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Also, the calories derived from prepared foods are not included in our analysis. The norm set up by the NAC may vary according to climate and the activities of the people. An individual may take more than the required norm in one day and less than the norm in another day. But the norm of the NAC represents an average measure for a rational consumer to keep him just normal. The entire analysis is based on mean expenditure level and mean commodity consumption and not on individual consumption. To assist the planners and to have a general view of the prevailing calorie deficiency among the States, this kind of analysis may be a better one than the analysis based on each individual's requirement and deficiency, which will consume more time and energy. Thus the results of this study should be valued accordingly. Despite these limitations, the method of finding the calorie distribution through the calorie elasticity is superior to other methods in the sense that given the total expenditure level, the calorie consumption at that level can immediately be worked out without much difficulty.

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A NOTE ON THE PRACTICE OF STANDARDISATION OF LAND IN FARM PRODUCTION FUNCTION STUDIES

It is usual for researchers estimating farm production functions to measure land in standardised units—often with the help of data on land revenue—to allow for the varying quality of land over the sample of farms. The purpose of this note is to suggest that, while it is important in such studies to take into account the quality variable, the device of standardised land is not necessarily the best way of introducing the variable in the production function. Standardised land is a composite variable, changes in whose value can arise either through change in quality of land or change in the quantum or a combination of the two changes. Since the use of a composite variable entails loss of information about the separate influence of the components comprised in it, it is obviously a good research strategy to employ composite variables only in situations where the component variables are incapable of independent variation or, in practice, display high inter-correlations among themselves. It is doubtful that the current practice of standardisation of land conforms to this principle since it would not seem usual for it to be preceded by a consideration of the extent of correlation existing between land and the chosen index of quality. Our impression, in fact, is that the practice derives not so much from an explicit consideration of alternative procedures as from a general feeling that it is inappropriate to measure land in ordinary acres without any thought being given at all to the dimension of quality. It is only fair to add that rules of thumb are indispensable in empirical investigations and that a researcher seeking to settle every methodological issue to his

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satisfaction would, assuredly, wander all over without reaching anywhere. At the same time, it would be a healthy practice to look once in a while into the logic of the prevailing rules of thumb, particularly those having the weight of established usage behind them.

To focus the discussion on the main point of this note and to simplify matters, it is assumed below that the farm production function has the Cobb-Douglas form and that the only inputs to be considered are land and its quality. Let us start with the proposition that the true model of the production function is :

$$O' = A' + a_1 r' + a_2 L' + e' \quad .. \quad .. \quad .. \quad (1)$$

where O = output, r = index of quality, L = land measured in ordinary acres, A, a_1, a_2 are the parameters, e is the disturbance term and the primes indicate the logarithms. It is assumed that r, the index of quality, is defined in such a way that the standardised land is obtained as a product of r and L.

When the production function is estimated with only L as an input it involves the specification error of omission of a relevant variable, *viz.*, r, and the results of estimation will reflect not the true model but the model affected by the specification error as shown below :

$$O' = B' + bL' + u' \quad .. \quad .. \quad .. \quad .. \quad (2)$$

This equation indicates that the omission of a relevant variable would affect the parameters as well as the disturbance terms of the true model; these effects can be investigated with the Theil-Griliches device of auxiliary regression of r' on L'. In particular, it will usually be true for the case under consideration that the parameter b obtained from equation (2) will be lower in value than the true parameter of land, a_2 obtained from equation (1). This, as is well-known, is one of the reasons for the frequently observed decline in the productivity of ordinary acre along with the increase in the size of holding.

More interestingly, replacement of land measured in ordinary acres (L) by standardised land (r L) does not help in removing the specification error implied in equation (2). With the standardised land, the equation estimated refers not to the true model but to the model shown below :

$$O' = C' + c\,(r' + L') + W' \quad .. \quad .. \quad .. \quad (3)$$

In other words, estimating the production function with standardised land amounts to imposing an *a priori* constraint on the true model that $a_1 = a_2$. Since the imposition of such untested constraints is also in the nature of a specification error, we use different symbols for parameters and the disturbance term to distinguish equation (3) from equation (1). It may be tempting to believe that this specification error is less damaging in its consequences than the outright omission of r implied in equation (2). It is

not our intention here to go into the large and intriguing question of whether the specification errors in regression are capable of being ranked uniquely and meaningfully in terms of their consequences. It is enough for the purpose of this note to make the following three fairly obvious points. First, the current practice of using standardised land amounts, in effect, to choosing equation (3) in preference to equation (2) without taking into account the possibility of the more general equation (1) being the true model. Second, there would not appear to be any intuitively plausible grounds to assume beforehand the same output-elasticity for the quality and quantum of land which is implied by the constraint $a_1 = a_2$; in fact, put in this explicit manner, the assumption underlying standardisation of land should serve to alert the researcher to the weak basis on which the current practice rests. Third, and more important, once the researcher obtains data on quality of land and is in a position to construct an index of quality—which is implied when the researcher takes recourse to standardisation of land—, it is obviously a better strategy for him to try out equation (1) in the first instance and to settle for equation (3) if the correlation between r′ and L′ tends to be high or, for some inscrutable reason, the empirical results consistently conform to the constraints implied in equation (3).

Before concluding this note, it is necessary to mention that equation (1) treats quality of land as a unidimensional entity which it hardly is. In this sense, equation (1) is no more than a half-way house between equation (3) and a fuller and more informative analysis of the influence of quality of land on production. The progress in the latter direction would be helped by decomposition of the quality variable into analytically distinct components. A fruitful basis for distinction is that between the man-made component built up through investment of material and labour inputs and the "land" component consisting of the inherent and nature-given properties of the soil. It would seem to be true as a broad proposition that the man-made component gains in weight along with technological change in agriculture and modernization of farming. It would be best to take this component out of the quality variable to treat it as an item of farm capital. As regards the "land" component, a sound approach may be to try to estimate separate production functions for the major types of land found in a village or a group of villages. This would be particularly true of the crop-specific production functions which could better reflect the production process than the whole-farm functions and which could utilize the individual plots within a farm as units of observation. Thus, paradoxically, the ability of a researcher to do without an explicit variable for quality of land may be a good measure of the adequacy of his treatment of this important dimension in the production process.

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