and the financial returns are much lower for Indian conditions than for those in the U.S.A. It appears from their analysis that, in order to farm on a higher, further north-eastwards located production function, a 'bundle' of research inputs is required and that merely an improvement in one facet usually does not greatly improve the situation.

In that respect much can still be expected from agricultural research in developing countries, because shortage of staff and lack of coordination have as yet restricted its achievements. Another point is that expatriates and also local research workers not firmly rooted in low-income agriculture have often attacked the problems from the viewpoint that the prevailing farming system is inferior and thus should be changed, often radically. As has been stressed by EDWARDS (1964, p.7): "It seems more realistic to accept the system as more or less given until possibilities of change have been identified: then research to take advantage of these possibilities can be designed". This often means a departure from the conventional approach of formal experiments on research stations.

As stressed earlier, technological changes resulting from agricultural research should aim at greater labour absorption in a labour-surplus economy. An impressive picture of Japanese farming is given in a structural comparison of Japanese and Indian rice farms by MELLOR (1962a). This analysis was made for similarly sized holdings. This author shows that, as a result of an improved 'bundle' of complementary inputs, the labour output on Japanese farms was 3.8 times higher than that on the Indian farms. Farm operating expenses and the value of fertilizers were nearly 8 times and over 16 times as large per acre on the Japanese farms, respectively. Gross output per acre was nearly ten times that on the Indian holdings.

Apart from technological change, an increase in the absorption of agricultural labour is sometimes found in a better distribution of land resources. Where severe rigidities occur, the promotion of a greater mobility by means of lease and lend arrangements sponsored by the authorities may be the answer. However, such a procedure has many pitfalls in that the redistribution of land holdings as an isolated act does usually not remedy the situation but may even lead to a further deterioration in living conditions.

Farm management surveys from India show that a rather large part of village communities' land may be in the hands of a few persons. As was observed in the Madras study, on these large holdings "inputs are too thinly spread, especially human labour". From a national-economic point of view, under circumstances where food is scarce and underemployment abounds, this seems to be an undesirable state of affairs. However, it is readily conceded that the problems at the local level are in fact not so simple: many factors influence the decision to produce a commodity.

Another possibility lies in a progressive land tax, which may force a big landowner to combine his resources at higher levels of output. In this way it may provide larger employment opportunities for the less favoured members of the community. However, depending on the attitudes and beliefs of traditional societies, such measures may have either a stimulating or a retarding effect on employment opportunities. This has a bearing on demand and availability of new goods and services, which may form a major stimulant for increased production at the expense of leisure<sup>90</sup>.

## 7.3 A strategy for agricultural labour absorption in the areas studied

### 7.3.1 Northern Nigeria

As described under 4.1, an attempt was made to construct a resource allocation model for the peasant farmers studied in Northern Nigeria. Since it was assumed that continuous returns had to be safeguarded, we included the maintenance of soil fertility

<sup>90</sup> For an exhaustive account of public measures for increasing agricultural production by means of increased labour see MELLOR (1966, p. 167 ff.).

in our satisfaction model as a basic, substantial factor. However, it was observed during the field-surveys in the provinces of Katsina and Sokoto during the period 1959-1963 that no allowance was apparently being made within the farming system for this long-term maintenance.

Thus, diminishing returns to labour take two forms. Firstly, on the long term, with an increasing supply of labour less is added per worker to traditional production on limited land in the absence of technological change. Secondly, under the present system of permanent cultivation, a gradually smaller gross output is achieved with the same inputs, as the land receives insufficient manure and/or rest, while deterioration caused by the appalling, omni-present forces of wind, water and sheet erosion is not brought to a stop.

To prevent such diminishing returns, in Northern Nigeria it is still possible to migrate from labour-surplus to land-surplus areas. Even in the heavily populated Katsina Province, there are various degrees of population concentration which induce people to move. This may take the form of either a leap-frog movement over a large distance (say 50-60 miles) or, alternatively, local diffusion. In the latter case people move only from a high to a somewhat lower pressure area over a short distance<sup>91</sup>. However, migration does not present a solution to the long-term problems. Though no accurate data on the population distribution between urban and rural sectors are available (which data may, in any case, be complicated by the phenomenon of part-time farming), it seems reasonable to put the agricultural sector at 80 % for the country's north-western corner of Katsina and Sokoto.

The development of the capitalistic sector should be the paramount, long-term goal for solving the problems of the economic development of the non-capitalistic economy. As demonstrated in 7.1, even with a satisfactory rate of increase in the capitalistic sector, such an economic transformation will be slow.

Evidently, with an increase of at least 2 % per annum of Northern Nigeria's population, and with such a large proportion of the population employed in the agricultural sector, the absolute number of low-income earners can be expected to increase even more in the near future. As an increasing number will have to depend heavily on agriculture for a long time to come, this means that considerable attention has to be paid to the development of this sector.

The question now is, what approach should be used to counter this two-fold threat of further diminishing returns to labour? In attempting to solve this knotty problem we should turn once more to the production function which has been estimated for the area studied.

It is generally accepted that production function estimates can be used for a broad analysis of resource allocation. Such an approach could be an appropriate and useful instrument in economic development, as such an estimate may indicate the direction which measures for enhanced productivity should take. In applying this approach, it is assumed that the actually calculated estimate for the function has a somewhat

<sup>91</sup> *Vide*: GROVE (1957, p. 8) and LUNING (1963a, p. 115).

general validity for similar areas and conditions in Northern Nigeria.

The actual estimate was as follows:

$$\ln \frac{y}{x_1} = 1.916 \times x_1^{0.017} \times \frac{x_2^{0.340}}{x_1} \times \frac{x_3^{0.829}}{x_1}$$

where  $y$  = output (in shillings)

$x_1$  = land (in acres)

$x_2$  = labour (in man-days)

$x_3$  = working capital (in shillings)

This functional expression indicates that on this type of upland farm the marginal productivity of land is very low, but that the marginal productivity of the capital input is quite high. Whereas a 1 per cent. increase in land would raise production by only 0.02 per cent. (other inputs being at their geometric mean level), a similar increase in capital services would raise production by 0.83 per cent. This theoretical conclusion appears to be highly consistent with the actual conditions under which the farm enterprises are operating.

For example, average yields for main crops in the area are conspicuously low. Millet and Guinea corn (sorghum) yield between 600 and 900 lb per acre (unthreshed), ground-nuts 600-900 lb (undecorticated), while the cotton grown in the southern part of the area yields between 150 and 400 lb of lint per acre in an average year.

There seems to be a great potential for research efforts of the yield-increasing type, especially as regards fertilizers. Much research has been carried out in Northern Nigeria on ground-nuts and cotton, but this has sometimes ignored the intricacies of the prevailing farming systems and the difficulties experienced by farmers in the application of new resources. Experiments have been carried out in an 'ideal' environment which hardly reflects local conditions. Thus, it has been observed by the author in the field that, for example, the use of a particular new input (say, a new ground-nut variety) was rarely accompanied by complementary inputs (cultural practices, use of a particular type of fertilizer), which often led to disappointing financial results. Besides, these events may have serious repercussions on the farmer's faith in the extension services. The emphasis should be rather on a 'bundle' of new low-priced inputs, but these should be adapted to the farmer's ways and means.

Another feature, which may well have been connected in the past with certain aspects of colonial policy, is that until recently agricultural research in Northern Nigeria has been focused on cash crops at the expense of food crops. The recently started research on food crops may therefore have the effect of opening up great opportunities, especially when emphasis is laid on a coordinated approach towards a 'bundle' of new inputs. Such a strategy will also result in a greater absorption and a higher productivity of labour, though the semi-arid conditions will still make it necessary to create off-season jobs in areas where dry-season cultivation is not possible. Further development of the present low-income sub-sector, represented by local industry, crafts, etc., ought to receive prime attention.

For these densely populated areas, farm mechanization (i.e. tractorization) does

not seem to be the apparent answer; at present yields per acre and per man are too low to warrant its high cost. Moreover, it will merely be a substitute for the abundant labour resource. In the latter field major emphasis should be placed on the possible improvement of local implements. This will ease the present drudgery of farm work and will enable the farmer to deal more effectively with his weeds, which appear to be a major yield-determining factor. This has clearly been shown in the shape of the labour-time curve (Chapter 5).

The transformation from hoe-farming to cattle-ploughing has been reasonably successful in certain areas of Northern Nigeria (Kano, Katsina). This system has enabled the farmer to cultivate 10-15 acres instead of 4-6 acres as previously. However, in the very densely populated areas, there is great difficulty in finding fodder, and only few farmers in these areas have such a large acreage under cultivation. Agricultural research into the establishment of permanent grassland or financially attractive rotations which include fodder crops have so far not yielded answers to the crucial problem of how to integrate livestock (including draught animals) in the agriculture of the savannahs of West Africa.

### 7.3.2 Surinam

At first sight, for a country with such a small population as Surinam, the obstacles encountered in enlarging the *per capita* income seem to be relatively small, especially in the contemporary aid context. Though Surinam has been the scene of a genuine attempt by her government to promote development planning since about 1950, the country's *per capita* income has not notably improved since that date<sup>92</sup>. An important cause of this stagnant situation seems to have been the large population explosion.

It goes without saying that to obtain an accelerated economic development all possible productive resources must be mobilized. The recent labour recruitment policy for Surinam government services barely covers the traces of an unemployment policy. It seems therefore essential to regard the agricultural sector, which comprises a third of the working population, as something more than just another sector which is eligible for a subsidy hand-out.

Recently, development economists have listed the contributions which the agricultural sector of a low-income country should make to the overall development of such a country.<sup>93</sup> One of these contributions could be dictated by the requirement to meet the increasing demand for food.

In the case of Surinam, the country's staple food, rice, is produced both by large-scale units (the largest of them is the earlier mentioned Wageningen Project) and by small peasant farms. Rice production by the large units has from the start been earmarked for export (Europe, Caribbean); its prospects, in contrast to those of the

<sup>92</sup> For a more detailed analysis of recent agricultural planning in Surinam see KOOL (1964).

<sup>93</sup> For example, NICHOLLS (1963).

other agricultural products of Surinam, have been and still are quite good, especially since the country's association with the EEC. The peasant rice producers have always been looked upon as the providers of rice for Surinam's population; in fact this has been so until recent years.

The question could be raised as to whether the latter sector should still remain the principal provider of rice for local consumption. In our opinion, this should indeed be the case. The following reasons for this can be brought forward:

- (1) For the present rice fields there is no alternative use; abandonment would mean that the land will have to go back to fallow, previously made investments thus being relinquished. The labour which would be released with the land cannot at present be put to a more efficient use in the rural areas. Besides, as was outlined in Chapter 6 (especially section 6.3), the magnetic draw of the country's capital is already being strongly felt. Ultimately a large part of the rural population may therefore be dependent on the Government for relief measures.
- (2) With a growing population and, subsequently, a growing local demand for rice (see Table 24), the rice acreage could be extended, as both land and labour will be available in the rural areas. There are few crops which can compete with rice in the outlying districts, provided that irrigation facilities are present.
- (3) The product of the large-scale rice schemes is standardized and of a good, uniform quality. The latter requirements are much more difficult to achieve in the case of the small-holder's rice. It is obvious that financial losses will occur when the standard quality, which fetches premium prices on the world market, has to be redirected for local consumption.
- (4) Moreover, the world market price for rice is higher than Surinam's market price. Rice exports therefore form an attractive proposition. If the large-scale units increasingly have to provide for local needs, this will amount to a loss of foreign exchange.

It thus can be argued that it will be to the country's advantage if peasant production can satisfy at least the local demand for rice. The trend in peasant rice production related to population growth is clearly discernible from Table 24<sup>94</sup>.

Since a few years, the large-scale schemes have to provide some part of their export product for local consumption. If present trends continue, this will become increasingly the case.

As has been analysed elsewhere (LUNING, 1966b), the lagging-behind of the peasant rice production in comparison with local demand is entirely due to a reduction in the area cultivated and not to a reduction in yield per hectare, as is demonstrated in Table 25.

This decline has taken place particularly in the districts of Surinam and Commewijne; in Nickerie district, on the other hand, there has even been an increase in the area cultivated, as is evident from Table 26.

<sup>94</sup> In order to allow for variability due to climatological factors, annual rice production has been averaged for a 5-year period.

Table 24. *Paddy production on peasant farms and population growth (annual averages per 5-year periods).*

	Average annual production in 1000 kg		Average total population	
1936-40	36,225	(100)	155,000*	(100)
1941-45	37,268	(103)	170,000*	(110)
1946-50	48,981	(135)	195,000*	(126)
1951-55	57,000*	(157)	225,000*	(145)
1956-60	55,090	(152)	260,000*	(168)
1961-65	49,695	(137)	305,000	(197)

\* Estimate.

Table 25. *Average peasant paddy production and average acreage, for two periods.*

	Average annual production in 1000 kg		Average acreage in ha	
1956-60	55,090	(100)	21,170	(100)
1961-65	49,695	( 90)	19,308	( 91)

Table 26. *Average annual peasant rice acreages in hectares, for two periods per district.*

	Districts					Total
	Nickerie	Surinam	Commewijne	Saramacca	Other	
1956-60	6,985 (100)	8,569 (100)	2,700 (100)	2,469 (100)	447	21,170 (100)
1961-65	8,333 (119)	6,126 ( 71)	2,217 ( 82)	2,357 ( 96)	275	19,308 ( 91)

The pattern emerging from this table appears to be connected with the (un-)profitability of rice cultivation. The government-fixed (off-farm) minimum price amounts to 10.5 cents per kilogram of paddy. In times of scarcity the large production units are obliged to step in, so that peasant farmers hardly ever receive more than this minimum level. It was found in cost-accounting studies conducted in various districts that it cost farmers in Nickerie around 8 cents, as compared with an average of 15 cents in Surinam district, to produce one kilogram of paddy, including the imputed family labour costs of Sf 3.- per man-day. This large difference is clearly linked to the possibilities for drainage and irrigation. In a Javanese farming community in Saramacca district rice cultivation had even to be carried out without drainage. There it cost the farmers more than 20 cents to produce as much paddy.

An analysis showed that these differences are due mainly to differences in yields per acre rather than to differences in the quantity and quality of inputs. The unprofitability of rice cultivation in districts such as Surinam, Commewijne and Saramacca has, over the last decade, led to a re-allocation of resources. For the outlying places this has often meant that people have had to move away, as alternative means of employment were not available.

As for our focal interest, the labour absorption in the agricultural economy of Surinam, the following observations are made.

Excluding for the present moment the spectacular developments connected with newly discovered mineral deposits (oil, ores), agriculture can be considered a growth sector next in importance to the present bauxite and plywood industries. Great developments in the small or medium-scale industries supplying the small local market <sup>95</sup> cannot be expected, though they should be encouraged where possible. To limit further the rural influx to Paramaribo and its immediate surroundings, which is at present leading to urban unemployment, the development of a viable agricultural sector could signify an important contribution to overall development, even for such a small country as Surinam.

As for Surinam's agricultural production pattern, in recent years rice has taken 60 per cent of the total cultivated area, has contributed 40 per cent of the total agricultural gross production and is the country's staple food. As such, it surely deserves attention.

From the foregoing it will be evident that an effective labour absorption strategy (i.e. measures to enlarge agricultural labour's productivity) should be two-fold. Development in the older areas of Surinam, Saramacca and Commewijne districts can only be achieved by introducing yield-increasing measures in the form of land improvements. The present lack of irrigation and/or drainage facilities forms the bottleneck to any other type of improvement.

As for Nickerie district, which is in a happier position, it is possible to be more specific if a further analysis is made of the earlier estimated production function, which was as follows (taking the one for 1966):

$$\ln y = 2.418 x_1^{0.5470} \times x_2^{0.3417} \times x_3^{0.0872}$$

In contrast to the findings of the Nigerian sample, the production function for Nickerie district rice farms indicates a high marginal productivity for land and a low one for the capital input. Whereas a 1 per cent. increase in land would raise production by 0.55 per cent. (other inputs being at their geometric mean levels), a similar increase in capital services would lead to an increase of only 0.10 per cent.

This conclusion is in general agreement with actual conditions observed in the field. It would be nonsense to suggest that mechanization should be stopped, but its further development is clearly reaching its ultimate limit. Some yield improvements may still be expected from combined research on improved varieties and fertilizers. Present yields per hectare amount to 3000-4000 kg of paddy, which is, all things considered, not unsatisfactory. However, the major emphasis in this district should be on an increase in land area per farm enterprise <sup>96</sup>.

<sup>95</sup> Because of its small population, the absorption capacity for locally produced commodities is not very large. Moreover, this capacity is further reduced by the various preferences shown by Surinam's ethnic groups.

<sup>96</sup> Whether the development of the agricultural sector in Surinam in general should follow the Mexican example is a debatable point. After the Second World War the large increases in agricultural production in Mexico were achieved by a small number of large-scale, highly commercialized farms. This policy has been followed to some extent in Surinam, but there it appears to lead now to a great social inequality.

The latter seems to be the best strategy for absorbing present labour resources. The introduction of broadcasting and, in particular, the use of 'combine' services have sharply reduced the labour peaks encountered during the critical periods of transplanting and harvesting (see Figure 17 under 6.6.2). An increase in land area can be achieved, firstly, by growing a second rice crop per year and, secondly, by the establishment of new polders. Designs for either strategy already are in an advanced stage of planning. The availability of part-time non-farm jobs forms an important buffer against deterioration in the income position. Wherever farmers have opportunities to become year-round, self-employed 'farm entrepreneurs', this development should be encouraged. Moreover, it can be deduced that in a dynamic, transitional type of society such as that found in Nickerie district the previously encountered 'target-income' will lose any traces of rigidity as time goes by.

## Summary

In low-income countries two sectors can be recognized: the high-income or capitalistic sector and the low labour-income sector.

The latter is of major importance in these countries: it employs the majority of their labour force. The low labour-income sector consists of peasant farmers, small traders and artisans. This study is largely confined to the peasant farmers as theirs is the predominant activity in this sector.

Opposing views on the applicability of economic theory, as developed in the West, to low-income peasant societies have been brought out ever since BOEKE. Recent literature contains similar views. Their main point is that available economic theories do not seem to fit the behavioral motivation, assumed in economic logic. These low-income societies seem to be characterized by the absence of a motive of gain. It is not merely the tenet of profit-maximization which is under attack. The question is raised, for instance, whether marginal analysis is useful for handling problems of allocative efficiency in resource use. This point of view seems to be supported by the apparent conditions of labour redundancy and disguised unemployment in the low labour-income sector.

The main theme of this study is the question: is the productivity of labour a determinant in wage formation and is it possible to treat the remuneration of labour as an economic variable?

Chapter 2 reviews wage theories, as far as they bear the author's concept of peasant farming in a static framework. A more general argument on labour remuneration is instigated through a discussion of the distribution of income.

In Chapter 3 a theoretical structure is presented of the borderline case of under-employment and its impact on the level of remuneration in low-income farming. A Ricardian macro-model does not give a satisfactory approximation. A micro-model is developed, which presents an explanation of the phenomenon of disguised unemployment.

Before relevant hypotheses are worked out, close attention is paid to the basic problems of measurement (Chapter 4). Results of field work, pertaining to the problem under investigation, are presented in Chapters 5 and 6.

Labour productivity is studied for a sample of peasant farms in a heavily populated and rather poorly endowed area in Northern Nigeria. A similar analysis is presented for smallholders in the coastal plains of Surinam, South-America. In the latter case the farm management survey was carried out during two successive years.

The hypothesis that labour's remuneration is in accordance with its productivity is

tested by means of multiple regression analysis. In all cases the null-hypothesis could not be rejected. There is no indication that family labour is used until its marginal productivity is zero.

As for the Surinam smallholders, an investigation has been made to test the hypothesis that farm holders may have a target-income in mind. A 'limited-aspiration' model is found to be consistent with actual conditions.

In both areas of investigation it is found that the typology of 'farmer' is too simple a presentation. A large part of their income is derived from off-farm activities. As regards the alternative use of labour, decisions appear to be made at the margin.

In the final chapter it is shown that in the early stages of economic development (under conditions of large population growth and with a large proportion of the workers in agriculture) a steadily increasing number of low-income earners have to be absorbed in the low-income sector. Hence, the absorption of labour into the agricultural economy is a crucial part of development strategy. For both areas of study such a strategy is designed with the aid of estimated production functions. Specific measures to increase labour's productivity are suggested.

## Samenvatting

*Economische aspecten van de bevolkingslandbouw in ontwikkelingslanden, speciaal met betrekking tot de factor arbeid*

Karakteristiek voor lage-inkomenslanden is het verschijnsel van twee doorgaans scherp gescheiden maatschappelijke sectoren: de kapitalistische of hoge-inkomenssector en de lage-inkomenssector. Deze laatste sector speelt kwantitatief een belangrijke rol: een groot deel van de arbeidskrachten in deze landen vindt hierin werkgelegenheid. In deze sector valt niet alleen de lage-inkomenslandbouw, doch ook de overeenkomstige takken van industrie, nijverheid, diensten en handel behoren hiertoe. De landbouw levert veelal de belangrijkste bron van bestaan, aangezien het landelijke element domineert in deze samenlevingen.

Ten aanzien van deze landen wordt sedert BOEKE betoogd, dat het gebruik van de in het westen ontwikkelde leerstukken der economische theorie bij de bestudering van hun lage-inkomenssector van weinig nut is. Ook in recente literatuur vindt men dergelijke opvattingen terug, waarbij men vooral betwijfelt of het principe van rationaliteit in de betekenis van het verkrijgen van de hoogste netto-opbrengsten of het produceren tegen de minste kosten in het individuele productieproces wel een aanvaardbaar uitgangspunt vormt.

Tegenstanders van één algemene economische theorie wijzen er o.a. op, hoe weinig relevant de leer van de inkomensverdeling is, waar de prijzen der produktiefactoren in concurrerende markten bepaald worden volgens het concept van het marginaal produkt. Het principe, dat bijv. de aanwending van arbeid geschiedt tot het punt waar de marginale factorkosten gelijk zijn aan de waarde van het marginale produkt, lijkt niet houdbaar te zijn onder omstandigheden met belangrijke verborgen werkeloosheid, zoals in de dichtbevolkte landbouwgebieden der lage-inkomenswereld. Is er nog wel van rationeel handelen sprake, als in zulke gevallen nog arbeid wordt ingehuurd? Wordt familie-arbeid aangewend op het bedrijf totdat de marginale arbeidsproductiviteit nul geworden is?

Na de inleiding is in hoofdstuk 2 een samenvatting gegeven van de loontheorieën, die geacht worden betrekking te hebben op de lage-inkomenssituatie; tevens is het vraag- en aanbodsaspect gezien, speciaal met betrekking tot landarbeid. Het centrale theoretische vraagstuk van het gelijktijdig voorkomen van landelijke verborgen werkeloosheid en positieve lonen, en de aanwending van familie-arbeid op het eigen landbouwbedrijf is geanalyseerd in hoofdstuk 3.

Een Ricardiaans macro-model blijkt geen totale verklaring van de werkelijkheid

te geven. Een door de auteur ontwikkeld micro-model (dat tevens een verklaring voor het verschijnsel der verborgen werkeloosheid inhoudt) lijkt daarentegen een betere aansluiting op te leveren.

De hypothese is gesteld dat het marginaliteitsprincipe kan dienen als richtsnoer bij het tot stand komen van de hoogte der arbeidsbeloning, althans op niet te korte termijn bezien. Alvorens tot toetsing van deze hypothese over te gaan is in hoofdstuk 4 een kritische beschouwing gewijd aan de te volgen methoden van onderzoek. Binnen het kader van bruikbare meettechnieken is gekozen voor de methode der produktiefunctie-analyse volgens COBB-DOUGLAS. Produktiviteitsmetingen, speciaal met betrekking tot agrarische arbeid in lage-inkomenslanden, zijn aan de hand van bestaande literatuur kritisch bezien. In de analyse van het eigen materiaal is een microbenaderingswijze gevolgd; het materiaal werd verkregen d.m.v. bedrijfseconomisch onderzoek. Tenslotte zijn de moeilijkheden geschetst die samenhangen met het verzamelen van bedrijfsgegevens in samenlevingen waar het kwantificatie-aspect nog zo weinig geprononceerd is.

In een dichtbevolkt gebied in Noord-Nigeria, waar het Malthusiaanse spookbeeld van overbevolking in de laatste decennia duidelijk naar voren is gekomen, is genoemde hypothese getoetst bij een aantal boeren, die 'traditionele landbouw' bedrijven. In een ander gebied met kleine boerenbedrijven (Nickerie-district, Suriname) is dit gedurende twee jaar bezien bij Hindostaanse rijstverbouwers die in een overgangsstadium tot moderne landbouw verkeren. In beide gebieden is gevonden dat beslissingen ten aanzien van arbeidsaanwending in het landbouwbedrijf op efficiënte wijze geschieden. De waarde van het marginaal produkt van arbeid en de vigerende loonvoet, per mandag, lieten geen significant verschil zien.

Er was geen aanwijzing dat de familie-arbeid wordt aangewend tot het punt waarop de marginale produktiviteit nul of zeer gering is. Voor de Nigeriaanse boeren viel dit af te leiden uit de gedetailleerde arbeidsfilm, opgesplitst in verschillende activiteiten. Voor de Nickeriaanse boeren was er bij nadere bestudering van dit facet een duidelijke indicatie dat er sprake was van een streefinkomen, waarboven de prikkel tot verdere arbeidsinspanning snel afnam. De waarde van het marginaal produkt van arbeid was op dit omslagpunt bepaaldelijk niet nul.

Tevens is in beide gebieden opgemerkt dat de typering 'boer' een te simpele voorstelling van zaken geeft: een aanzienlijk deel van het inkomen werd verkregen buiten het eigen landbouwbedrijf. Er was een duidelijke aanwijzing dat, wat betreft de alternatieve aanwending van arbeid, beslissingen werden genomen aan de marge.

In het slothoofdstuk is erop gewezen dat in die lage-inkomenslanden, waar een groot deel der beroepsbevolking in de landbouwsector emplooi vindt en waar de totale bevolkingsaanwas groot is, het noodzakelijk zal zijn om een toenemende hoeveelheid arbeid in deze sector te plaatsen.

Voor beide studiegebieden werd aan de hand van de geschatte produktiefunctie een aanwijzing gegeven omtrent de te volgen strategie in de absorptie van een in absolute zin toenemende hoeveelheid arbeid, en voor stijgende arbeidsproduktiviteit in de betreffende lage-inkomenssectoren.

## Authors' index

- ABELL, H. C., 80  
ACHARI, T. K. T., 58  
ADELMAN, I., 22  
AMSON, F. W. VAN, 108
- BALDWIN, K. D. S., 83  
BARBER, W. J., 33  
BAUER, P. T., 8, 10, 43, 103  
BERG, E. J., 30  
BHATTACHARJEE, J. P., 10, 13  
BOEKE, J. H., 6, 9, 28  
BOSERUP, E., 34, 73, 74  
BOULDING, K. E., 15  
BREWSTER, J. M., 10  
BUCHANAN, K. M., 69  
BÜRER, M. TH., 96, 97
- CHAYANOV, A., 9  
CHIN, H. E., 91  
CHO, Y. S., 27  
CLARK, C., 35, 52  
CLARK, J. B., 24, 50  
COALE, A. J., 34  
COURNOT, A. A., 25  
CUMPER, G. E., 33
- DALTON, G., 6, 9  
DANDEKAR, V. M., 51  
DEAN, E. R., 54  
DESAI, D. K., 60  
DESPRES, E., 31  
DILLON, J. L., 64  
DOBB, M., 23  
DOUGLAS, P., 25  
DOVRING, F., 114
- ECKAUS, R. S., 52  
EDWARDS, D. T., 117  
ELKAN, W., 30  
ENKE, S., 33, 51
- FARCY, H. DE, 52  
FRAUENDORFER, S. VON, 116  
FEI, J. C. H., 33
- GALETTI, R., 50, 85  
GELDEREN, J. VAN, 13  
GEORGESCU-ROEGEN, N., 52  
GRILICHES, Z., 117  
GROVE, A. T., 119  
GUPTA, S. C., 13
- HAGEN, E. E., 98  
HANSEN, B., 54  
HASSELBACH, O. E., 108  
HASWELL, M. R., 35, 52  
HEADY, E. O., 11, 58, 64  
HELLEINER, G. K., 103  
HERDT, R. W., 117  
HEWITT, W., 97  
HICKS, J. R., 26, 28  
HILL, P., 13  
HOOVER, E. M., 34  
HOPPER, W. D., 54  
HOWARD, L. E., 16, 17  
HUIZENGA, L. H., 94, 103
- JOHNSON, G. L., 64  
JOHNSTON, B. F., 8, 114, 115, 117  
JOOSTEN, J. H. L., 63  
JOSHI, M. C., 44
- KAO, C. H. C., 60  
KEAY, R. W. J., 71  
KENDRICK, J. W., 24  
KEYNES, J. M., 13  
KINDLEBERGER, C. P., 31  
KOOL, R., 99, 121  
KURIAN, J., 44  
KUZNETS, S., 19, 34, 113
- LEIBENSTEIN, H., 27  
LESTER, R. A., 50

- LEWIS, W. A., 5, 7, 12, 33, 35, 51  
 LOSSING BUCK, J., 59  
 LUNING, H. A., 36, 54, 68, 76, 82, 84, 98, 100, 119, 122  
 MACHLUP, F., 50  
 MALTHUS, T. R., 19, 20  
 MANDAL, G. C., 52  
 MANSELL PROTHERO, R., 76  
 MARSHALL, A., 23, 25, 50  
 MARTIN, A., 14  
 MARX, K., 21  
 MATHUR, A., 51  
 MELLOR, J. W., 8, 29, 61, 88, 89, 102, 103, 114, 117, 118  
 MOORE, W. E., 28  
 MUJUMDAR, N. A., 26, 45, 60  
 MUKHERJEE, P. K., 6, 16  
 MUSCAT, R. J., 14  
 MYINT, H., 5  
 NAIR, K., 12, 102  
 NAQVI, S. I., 44  
 NASH, M., 10  
 NICHOLLS, W. H., 121  
 NURKSE, R., 32, 51  
 OHKAWA, K., 117  
 PAGLIN, M., 52  
 PANDAY, R. M. N., 95, 96, 99  
 PEPELASIS, A. A., 61  
 PETTY, W., 8  
 POLANYI, K., 6, 9  
 PUGH, J. C., 69  
 RADHAKRISHNA, D., 63  
 RANIS, G., 33  
 RICARDO, D., 16, 19, 21, 22, 23  
 ROBBINS, L., 10, 28  
 ROBINSON, J., 32  
 ROSENSTEIN-RODAN, P. N., 59, 60  
 ROSOVSKY, H., 117  
 ROTSCCHILD, K. W., 26, 28  
 SALVERDA, W., 94, 103  
 SARKAR, N. K., 51  
 SARMA, Y. S. R., 44  
 SCHULTZ, T. W., 8, 12, 54, 60  
 SCHUMPETER, J. A., 8, 20  
 SEN, A. K., 102  
 SHASTRI, C. P., 33, 48  
 SMITH, A., 19, 20, 21, 22, 28  
 SMITH, M. G., 89  
 SOLOW, R. M., 25  
 SOMBART, W., 9  
 SRINIVASAN, M., 61  
 STEVENS, R. D., 61, 88, 89  
 SURYANARAYANA, K. S., 63  
 TANG, A. M., 117  
 THORNER, D. & A., 35  
 TINTNER, G., 87  
 UPPAL, J. S., 31  
 VRIES, E. DE, 35  
 VRIES, M. DE, 91  
 WARRINER, D., 59  
 WELSCH, D. E., 54, 86  
 WENGEN, G. D. VAN, 54  
 WHETHAM, E. H., 74  
 YAMADA, H., 6  
 YAMEY, B. S., 8, 10, 43  
 YANG, W. Y., 58  
 YOTOPOULOS, P. A., 61

## References

- ABELL, H. C. 1962 The Role of rural women in farm and home life. FAO Socio-economic survey of peasant farming in Northern Nigeria. Zaria. (mimeographed).
- ACHARI, T. K. T. 1965 Resource productivity and optimum resource allocation on a sample of Queensland sugarcane farms. *Indian J. Agric. Econ.* 20 (2): 21-31.
- ADELMAN, I. 1961 Theories of economic growth and development. Stanford.
- ANGLO-FRENCH FORESTRY COMMISSION 1937 Report of the Anglo-French Forestry Commission 1936-'37. Sessional Paper 37 of 1937. Lagos.
- BALDWIN, K. D. S. 1957 The Niger Agricultural Project. Oxford.
- BARBER, W. J. 1961 Disguised unemployment in underdeveloped economies. *Oxford Econ. Papers* 13 (1): 103-15.
- BAUER, P. T. 1954 West African trade. Cambridge.
- BAUER, P. T. and B. S. YAMEY 1959 The economics of underdeveloped countries. Cambridge.
- BERG, E. J. 1961 Backward-sloping labor supply functions in dual economies.- The Africa case. *Quart. J. Econ.* 75: 468-92.
- BHATTACHARJEE, J. P. 1966 Presidential Address, Twenty-fifth conference, Indian Society of Agricultural Economists. *Indian J. Agric. Econ.* 21 (1): 6.
- BOEKE, J. H. 1953 Economics and economic policy of dual societies. New York.
- BOSERUP, E. 1965 The conditions of agricultural growth: The economics of agrarian change under population pressure. London.
- BOULDING, K. E. 1952 Implications for general economics of more realistic theories of the firm. *Am. Econ. Rev.* 42 (2): 35.
- BREWSTER, J. M. 1961 Beliefs, values and economic development. *J. Farm Econ.* 43: 779-96.
- BUCHANAN, K. M. and J. C. PUGH 1955 Land and people in Nigeria. London. Chapter II.
- BÜRER, M. TH. 1956 Het niet-gemechaniseerde rijstbedrijf van 4 ha. *De Surinaamse Landbouw* 4: 170-4.
- CHIN, H. E. 1964 Het nationale inkomen van Suriname. Stichting Planbureau Suriname, Paramaribo. (mimeographed).
- CHO, Y. S. 1963 Disguised unemployment in underdeveloped areas. Berkeley and Los Angeles.
- CLARK, C. and M. R. HASWELL 1964 The economics of subsistence agriculture. London.
- COALE, A. J. and E. M. HOOVER 1958 Population growth and economic development in low-income countries. Princeton. Chapter II.
- CUMPER, G. E. 1963 Lewis' two sector model of development and the theory of wages. *Social and Econ. Studies* 12: 37-50.
- DALTON, G. 1961 Economic theory and primitive society. *Am. Anthropologist* 63: 1-25.

- DALTON, G. 1962 Traditional production in primitive African economies. *Quart. J. Econ.* 76: 360-78.
- DANDEKAR, V. M. 1962 Economic theory and agrarian reform. *Oxford Econ. Papers* 14: 69-79.
- DEAN, E. R. 1965 Economic analysis and African response to price. *J. Farm Econ.* 47: 402-9.
- DESAI, D. K. 1963 Increasing income and production in Indian farming. Bombay.
- DEPARTMENT OF AGRICULTURE, 1966 Landbouwcijfers.  
SURINAM
- DOBB, M. 1948 Wages. Cambridge.
- DOVRING, F. 1959 The share of agriculture in a growing population. *FAO Monthly Bull. Agric. Econ. and Statist.* 8: 1-11.
- ECKAUS, R. S. 1955 Factor proportions in underdeveloped countries. *Am. Econ. Rev.* 45: 539-65.
- EDWARDS, D. T. 1964 A strategy for agricultural research in Jamaica. Univ. of the West Indies. (mimeographed).
- EICHER, C. K. and 1964 Agriculture in economic development. New York.  
L. W. WITT, ed.
- ELKAN, W. 1959 Migrant labour in Africa. An economists' approach. *Am. Econ. Rev.* 49: 188-97.
- ENKE, S. 1962 Economic development with unlimited and limited supplies of labour. *Oxford Econ. Papers* 14: 158-172.
- FRAUENDORFER, S. VON 1966 Part-time farming - A review of world literature. *World Agric. Econ. & Rural Sociol. Abstr.* 8: v-xxxviii.
- GALETTI, R., 1956 Nigerian cocoa farmers. Oxford.  
K. D. S. BALDWIN and  
I. O. DINA
- GELDEREN, J. VAN 1927 Lectures on tropical-colonial economics. Haarlem. Translated in: Indonesian Economics. The Hague. 1961.
- GEORGESCU - ROEGEN, N. 1963 Economic theory and agrarian economics. *Oxford Econ. Papers* 15 (1): 1-40.
- GRILICHES, Z. 1958 Research costs and social returns: Hybrid corn and related innovations. *J. Polit. Econ.* 66: 419-31
- GROVE, A. T. 1957 Land and population in Katsina Province. Government Printer, Kaduna, Northern Nigeria.
- GUPTA, S. C. 1966 Agricultural economics in India. *Intern. J. Agr. Affairs* 5 (1): 1-51.
- HAGEN, E. E. 1962 On the theory of social change. Homewood, Illinois. Chapter 11.
- HANSEN, B. 1966 Marginal productivity wage theory and subsistence wage theory in Egyptian agriculture. *J. Development Studies* 2: 367-407.
- HASSELBACH, O. E. and 1965 A study of pre-seasonal cultivation methods in rice. *Bull. Agric. Res. Stat., Surinam.* 85.  
F. W. VAN AMSON
- HEADY, E. O. 1946 Production functions from a random sample of farms. *J. Farm Econ.* 28: 998.
- HEADY, E. O. 1952 Economics of agricultural production and resource use. Englewood Cliffs. Chapter 14.
- HEADY, E. O. and 1961 Agricultural production functions. Ames, Iowa.  
J. L. DILLON
- HELLEINER, G. K. 1966 Typology in development theory: The land surplus economy (Nigeria). *Food Res. Inst. Studies* 6: 181-94.

- HERDT, R. W. and J. W. MELLOR 1964 The contrasting response of rice to nitrogen. India and the United States. *J. Farm Econ.* 46: 150-60.
- HICKS, J. R. 1963 The theory of wages. London.
- HILL, POLLY 1966 A plea for indigenous economics: The West African example. *Econ. Development and Cultural Change* 15 (1): 10-20.
- HOPPER, W. D. 1965 Allocation efficiency in a traditional Indian agriculture. *J. Farm Econ.* 47: 611-24.
- HOWARD, L. E. 1935 Labour in agriculture. Oxford.
- HUIZENGA, L. H. and W. SALVERDA 1964 Een oriënterend onderzoek naar de wijze van bedrijfsvoering van 50 rijstbouwbedrijven in Nickerie. Wageningen.
- JOHNSON, G. L. 1964 A note on non-conventional inputs and conventional production functions. In: EICHER and WITT (1964): 120.
- JOHNSTON, B. F. 1951 Agricultural productivity and economic development in Japan. *J. Polit. Econ.* 59: 499 seq.
- JOHNSTON, B. F. 1966 Agriculture and economic development: The relevance of the Japanese experience. *Food Res. Inst. Studies* 6: 251-312.
- JOHNSTON, B. F. and J. W. MELLOR 1961 The role of agriculture in economic development. *Am. Econ. Rev.* 51: 566-93.
- JOSHI, M. C. and Y. S. R. SARMA 1965 Some aspects of farm-household relationship. *Agric. Situation in India*, 19: 1007-12.
- KAO, C.H.C., K.R. ANSHEL and C. K. EICHER 1964 Disguised unemployment in agriculture: A survey. In: C.K. EICHER and L. W. WITT (1964): 129-44.
- KEAY, R. W. J. 1959 An outline of Nigerian vegetation. Lagos.
- KENDRICK, J. W. 1961 Productivity trends in the United States. Princeton.
- KINDLEBERGER, C. P. and E. DESPRES 1952 The mechanism for adjustment in international payments - The lessons of postwar experience. *Am. Econ. Rev.* 42: 338.
- KOOL, R. 1964 Agricultural planning in Surinam 1950-1960. An evaluation. Wageningen.
- KUSUM NAIR 1962 Blossoms in the dust. London.
- KUZNETS, S. 1954 Underdeveloped countries and the pre-industrial phase in the advanced countries. *Proceedings of the World Population Conference, 1954*. In: A. N. AGARWALA and S. P. SINGH (eds.): The economics of underdevelopment. Bombay, 1958, pp. 135-53.
- LEIBENSTEIN, H. 1957 The theory of under-employment in backward economies. *J. Polit. Econ.* 65: 91-103.
- LESTER, R. A. 1946 Shortcomings of marginal analysis for wage-employment problems. *Am. Econ. Rev.* 36: 63-82.
- LEWIS, W. A. 1954 Economic development with unlimited supplies of labour. *Manchester School of Econ. and Soc. Stud.*: 139-92.
- LEWIS, W. A. 1955 The theory of economic growth. London. Chapter 2.
- LOSSING BUCK, J. 1930 Chinese farm economy. Chicago.
- LUNING, H. A. 1957 The Shendam Resettlement scheme. Ministry of Natural Resources, Northern Nigeria. (stencilled).
- LUNING, H. A. 1963a An agro-economic survey in Katsina Province, Northern Nigeria. Kaduna.
- LUNING, H. A. 1963b The rural economy in the upper catchment of the Sokoto-Rima Valley. Gusau, Northern Nigeria.
- LUNING, H. A. 1963c An agro-economic survey in the Marumaru-Kasarawa Catchment Area. Gusau, Northern Nigeria.
- LUNING, H. A. 1964 The measurement of labour productivity, a case study. *Neth. J. Agric. Sci.* 12: 281-90.

- LUNING, H. A. 1965 The impact of socio-economic factors on the land tenure pattern in Northern Nigeria. *J. Local Adm. Overseas* 4: 173-82.
- LUNING, H. A. 1966a Farm size, employment and agricultural planning. *De Surinaamse Landbouw* 14: 36-44. Dutch with English summary.
- LUNING, H. A. 1966b Some notes on the place of agriculture in the economic development of Surinam. *De Surinaamse Landbouw* 14: 117-35. Dutch with English summary.
- LUNING, H. A. 1967 Patterns of choice behaviour on peasant farms in Northern Nigeria. *Neth. J. Agric. Sci.* 15: 161-169.
- MACHLUP, F. 1946 Marginal analysis and economic research. *Am. Econ. Rev.* 36: 519-54.
- MANDAL, G. C. 1966 A note on the concept of disguised unemployment with reference to the productivity of farm family labour. *Indian J. Agric. Econ.* 21: 17-22.
- MANSELL PROTHERO, R. 1958 Migrant labour from Sokoto Province, Northern Nigeria. Kaduna.
- MARSHALL, A. 1925 Principles of economics. London.
- MARTIN, A. 1961 Economics and agriculture. London.
- MATHUR, A. 1964 The anatomy of disguised unemployment. *Oxford Econ. Papers* 16: 161-93.
- MELLOR, J. W. 1962a Increasing agricultural production in early stages of economic development: Relationships, problems and prospects. *Indian J. Agric. Econ.* 17(2): 29-46.
- MELLOR, J. W. 1962b The process of agricultural development in low income countries. *J. Farm Econ.* 44: 700-16.
- MELLOR, J. W. 1963 The use and productivity of farm family labour in early stages of agricultural development. *J. Farm Econ.* 45: 517-34.
- MELLOR, J. W. 1966 The economics of agricultural development. Ithaca, New York.
- MELLOR, J. W. and R. D. STEVENS 1956 The average and marginal product of farm labor in under-developed countries. *J. Farm Econ.* 38: 780-91
- MINISTRY OF AGRICULTURE, etc. SURINAM 1960 Second census of agriculture.
- MINISTRY OF FOOD AND AGRICULTURE, NEW DELHI 1957-62 Studies in the economics of farm management. India. UTTAR PRADESH; MADRAS.
- MOORE, W. E. 1955 Labor attitudes toward industrialization in underdeveloped countries. *Am. Econ. Review* 45: 156.
- MUJUMDAR, N. A. 1961 Some problems of under employment. Bombay.
- MUKHERJEE, P. K. 1960 Economic surveys in under-developed countries. New York.
- MUSCAT, R. J. 1966 Development strategy in Thailand. A study of economic growth. New York pp. 96-128.
- MYINT, H. 1967 The economics of the developing countries. London. pp. 43-44.
- NAQVI, S. I. and J. KURIAN 1961 Occupational structure of the villages in East India. *Agric. Situation in India* 16: 108-26.
- NASH, M. 1961 The social context of economic choice in a small society. *Man* 219:186-91.
- NICHOLLS, W. H. 1963 The place of agriculture in economic development. In K. BERILL (ed.): Economic development with special reference to East Asia, pp. 336-71.
- NURKSE, R. 1953 Problems of capital formation in under-developed countries. Oxford.

- OHKAWA, K. and H. ROSOVSKY 1960 The role of agriculture in modern Japanese economic development. *Econ. Developm. and Cultural Change* 9: 43-68.
- PAGLIN, M. 1965 Surplus agricultural labor and development: Facts and theories. *Am. Econ. Review* 55: 815-34.
- PANDAY, R. M. N. 1959 Agriculture in Surinam, 1650-1950. Amsterdam.
- PEPELASIS, A. A. and P. A. YOTOPOULOS 1962 Surplus labour in Greek agriculture, 1953-1960. Athens.
- POLANYI, K., C. ARNESBERG and H. PEARSON (eds.) 1957 Trade and market in the Early Empires. Glencoe.
- RADHAKRISHNA, D. 1964 A study of regional productivities of agricultural inputs. *Ind. J. Agric. Econ.* 19: 238.
- RANIS, G. and J. C. H. FEI 1961 A theory of economic development. *Am. Econ. Review* 51: 533-65.
- RIGARDO, D. 1817 The principals of political economy and taxation. Edition Dent & Sons (1955), London.
- ROBBINS, L. 1950 On the elasticity of demand for income in terms of effort. In: Readings in the theory of income distribution. London.
- ROBBINS, L. 1952 An essay on the nature and significance of economic science. London.
- ROBINSON, J. 1936 Disguised unemployment. *Econ. J.* 46: 225-37.
- ROSENSTEIN-RODAN, P. N. 1943 Problems of industrialization of eastern and south-eastern Europe. *Econ. J.* 53: 201-11.
- ROSENSTEIN-RODAN, P. N. 1957 Disguised unemployment and underemployment in agriculture. *FAO Monthly Bull. Agric. Econ. and Statist.* 6: 1-7.
- ROTSCHILD, K. W. 1954 The theory of wages. Oxford.
- SARKAR, N. K. 1957 A method of estimating surplus labour in peasant agriculture in overpopulated underdeveloped countries. *J. Royal Statist. Soc. A*, 120: 209-14.
- SCHULTZ, T. W. 1956a The economic test in Latin America. New York *Bull. State School Industrial and Labor Relations. Ithaca*, 35.
- SCHULTZ, T. W. 1956b Reflections on agricultural production, output and supply. *J. Farm Econ.* 38: 748-62.
- SCHULTZ, T. W. 1964 Transforming traditional agriculture. New Haven & London.
- SCHULTZ, T. W. 1965 Economic crises in world agriculture. Ann Arbor.
- SCHUMPETER, J. A. 1961 History of economic analysis. London.
- SEMINAR ON COST STUDIES IN AGRICULTURE, INDIA 1961 Report of discussion. Bombay.
- SEN, A. K. 1966 Peasants and dualism with or without surplus labor. *J. Polit. Econ.* 74: 425-50.
- SHASTRI, C. P. 1957 Labor utilization in Indian farming. *J. Farm Econ.* 39: 759-769.
- SMITH, A. 1776 The wealth of nations. Ed. Dent & Sons, 1954, London.
- SMITH, M. G. 1955 The economy of Hausa communities of Zaria, Northern Nigeria. *Colon. Res. Study* 16. London. Chapter 7.
- SOMBART, W. 1916 Der moderne Kapitalismus. München & Leipzig.
- SRINIVASAN, M. 1957 Pattern of employment of hired labour in agriculture in certain villages of Coimbatore Taluk of Madras State. *Indian J. Agric. Econ.* 12: 97-108.
- SURYANARAYANA, K. S. 1958 Resource returns in Telengana farms: A production function study. *Indian J. Agric. Econ.* 13: 20-6.
- TANG, A. M. 1963 Research and education in Japanese agricultural development, 1880-1938. *Econ. Studies Quart. XIII*, quoted in SCHULTZ (1965).
- THORNER, D. and A. 1962 Land and labour in India. Bombay.

- TINTNER, G. 1965 Econometrics. New York.
- UNITED NATIONS 1951 Measures for the economic development of underdeveloped countries. New York.
- UPPAL, J. S. 1965 Disguised agricultural unemployment in an underdeveloped economy - its nature and measurement. University of Minnesota.
- VRIES, M. DE 1965 De landbouwers van Suriname. Paramaribo.
- WARRINER, D. 1939 Economics of peasant farming. Oxford.
- WELSCH, D. E. 1965 Response to economic incentives by Abakaliki rice farmers in Eastern Nigeria. *J. Farm Econ.* 47: 900-14.
- WENGEN, G. D. VAN 1966 De rijstbouw bij de Javanen in Suriname - een veranderend cultuurpatroon. *Nieuwe West-Indische Gids* 45: 67.
- WHETHAM, E. H. 1966 Diminishing returns and agriculture in Northern Nigeria. *J. Agric. Econ.* 17: 151-8.
- YAMADA, H. 1966 Boeke's view of Eastern society - with special reference to his critics - *The Developing Economies*, 4 (3): pp. 334-348.
- YANG, W. Y. 1965 Methods of farm management investigation. FAO, Rome.