

LAND REFORM: ITS IMPACT ON THE
LABOR INTENSITY OF CULTIVATION

Jing-min Lin*

林 敬 民

(作者為本校經濟系客座教授)

摘 要

土地改革於農耕勞動密集度之影響，取決於所得效果與替代效果；前者使投入之勞動量減少，後者使之增加。租佃制度大別有二，即定比地租制與定額地租制。凡土地改革兼具所得與財富重分配目的者，必有所得效果；至替代效果，則唯有涉及定比地租制之土地改革方有之。

如土地無償或低價移轉於前佃戶，但禁止其自由出讓，則如土地改革之受益者為前定比地租佃戶，農耕勞動密集度可增加、不變、或減少，視所得效果與替代效果之相對強度而定；設若受益者為前定額地租佃戶，則因只有所得效果發生作用，農耕之勞動密集度必然下降。凡此皆將影響土地之單位面積產量。

但如土地係按實際價值作價移轉前佃戶，或雖係無償或低價移轉前佃戶，但允許其自由出讓，則土地改革消除定額地租制後，即不致有農耕勞動密集度下降之傾向；而消除定比地租制後，更可提高農耕之勞動密集度。

ABSTRACT

The impact of land reform on the labor intensity of cultivation depends on the operation of two opposing forces: the income and substitution effects. The substitution effect will raise the work effort while the income effect will lower it. There are two major forms of tenancy: the share tenancy and the fixed-rent tenancy. Whichever may be the tenancy system before land reform, the income effect will be generated if an income/wealth redistribution objective is incorporated into the land reform program. As regards the substitution effect, it will occur only if land reform is carried out in a framework of share tenancy, as opposed to fixed-rent tenancy.

* The author is a Senior Lecturer in the Department of Economics and Statistics, National University of Singapore; visiting the Department of Economics, National Chengchi University at the time of submission of this article.

On the assumption that land is distributed free of charge or at reduced prices but is prohibited from resale by land recipients, the labor intensity of cultivation may increase, remain unchanged, or decrease, depending on the relative strength of the income and substitution effects if the land reform is carried out among share-tenants. On the other hand, the labor intensity of cultivation must decrease if such reform is carried out among fixed-rent tenants, because now only an income effect is present. Other things being equal, the output per unit of land will be affected accordingly.

However, if the land recipients are charged the full land prices or are allowed to resell their land freely afterwards if the land has been distributed to them without charges or at reduced prices, the tendency towards decreasing labor intensity of cultivation associated with the abolition of fixed-rent tenancy will be averted. And it will assure that the land will be cultivated more intensively than before land reform if the pre-reform tenancy system is that of share tenancy.

I. Introduction

A common feature of land reform is the redistribution of the estates of large landowners to the incumbent tenants in small units. The policies for collecting the land prices from land recipients differ, however. At one extreme, land is given free to the cultivators; at the other extreme, land recipients are obliged to defray the full land prices plus administrative costs.¹ In the majority of the land reform programs, the concept that land recipients have to pay for the land distributed to them is accepted as a matter of principle; but the land prices and/or terms of payments are regulated by the government so as to keep the beneficiaries' burden as light as possible.

A main economic consequence of land reform is in agricultural production. The present article will examine the impact of land reform on the labor intensity of cultivation as a factor influencing the output per unit of land under various assumptions regarding the pre-reform tenancy systems; the level of payments, relative to the real value of the land acquired, by land recipients; and their rights to dispose of the land after acquisition of the land ownership. The examination will be restricted to the perfectly competitive model and conducted in a partial-equilibrium setting in the sense that the product price and the wage rate can be taken as given. Land reform is defined within the context of this analysis as simply a redistribution of land ownership, corresponding to Warriner's concept of a simple reform [13, p. 119].

Tenancy takes two major forms: the fixed-rent tenancy and the share tenancy systems. Payments by tenants for the use of land consist of a fixed quantity under the former system and a fixed proportion under the latter system of the crop yield (or equivalent cash). The impact of land reform on the labor intensity of cultivation

differs according to the pre-reform tenancy systems.

II. From Share Tenancy to Cultivator Ownership

In the work/leisure decision process, people equalize the marginal utility of income from work with the marginal disutility of the work.² To simplify the analysis, it will be assumed first that all the tenant's income is earned from cultivation in a given parcel of land: In Figure 1, the vertical axis measures the marginal utility and the marginal disutility for the individual,

the horizontal axis measures the output of the land. In a model with land as the fixed input and labor as the only variable input (capital input is ignored for simplicity's sake), the tenant's work effort and hence the disutility of work can be related directly to the total output of the land. MDU is the tenant's marginal disutility curve. It slopes upward for two reasons. First, ignoring the stage of increasing marginal physical returns, the law of diminishing marginal physical returns dictates that as the amount of labor applied to a given plot of land increases, it requires an ever-increasing

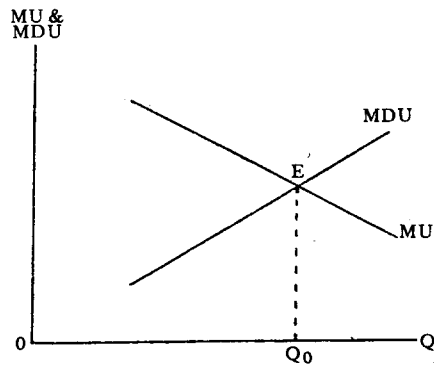


Figure 1

number of units of labor input in order to add one additional unit of output. Second, disutility of work increases at an accelerating rate for every increase of work effort, i.e., increasing marginal disutility of work. MU is the marginal utility curve for the tenant with respect to the total output of the land before land reform. That is, as drawn, the MU curve slopes downward and relates the tenant's marginal utility to the total output of the land rather than the tenant's share of the output or the tenant's income. Given a rental percentage r , the tenant's income is given by the function $Y = (1-r)Q$, where Y and Q stand for the tenant's income and the total output of the land respectively. Let the tenant's total utility function be $TU = F(Y)$, the MU curve in Figure 1 will be represented by the function $MU = (1-r)F'(Q-rQ)$, bearing in mind that while the total utility function relates the tenant's total utility to his income in the usual way, the marginal utility function relates, in the present context, the tenant's marginal utility to the total output of the land rather than his income.³ The intersection of the MU curve and the MDU curve will determine the total output of the land at Q_0 before land reform.

After a land reform that transfers all land to the incumbent tenants free of charge, the marginal utility curve for the cultivator (the former tenant) in question will be represented by the function $MU = F'(Q)$ because now he is permitted to retain all the output of the land and his income and the output of the land are identical. As already noted, the output of the land varies positively with the level of labor inputs. For the purpose of determining the labor incentive effect and so the production effect of the land reform, it is not necessary to construct the entire new curve; it is enough to inquire whether the new marginal utility curve will give the cultivator a marginal utility higher than, equal to, or lower than that before land reform at the pre-reform output level Q_0 ; if it is higher, he will increase his work effort, if it is lower, he will decrease his work effort, if it is the same, he will leave his work effort unchanged. That is, the work effort and hence the total output of the land will increase, remain unchanged, or decrease according as $F'(Q_0)$ is greater than, equal to, or smaller than $(1-r)F'(Q_0-rQ_0)$. These three possibilities will be considered in turn. Consider first the case that $F'(Q_0)$ is greater than $(1-r)F'(Q_0-rQ_0)$. The new marginal utility curve (not shown) will intersect the MDU curve to the right of point E in Figure 1, leading to an equilibrium (this is merely a temporary equilibrium as will be discussed later) with both the levels of output and labor input higher than before reform.

Conversely, if $F'(Q_0)$ is smaller than $(1-r)F'(Q_0-rQ_0)$, the new point of intersection will lie to the left of point E in Figure 1. The total output of the land will decline as a consequence of the decrease in the inputs of labor. This possibility should not be construed as contradicting the argument, in the tradition of the Marshallian marginal analysis, that an owner-cultivator tends to cultivate the land more intensively and hence produce more with a given parcel of land than a share-tenant. The argument that as a share-tenant is converted to an owner-cultivator, he must in all cases cultivate the land more intensively holds true only if a constant real income is assumed. Thus, suppose that a share-tenant has been converted to an owner-cultivator but his real income has been held constant by certain compensating measures, then since now he can retain all the marginal product of labor, his marginal utility of income from work will be higher than the marginal disutility of the work at the original level of work effort. Therefore, he will increase his work effort to produce more. This process of substitution of income for leisure, referred to as substitution effect, will continue until the marginal utility of income from work is once again equal to the marginal disutility of the work. In the case of a land reform by which the land is transferred to the tenant free of charge as has been assumed presently, however, the real income of the cultivator (the former tenant) must

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increase after land reform because now he can retain the amount formerly payable to the landlord as rent. Higher income lowers the marginal utility of income, referred to as income effect. Thus, after land reform, despite the fact that the whole rather than only a part of the marginal product of labor is available to the cultivator, the income effect may so outweigh the substitution effect that his marginal utility corresponding to the pre-reform level of work effort and hence to the pre-reform level of output falls. In other words, to maintain the same level of work effort as before land reform, the marginal utility of income from work will be lower than the marginal disutility of the work. This will result in an adjustment leading to a reduction in the work effort and hence in agricultural production.

Finally, it may so happen that $F'(Q_0)$ equals $(1-r)F'(Q_0-rQ_0)$. The new marginal utility curve will intersect the MDU curve at E, the point of intersection of the MDU curve and the pre-reform marginal utility curve MU. The work effort and hence the total output of the land will remain the same. Thus, after land reform, three outcomes are possible: the labor intensity of cultivation may increase, remain unchanged, or decrease. However, this conclusion holds true only if the land granted free is prohibited from resale by the grantee. If the land can be resold freely later, then after land reform, the labor intensity of cultivation can only increase as will be explained below.

In Figure 2, the vertical axis measures the value of the marginal product of labor, the horizontal axis measures the quantity of labor. AF is the value of the marginal product of labor curve for a given farm, ignoring the stage of increasing marginal physical returns. OW along the vertical axis measures the height of the going wage rate. After a land reform which abolishes tenancy but imposes no restriction on resales of land, optimization dictates that OL_3 of labor be expended on the land so as to equate the value of the

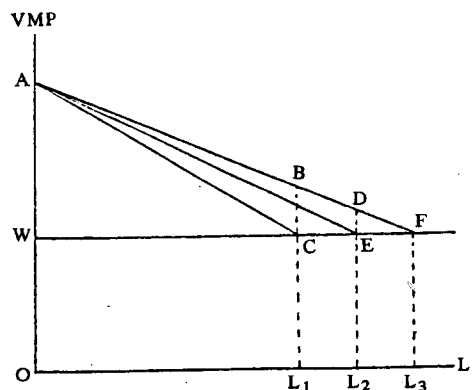


Figure 2

of the marginal product of labor with the going wage rate. With labor as the only cooperating input as has been assumed, the land should command a rental value of WAF, which is the excess of the total output of the land, $OAF L_3$, over the labor cost, $OWFL_3$. In the absence of any expected changes in the land value itself, the capital value of the land can be obtained by capitalizing the rental value. It has been noted above that as a share-tenant is converted to an owner-cultivator, his work effort devoted to

farming may increase, remain unchanged, or decrease. Considering first the case of decreasing work effort, let OL_2 and OL_1 be the amounts of labor expended on the land before and after land reform respectively. Moving along the AF curve, it shows that the total production of the land declines from $OADL_2$ to $OABL_1$. However, where no restriction is imposed on the transfer of land ownership after land reform, this will not be an equilibrium position for the obvious reason that when OL_1 of labor is applied, the value of the marginal product of labor ($= L_1B$) exceeds the going wage rate ($= OW$).⁴ Therefore, further adjustments must ensue.

To simplify the analysis, assume that the production function is linearly homogeneous, i.e., constant returns to scale prevail. Then if resale of land is permissible and the cultivator decides to reduce his work effort to OL_1 , it is to his advantage to sell the L_1L_3/OL_3 portion of the land and reduce his holding to OL_1/OL_3 the original size at the same time. After such adjustment, the value of the marginal product of labor curve in Figure 2 swings to AC. The cultivator's income from farming will be $OACL_1$, while the return on the capital obtained from selling the L_1L_3/OL_3 portion of the land will be CAF .⁵ His total income is thus $OAFCL_1$, which is CBF greater than $OABL_1$, the income that would be earned if the original size of the holding had been maintained. Now the cultivator reduces his work effort by the proportion L_1L_2/OL_2 and the size of his holding by the proportion L_1L_3/OL_3 . Since L_1L_3/OL_3 is greater than L_1L_2/OL_2 , the cultivator must cultivate the remaining portion of the land more intensively than before.

Turn to the case that the cultivator's work effort remains the same after land reform. Let the amount of labor expended on the land both before and after land reform be OL_2 . Again, the cultivator will maintain his holding in its original size only if the land granted free is prohibited from resale by the grantee. If resale is permissible, then following the same reasoning as in the previous case, it is to the advantage of the cultivator to dispose of the L_2L_3/OL_3 portion of the land and expend all the work effort on the remaining land. Referring to Figure 2, to apply OL_2 of labor on the same area of land as before yields a total income of $OADL_2$. To dispose of the L_2L_3/OL_3 portion of the land and apply the same amount of labor as before on the remaining land, the value of the marginal product of labor curve will swing to AE and the income from farming will be $OAEL_2$. Meanwhile, also following the same reasoning as in the previous case, the return on the capital obtained from selling the L_2L_3/OL_3 portion of the land is EAF . These give the cultivator a total income of $OAFEL_2$, which is EDF greater than $OADL_2$, the income that would be earned if the original size of the holding had been maintained. To apply the same amount of labor as before to a plot of land smaller than before, it

again suggests an increase in the labor intensity of cultivation after land reform.

Finally, consider the case that land reform has resulted in an increase in the work effort. However, referring to Figure 2, the increment would never exceed L_2L_3 , OL_2 being the work effort before land reform. The reason is obvious. If the increment of the labor input exceeds L_2L_3 , total labor expended on the land will exceed OL_3 , with the resulting value of the marginal product of labor falling below the going wage rate. Should the cultivator decide to work more than OL_3 , he could do better by devoting OL_3 of labor to cultivation and the remaining portion of the work effort to alternative employments. This is the only occasion that free transfer of land ownership after land reform will not cause the size of the cultivator's land holding to contract. On all other occasions where the increment of the work effort is less than L_2L_3 , adjustment processes similar to those associated with the cases of decreasing work effort and constant work effort noted above will occur and for similar reasons. The results are also similar. The cultivator will contract his farm size so as to equate the value of the marginal product of labor in farming with the going wage rate and sell the excess land. Since the work effort has increased while the farm size either remains unchanged or contracts, the land must be cultivated more intensively than before.

III. From Fixed-Rent Tenancy to Cultivator Ownership

A land reform which transfers land to the incumbent tenants free of charge but prohibits it from resale must necessarily have an adverse effect on the labor intensity of cultivation and hence on agricultural production when carried out in a framework of fixed-rent tenancy. This is because such reform has an income effect only. Fixed-rent tenancy and owner-cultivator arrangements are similar in that the reward for employing additional increments of labor accrues solely to the cultivator. Therefore, the abolition of fixed-rent tenancy does not generate a substitution effect. However, for any given level of the work effort, the gain in the cultivator's income resulting from land reform equals the amount formerly payable as rent. The consequent income effect affects the work effort adversely, thus leading to a decline in output. Figure 1 also illustrates this, except that now $Y = Q - R$, where Y and Q are as defined above and R is the fixed rent, given the total utility function $TU = F(Y)$ as before, the pre-reform marginal utility curve MU will be represented by the function $MU = F'(Q - R)$. After the abolition of tenancy, the marginal utility curve will be represented by the function $MU = F'(Q)$ because now the income of the cultivator (the former tenant) and the total output of the land are identical. Given

the marginal utility decreasing, the new marginal utility curve must give the cultivator a marginal utility lower than before land reform at the pre-reform output level Q_0 . That is, the new marginal utility curve (not shown) will intersect the MDU curve to the left of point E in Figure 1, with the resulting effects on work effort and production as stated above.

Again, the tendency towards a lower level of the labor intensity of cultivation can be prevented by permitting free transfer of land ownership after land reform. In Figure 3, the vertical axis measures the value of the marginal product of labor, the horizontal axis measures the quantity of labor.

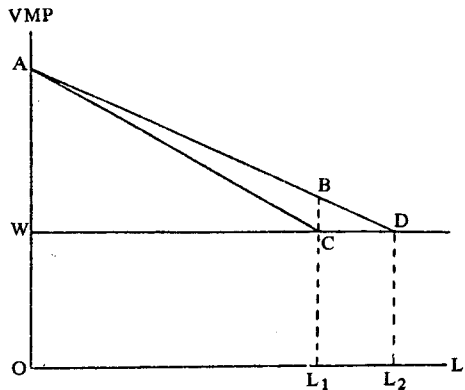


Figure 3

AD is the value of the marginal product of labor curve for a given farm, ignoring the state of increasing marginal physical returns. OW along the vertical axis measures the height of the going wage rate. Let OL_2 be the amount of labor expended on the land before land reform. Then after a land reform which transfers the land to the tenant free of charge but prohibits it from resale, the work effort will decline to, say, OL_1 because of the income effect. Correspondingly, the production declines from $OADL_2$ to $OABL_1$. However, if resale of land is permitted, it will be to the advantage of the cultivator to contract his holding to such size that the value of the marginal product of labor, when OL_1 of labor is applied, equals the going wage rate and sell the excess land. Thus, to continue assuming a linearly homogeneous production function, the cultivator will sell the L_1L_2/OL_2 portion of the land and expend OL_1 of labor on the remaining land. After such adjustment, the value of the marginal product of labor curve will swing to AC. The cultivator's income from farming will be $OACL_1$; the return on the capital obtained from selling the L_1L_2/OL_2 portion of the land will be CAD .⁶ The cultivator's total income is thus $OADCL_1$, which is CBD greater than $OABL_1$, the income that would be earned if the original size of the holding had been maintained. Since the cultivator's work effort and the size of his holding decrease by the same proportion, the land will be cultivated as intensively as before. The tendency towards decreasing labor intensity of cultivation is thus averted.

IV. Some Refinements

Adjustments in the farm size consequent on land reform have been examined above on the assumption first of a share tenancy and then of a fixed-rent tenancy system before land reform. In both cases, however, attention has been confined to the initial adjustments only. The equilibrium positions thus determined are therefore not final. After the initial adjustment, the cultivator will be earning income from invested capital in addition to his income from farming. This must affect the cultivator's marginal utility as a function of the total output of the land. It has been noted above that after land reform, whether the change is from share tenancy or from fixed-rent tenancy to cultivator ownership, but before adjustment of the farm size, the cultivator's marginal utility as a function of the total output of the land is given by the function $MU = F'(Q)$. After the initial downward adjustment of the farm size, however, his marginal utility as a function of the total output of the land will be given by the function $MU = F'(Q + K)$, where K is the return on the capital as represented by the selling price of the portion of the land sold. The marginal utility curve represented by the latter function must lie below the marginal utility curve represented by the former function for any given level of Q . That is, plotted with respect to the marginal utility measured on the vertical axis and the total output of the land measured on the horizontal axis like Figure 1, the marginal utility curve will shift downward to the left as the income from the invested capital is taken into consideration. Meanwhile, recall that the MDU curve in Figure 1 relates the marginal disutility of work to the total output of the land of a given size. As the land holding reduces in size, the MDU curve will rotate upward to the left, corresponding to the rotation of the value of the marginal product of labor curve downward to the left under the same situation noted in Figures 2 and 3 above. The shifting of both the MU curve and the MDU curve thus calls for further contraction of the land holding. After many such iterations the final equilibrium will be found where the following two conditions are satisfied: (1) the value of the marginal product of labor in cultivation is equal to the going wage rate; (2) the marginal utility of the reward for work is equal to the marginal disutility of the work.

As to the level of the labor intensity of cultivation, it must be higher than if free transfer of land is prohibited. The reason is obvious. Where free transfer of land is prohibited after land reform, the labor intensity of cultivation, as already noted, will fall short of the level at which the equality of the value of the marginal product of labor and the going wage rate is achieved (apart from the exceptional case where, as noted earlier, contraction of farm size does not take place anyway,

whether there is the restriction on land resales or not). On the other hand, if free transfer of land is permissible, all land will be cultivated until the value of the marginal product of labor is equal to the going wage rate. Though the former tenants may reduce their work efforts in farming, they will reduce the sizes of their land holdings by a greater proportion or by the same proportion, according as whether they were formerly share-tenants or fixed-rent tenants. Therefore, the level of the labor intensity of cultivation can only either be higher than or remain the same as before land reform, thus ruling out the possibility that land may be cultivated less intensively after land reform.

Furthermore, the above analysis has proceeded on the assumption that land is given free to incumbent tenants in land reform. An outright free distribution of land is probably rare with a market economy. However, the cases that the implementation of the reform is such that the land recipients actually acquire their land at much reduced prices are common.⁷ Since in such cases land recipients obtain land at reduced costs rather than without charges, the income effect is weakened but not eliminated. Therefore, the above analysis and reasoning still apply, though now the income effect is weaker. Charging land recipients the full land prices would completely eliminate the income effect. However, as noted in the opening paragraph, the income/wealth redistribution objectives tend to be incorporated into the land reform program in the majority of cases.

V. Conclusions

The impact of land reform on agricultural production involves multiple dimensions. Thus, to illustrate, a land reform which results in the transfer of land from large properties into small ownership gives rise to the problem of returns to scale.⁸ Changes in structure from tenancy to cultivator ownership would have a positive effect on rural capital formation as they give incentives for land improvements. On the other hand, if the cultivators have lower marginal propensities to save than the original landowners, the effect would be a decrease in aggregate rural savings. All such economic and institutional factors must be taken into account in order to give a proper assessment of the production effect of land reform. However, the fact that the labor intensity of cultivation is among the most important factors determining the output per unit of land justifies the rigorous examination given to it in this article.

The impact of land reform on the labor intensity of cultivation depends on the operation of two opposing forces: the income effect and the substitution effect.

The substitution effect raises the work effort while the income effect lowers it. Wherever a land reform program incorporates in it an income/wealth redistribution objective, the income effect will be generated. As regards the substitution effect, it will occur only if the reform has effected a transfer of land ownership to cultivators formerly under share tenancy.⁹ On the assumption that land is distributed free of charge or at reduced prices but is prohibited from resale by land recipients in land reform, then the labor intensity of cultivation and therefore, other things given, the output per unit of land may increase, remain unchanged, or decrease, depending on the relative strength of the income and substitution effects, if the reform is carried out among share-tenants. On the other hand, the labor intensity of cultivation must decrease if such reform is carried out among fixed-rent tenants, because now only an income effect is present. The output per unit of land will be correspondingly lower, other things given. The differences in outcomes arise from the fact that any hopes for output gains per unit of land after reform are associated with the removal of distortions which characterize the pre-reform tenancy systems. In terms of the Pareto optimality, the marginal condition for product substitution fails as between leisure and agricultural product under share tenancy but not under fixed-rent tenancy. This is because the equality between the marginal rate of transformation in production and the marginal rate of substitution in consumption with respect to leisure and agricultural product is destroyed under the former but not under the latter systems.¹⁰ Therefore, the conversion from share tenancy to cultivator ownership in land reform leads to an improvement in allocative efficiency, which counteracts the unfavorable income effect on production. Fixed-rent tenancy and cultivator ownership are similar in that they both achieve allocative efficiency. The abolition of fixed-rent tenancy, by and in itself, does not improve allocative efficiency.

However, by charging the land recipients the full land prices or by allowing them to resell their land freely afterwards if the land has been distributed without charges or at reduced prices, the tendency towards decreasing labor intensity of cultivation associated with the abolition of fixed-rent tenancy will be averted. And it will assure that the land will be cultivated more intensively than before land reform if the pre-reform tenancy system is that of share tenancy.

Notes

1. These two extremes are exemplified by the land reforms in the pre-communist South Vietnam and in Brazil, respectively. See [10, pp. 174, 177].

2. It is not necessary for the purpose of the present argument to assume that work is painful. To assume that the pleasure of work is outweighed by the opportunity pleasure of leisure will give the same result.
3. Noting that the marginal utility function as used in the present context relates the tenant's marginal utility to the total output of the land, Q , it follows that

$$MU = \frac{dTU}{dQ} = \frac{dTU}{dY} \cdot \frac{dY}{dQ} = F'(Y) \frac{dY}{dQ}$$

Substituting $Y = (1-r)Q$ into the above equation,

$$MU = (1-r)F'(Q-rQ)$$

This proves the result given in the text.

4. In Figure 2, the value of the marginal product of labor L_2D also exceeds the going wage rate OW when OL_2 of labor is applied before land reform. That is explicable by the existence of share tenancy. The share-tenant equates his share of the value of the marginal product of labor with the going wage rate, i.e., $L_2D(1-r) = W$ or $L_2D = \frac{W}{1-r}$, where W and r are the going wage rate and the rental percentage, respectively.
5. To prove, first note that CAF is in fact the rent for the portion of the land sold. As shown in Figure 2, OL_1 of labor combined with the OL_1/OL_3 portion of the land yields an income of $OACL_1$ from farming; OL_3 of labor combined with the whole land yields an income of $O AFL_3$ from farming. The difference between these two amounts is measured by $L_1CAF L_3$, which represents the income that would be earned from farming by combining L_1L_3 of labor with the L_1L_3/OL_3 portion of the land. $L_1CAF L_3$ consists of two parts: L_1CFL_3 and CAF . The first part is the return to labor L_1L_3 . It follows that CAF is the return to the L_1L_3/OL_3 portion of the land or the rent for the portion of the land sold. It has been noted in the text that the capital value of land can be computed as the capitalized value of its rental value. Further, since in equilibrium, investments in any assets yield the same rate of return, ignoring differentials owing to differences in risk and cost of management, it will then assure that the return on the capital obtained from the sale of the L_1L_3/OL_3 portion of the land and the rent accruing to that portion of the land are equal.
6. The proof is analogous to that given in Note 5.
7. For example, in the 1946 land reform in Japan, it was arranged for cultivators to pay for land which they purchased by means of long-term installments. However, rapid currency inflation had so eroded the real value of the purchase prices that the cultivators virtually obtained their land almost free. See [12]. Another example is the 1953 land-to-the-tiller program in Taiwan. The landowners received compensations according to the market prices of tenanted land in the land reform. However, the land-to-the-tiller program was preceded by a farm rent reduction program which had depressed the prices of tenanted land almost by one half as was evidenced by a price difference of about one hectare of owner-operated land to two hectares of tenant-operated land. See [9, pp. 314-5].
8. Cline contends that the economies-of-scale argument against land reform has little merit in the developing countries. The primary reason to expect scale economies would be that minimum areas are required to utilize certain farm machines. However, he asserts, in a labor surplus context, these machines are not likely to be profitable at appropriate exchange rate,

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capital and product prices, and more so if labor is shadow-priced. Even if they are profitable, these machines can be supplied on a custom service basis, so that their availability need not depend on farm size. See [6, p. 144]. In an empirical study undertaken in Brazil, it was found that constant returns to scale indeed prevailed in agricultural production. See [4].

9. For theoretical completeness, it will be added that a reduction in the rental percentage without transfer of land ownership to share-tenants has a similar though weaker effect.
10. A theory has been advanced by Cheung and Hsiao, in their respective articles, that in a competitive land-leasing market, distortions in marginal conditions do not exist even under share tenancy. The theory is based on the assumption that it is practicable to include in the share contract a provision regarding the intensity of use of labor in cultivation and enforce it. See [5, pp. 27-9, 51-5] [8]. This possibility has indeed been allowed for by Marshall as he notes that if the landlord can freely arrange the amount of labor supplied by the tenant under share tenancy, he will so adjust it as to force the tenant to cultivate the land just as intensively as he would under fixed-rent tenancy. See [11, p. 536]. Where the tenant labor is not fully controllable by the landlord, as appears to be typical the case, however, the allocative inefficiency associated with share tenancy as noted in the text must necessarily result.

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