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EVALUATION OF THE EFFICIENCY OF RESOURCE USE ON FARMS AND THE WELFARE OF FARM PEOPLE

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Studies evaluating efficiency of resource use on farms and farmer welfare have commonly failed to specify the precise nature of problems often described in terms such as 'low-income'. Hence superior, alternative welfare and resource use positions, of interest to the policy formulator, are inadequately specified. Additionally, criteria used in these studies have often been invalid or inappropriate. This paper examines the theoretical and operational bases of efficiency and welfare criteria.

Introduction

The terms 'high-cost', 'marginal', 'low-income', 'inefficient', 'non-viable' and others have appeared frequently in Australian economic literature over the last two decades as descriptions of the economic status of individual farm firms. Such terms fail to specify the precise nature of problems to which they obviously refer.

The principal objective of this paper is to examine the theoretical and operational criteria by which the efficiency of resource use on farms and farmer welfare are evaluated. Precise specification of problem situations and superior, alternative resource use and welfare positions will assist in the formulation of policies to rectify the problems.

Theoretical Bases of Concepts of Efficiency and Welfare

The two important sets of standards for evaluating, firstly farm resource use and, secondly, farmer welfare, are derived from propositions which have foundations in the theory of welfare economics. The propositions are concerned with the maximising of social welfare. They yield two interdependent conditions which identify an 'ideal' allocation of national resources.¹

The first condition is that factors of production be optimally allocated to maximise the social value of the total product. There will, in general, be many ways in which factors in an economy can be allocated such that the social value of the total product cannot be increased. Each of these Pareto optima will be associated with a different distribution of welfare.

The second condition therefore is that welfare be satisfactorily distributed. If alternative distributions of welfare could be ranked, the one

* This paper developed from work done while at the University of New England. The guidance of Associate Professor W. F. Musgrave is thankfully acknowledged. John Phillips and R. A. Powell made helpful comments on an earlier draft.

¹ See Mishan, E. J., 'A Survey of Welfare Economics, 1939-59', in *Surveys of Economic Theory, Volume 1*, London: Macmillan, 1965, pp. 154-222.

which yields the greatest social welfare could be selected. The optimal allocation of factors which produces the ideal distribution would then be identified.

The theory of welfare economics has shown that attainment of a Pareto optimum, is ' . . . contingent upon the fulfilment of a single rule . . . requiring that the value, at the margin, of any class of factor be the same in all occupations in which it is used'.² This rule ' . . . should be interpreted to include non-pecuniary activities, in particular leisure, among the alternative occupations open, without constraint, to the factor owner'.³ This rule must be further modified to allow for the preferences of individual factor owners for different occupations.⁴ While the notion of allocative efficiency is well defined in economic theory and has widely accepted conditions for its attainment, the concept of an optimum distribution of welfare yields no similar formula. Contributors to the theory of welfare economics have been unsuccessful in devising a rule by which the many alternative distributions of welfare may be ranked. In practice, therefore, without an optimising criterion or a knowledge of all the feasible alternative welfare distributions no more can usually be said than that a particular distribution of welfare is more desirable than another.

Obviously an optimal allocation of resources does not necessarily mean a satisfactory distribution of welfare in the static context of theoretical welfare economics. Nor does an unsatisfactory distribution of welfare necessarily mean a sub-optimal allocation of resources. An optimal allocation of resources results only in a summit point, a Pareto optimum. It is a first order condition for maximum social welfare which also requires the second order condition that the summit represent a satisfactory distribution of welfare.

It is commonly inferred that instances of unsatisfactory welfare in agriculture mean that the resources involved are inefficiently employed; hence that satisfactory welfare could be attained if the resources were efficiently employed. This inference presumes the quite specific situation in which optimal allocation of resources simultaneously results in the desired distribution of welfare. It has been shown in the specific context of static welfare economics that optimal allocation of resources is not a sufficient condition for satisfactory welfare. This can also be shown for the dynamic real world.

In the dynamic real world with change and uncertainty, individuals are liable to make decisions about investing capital and about acquiring skills and preferences for occupations, which changing events do not justify. Capital losses and reduced returns to skills are incurred despite any efforts to re-employ resources most efficiently. Society may consider that some of these capital losses are inequitable.⁵ Also, it might consider that tangible and intangible costs of re-location and re-employment and difficulties in commanding new employment are too great to allow some individuals to attain an acceptable welfare status.

Thus, in dynamic situations the welfare of some people can fall below community welfare standards even when resources are efficiently em-

² *ibid.*, p. 163.

³ *ibid.*, p. 165.

⁴ *ibid.*, p. 166.

⁵ The argument by Schultz for compensating capital losses is discussed later.

ployed. Policy objectives can be the improvement of the welfare of these people who are, nonetheless, making best use of their resources. Of course in many situations of unsatisfactory welfare it can be that improvements in welfare *are* attainable through more efficient use of resources. The improvements may not, however, be sufficient for welfare to reach satisfactory levels in all such situations.

The main point in this discussion is that a problem of unsatisfactory welfare need not necessarily mean inefficient resource use so that measures to correct welfare problems can be essentially different to the measures required to correct efficiency problems. Descriptions such as 'low income' fail to make the distinction between efficiency and welfare problems and hence do not adequately define the nature of the problem they describe. If policies are to be tailored to deal with specific problems, more accurate and specific problem definition is essential.

Next, operational criteria for evaluating efficiency and welfare are examined.

Deriving Income Standards from Concepts of Efficiency and Welfare

For operational purposes, the conditions for optimal allocation of resources and satisfactory welfare are customarily expressed in terms of income. That is, it is usually accepted that the value of a factor can be measured by the market value of the factor product. It follows that changes in resource use which increase income are improvements in resource allocation. Efficiency standards are, conventionally, the highest earnings possible for each unit of each resource.

Inability to rank alternative distributions of income which would result from non Pareto-better changes in resource use means that no single distribution or income level can be nominated as ideal. Despite this, it is accepted that individuals should have the opportunity of commanding at least some minimum level of purchasing power, even if transfer payments are required to achieve this. However the appropriate minimum level for welfare standards remains contentious.

In empirical analysis the income standards for judging efficiency and welfare need not coincide. The standards used in investigations of efficiency will usually measure whether a Pareto-better use can be made of resources, i.e. given the existing distribution of income. Welfare standards will be the levels of income received if income distribution is 'satisfactory'. Achievement of 'satisfactory' welfare may require non Pareto-better resource use.

Deficiencies of Income Standards

Conceptual problems associated with the use of income standards have been recognized in the literature at various times. Nevertheless, judgements of resource use efficiency and farmer welfare are frequently made without recognition of these difficulties, and a brief review of them seems worthwhile.

Price as a Measure of Social Value

The monetary returns for products can be imperfect measures of their social value. For example, subsidies paid on products can result in the divergence of the market value product and the social value product of resources.

Despite such divergences efficiency analysis using monetary standards can still be useful. Frequently main interest will lie in the success with which resources have responded to market signals. In this context, distortion of market signals is a separate and distinct issue.

The Neglect of Non-pecuniary Considerations

The non-pecuniary conditions for allocative efficiency invalidate, in theory, the use of income standards for efficiency and welfare evaluation unless values are placed on preferences for leisure and occupation. Certainly the criterion of maximization of income completely overlooks non-pecuniary values. These values are an integral part of the conditions for allocative efficiency and satisfactory welfare yet frequently are not recognized. Occupational preference is sometimes acknowledged as impinging on resource allocation but the inference is usually that it is an impediment to optimal resource allocation.

Disregard of non-pecuniary influences could lead to specification of welfare and efficiency problems which do not in fact, exist. Factor owners may not seek to maximize monetary income and hence may not attain, by intention, so called efficiency or welfare standards.

Conversely, in situations where higher incomes are available to individuals who do, in fact, suffer a welfare disadvantage, disregard of non-pecuniary components of welfare can cause mis-specification of solutions to the welfare problem. If higher incomes are available only with a change in employment or location then strong attachment to present positions could mean that the individuals would not be better off in the alternative positions.⁶

Differences Between Monetary Income and Real Income

The variable relationship between real and monetary incomes in different employment situations is widely recognized in investigations of the comparative welfare of rural and urban populations.⁷ Surprisingly few studies have considered this variable relationship in establishing efficiency standards. Indeed, in some studies, researchers have made allowances for the variable relationship when comparing farm with non-farm family welfare but have not considered it relevant to questions of resource use efficiency.⁸ Unadjusted monetary returns remain the most commonly used standards for judging the efficiency with which resources are allocated between alternative employment situations.

Changes in the Capital Value of Assets

In judgements of resource use efficiency and welfare, Hathaway⁹ has

⁶ Tweeten, Luther G., 'Theories Explaining the Persistence of Low Resource Returns in a Growing Farm Economy', *Amer. J. Agric. Econ.*, 51(4): 798-817, 1969, p. 804.

⁷ The two main issues in these investigations have been firstly, the goods and services not included in monetary income in different employment situations and secondly, differences in the quantity of goods and services which equal money incomes will purchase. See for example: Davidson, B. R., 'Welfare and Economic Aspects of Farm Size Adjustment in Australian Agriculture', in Makeham, J. P., and Bird, J. G., (Eds.), *Problems of Change in Australian Agriculture*, Armidale, University of New England, 1969, pp. 261, p. 143.

⁸ See, for example: *ibid.*, p. 140.

⁹ Hathaway, Dale E., 'Improving and Extending Farm—Non-Farm Income Comparisons', *J. Farm Econ.*, 45(2): 367-375, 1963, p. 371.

advocated that changes in net worth due to capital gains and losses be included as income or that returns be calculated on original investment.

These procedures might be most appropriate when non-farm returns are being used as efficiency standards. Of course in such a case, non-farm returns would have to be adjusted using similar procedures. For example, capital gains and losses accruing in the non-farm sector would have to be included in non-farm income if the first procedure were adopted.

A great difficulty with these procedures is that changes in the price of assets such as land may be unrelated to the efficiency with which the asset is employed. Increasing land prices may be as much a consequence of anticipation of increases in future farm incomes or of competition for land for farm reconstruction by 'trapped' farmers, as of increases in present farm incomes. It is difficult to accept that gains from all such causes should be considered in judging the efficiency of use of national resources. On the other hand, individuals allocate resources according to expectations of capital gains and losses, whatever the cause, as well as to current income. Hence capital gains and losses must be taken into account in assessing individual farmer income.

Where current farm incomes are to be compared with the incomes which could have been earned if resources were most efficiently employed on the farms, the procedure of adding capital gains to current income would be inappropriate since the capital gains would appear on both 'sides' of the comparison.

The implications of capital gains for welfare are clearer than they are for resource use efficiency though the issue is controversial. Capital gains increase the net worth of the asset owner and hence his command of goods and services.

The Cost of Resource Transfer

Pecuniary costs incurred by people moving out of agriculture include: outlays for transporting themselves and their material possessions; the added outlays for food and lodging which are incurred during the transfer period; the loss of income which might have been earned in farming during the transfer period;¹⁰ and losses arising from 'false starts' in new employment.¹¹ In addition there exist psychic costs of changing occupation and place of living which are separate from occupational preferences.¹²

Simple comparisons of earnings opportunities in different employment situations do not take into account the cost of transfer from one to another. At least, the monetary costs should be deducted from alternative earnings in efficiency and welfare evaluations.

Setting Efficiency Standards

If problems of non-pecuniary benefits, the divergence of real and monetary incomes, and the cost of resource transfer are disregarded, then

¹⁰ Maddox, J. G., 'Private and Social Costs of the Movement of People Out of Agriculture', *American Econ. Rev.*, L(2), 1960, p. 393.

¹¹ Heady, E. O., 'Discussion', *American Econ. Rev.* L(2), 1960, p. 413.

¹² Examples of psychic costs of leaving farming are given in Hill, L. D., 'Characteristics of Farmers Leaving Agriculture in an Iowa County', *J. Farm Econ.*, 44(2), 1962, pp. 419-426, p. 424.

the objective of optimally allocating resources is essentially that of employing each unit of each resource such that it earns greatest income.

Resource allocation can be examined from a long run and a short run viewpoint. The short run can be seen as the period which is less than the useful life of at least some inputs employed by farm firms. The efficiency standards of these inputs will be their maximum marginal value product in their present situation or their salvage value, whichever is the greater. Eventually in the long run all inputs of the firm would need to be replaced and the efficiency standards of inputs will be their acquisition cost, or their maximum marginal value product in the firm, whichever is the greater.

A long run view of present resource use will enable comment to be made on the efficiency of replacing all existing inputs with the same inputs employing the same technology. Unless present resource use patterns are expected to continue in the long run, the relevance of such an analysis is limited. Firms may replace existing inputs with a different combination of inputs employing different technology. Indeed, the firm may cease operation and not replace inputs at all in the long run. A long run view will define a potential rather than actual efficiency problem and will indicate the need for change in the long run.

Analysis of efficiency from a short run viewpoint will compare the potential earnings of *existing* resources with their actual earnings. It is possible that the highest potential earnings of some existing resources, particularly durable assets, will not cover their replacement cost. In such cases these resources may not be worth replacing but the efficiency objective nevertheless will be to make the best use of them.

Thus in evaluating the efficiency with which farm firms employ resources in the short run, the earnings of some resources which are replaced frequently can be compared with their replacement cost. For the other resources which are replaced less frequently, the comparison will be between present earnings and potential earnings.

Applications of the technique of residual imputation used for evaluating the economic performance of individual farms have been interpreted as comparison of farm income with efficiency standards for each resource category comprising the farm firm. The deduction of imputed charges for depreciation and interest on capital in assets from gross income can be interpreted as applying an efficiency standard to capital. Similarly, deduction of a charge for unpaid family labour serves as an efficiency standard for the labour. The residual remaining after deduction of these charges from farm gross margin is imputed to a remaining factor, or a group of factors, and compared with efficiency standards for those remaining factors. Measures such as net farm income, when used in studies of resource use efficiency, are not therefore independent of judgments which have been made earlier about the efficiency with which capital and some labour is employed. Charges for depreciation and family labour will have to be checked to ensure that they are valid measures of the opportunity cost of these resources, if measures such as net farm income are to be used in evaluating resource use efficiency.

Many farm surveys in Australia have been aimed at assessing whether farm resources could be more efficiently employed *on the farms* where the resources are presently employed. Efficiency has frequently been assessed on the basis of the comparative rates of return to resources

employed on different farms. When some farms earn a comparatively low rate of return it is often implied that if resources were as efficiently used on these farms as on other farms in the survey group, all could attain the income standard of efficiency set by the most successful farms. A difficulty with this means of assessment is created by differences in the quality of land and management and in the level of technology embodied in existing assets that occur between farms. These differences, where they exist, will preclude the application of a single set of efficiency standards to all farms in a survey group.

In addition, efficiencies achieved on some farms through scale or size economies may not be attainable, at least in the short run, on all farms. The nature of some existing durable assets may mean that they cannot be simply added to in order to attain more recently developed economies of scale and size. Inputs such as land may not be available at current prices for farm enlargement to be feasible for many farms. Consequently, it may not be possible for all farms to earn the same rate of return on inputs. Thus this type of comparative analysis may not be suitable for assessing on-farm efficiency of resource use.

Linear programming models and similar techniques can be used to avoid some of these deficiencies of comparative analysis in testing the on-farm efficiency of resource use. However these techniques must also recognize aggregate factor supply relationships before drawing conclusions of inefficient resource use. Such models may indicate, for example, that farms would employ resources more efficiently if their land area were increased at current land prices. However for the models to be useful in regional adjustment studies, aggregate supply relationships for inputs especially land, will have to be used to determine input prices which would prevail with widespread adjustment.

Thus evaluation of the efficiency with which resources are employed on farms must eventually involve the question of the efficiency of liquidating some farm firms and making land available to other farms for amalgamation. That is, the efficiency of re-employing farm resources in off-farm employment will have to be considered since this issue will determine, in part, the price at which land will be available for amalgamation. For some farm firms to find it profitable to enlarge, other farm firms must find it profitable to liquidate.

In testing the efficiency of liquidating farm firms in the short run, it will be necessary to compare present farm earnings with the salvage value of labour and capital in off-farm employment and the value of the land to other farmers. Efficiency standards for capital (depreciation and interest) based on replacement cost will not measure the earnings foregone in further use of existing durable assets. Similarly, wage awards or typical off-farm earnings can be invalid efficiency standards for some farm labour. Operator labour and other types of family labour, because of age or lack of skills, may not have the opportunity to earn these incomes off the farm. Hence the standards may be invalid measures of off-farm opportunity cost and are likely to overstate the benefits of off-farm employment and hence of farm liquidation.

In brief, analyses which by their measurement techniques adopt a long run viewpoint from which firms are evaluated for their capacity to continue to use resources efficiently in the long run will be inappropriate in some farm situations. Where the structure of farming is chang-

ing, many farm firms will cease to exist in the long run. Efficiency problems defined in terms of present earnings and the opportunity cost of replacement resources may not, in fact, eventuate. Where farming structures are changing or are expected to change, evaluating the efficiency of use of *existing* resources is likely to be more appropriate, particularly for planning policy measures to modify both short and long run resource use. In evaluating the use of existing resources, questions about the salvage value of existing resources, earnings opportunities of existing labour, aggregate supply relationships for farm inputs especially land, and on-farm earnings opportunities will have to be considered.

Such evaluations will not only assess resource use efficiency but will also indicate the opportunity for increasing welfare by improving efficiency. Welfare aspects of resource use are considered next.

Establishing Welfare Standards

Three significantly different approaches to judgement of individual welfare can be distinguished in the literature and merit examination.

Annual Income Approach

The most common approach is to consider current income. For example:

'For a welfare problem to exist in agriculture, farm incomes must be lower than those obtained by other sections of the community.'¹³ Controversy within this approach centres on two issues: the measurement of income and the setting of welfare standards.

(i) The accounting measure, net farm income, is usually adopted as a measure of farmer income for welfare evaluation.¹⁴ The charges made for family labour and depreciation in calculating this measure are debatable.

The charge for family labour implies that this category of labour must earn its imputed return (based usually on labour awards) if it is to enjoy satisfactory welfare. It can be argued that if this labour, particularly that of the farmer's wife, willingly works for less than the award and the operator himself earns a satisfactory return then the imputed charge is unreasonable.

The depreciation charge can have a number of debatable interpretations. If it is an allowance set aside for the replacement of farm assets then, between years in which high cost assets are replaced, funds which could be available for consumption will be greater than the measured net farm income indicates. Particularly where farms are 'running down' capital without intention of replacement, actual expenditure may be a more appropriate charge than depreciation. Another interpretation of depreciation is that it is an allowance for the recovery of capital previously invested to generate present income. This interpretation introduces a new element into welfare evaluation. It means that welfare is judged not on current income but on income over and above that required to maintain the individual's net worth. Indeed it could mean this interpretation requires the recovery of capital losses which may have

¹³ Davidson, B. R., *op. cit.*, p. 141.

¹⁴ See for example, Davidson, B. R., *op. cit.*, and McKay, D. H., 'The Small-Farm Problem in Australia', *Aust. J. Agric. Econ.* 11(2): 115-132, 1967, p. 115.

occurred on some assets. A difficulty with depreciation charges in estimating farmer incomes over a relatively small number of years is that the pattern of capital recovery may not coincide with the pattern of depreciation charges.

Capital gains on assets also cause some debate in the calculation of incomes. Some welfare evaluations have included capital gains as welfare gains. Others argue '... that a windfall surplus or loss ... does not really make the farmer better or worse off than he was before.'¹⁵

(ii) Welfare standards with which to compare farm incomes are usually set in terms of non-farm incomes. Two areas of debate are evident in this approach. The first is in setting the level of farm income which provides the same income as a non-farm income level. The second is the level of non-farm income which is judged to be the welfare standard. Studies have adopted a range of standards including particular wage awards and average non-farm earnings.

Despite these controversial issues, annual income is the basis on which welfare judgements are most commonly made.

Total Wealth Approach

Unlike the other two approaches, this one does not measure welfare as the income of the individual during a single year or even a few years. Welfare is measured in terms of the total funds that the individual commands regardless of the source or the time periods in which they were accumulated.

Hathaway has claimed that welfare evaluation should be the: '... comparative ability of groups to command a given level of goods and services regardless of whether their ability is the result of current income, inheritance, pension funds, capital gains or past savings.'¹⁶

Obviously the major difference between the 'minimum income' approach to farmer welfare and the 'total wealth' approach is the treatment of accumulated wealth.

If farmers earn relatively low incomes, yet have managed to accumulate relatively greater wealth, then it is debatable that these farmers are suffering a welfare disadvantage. If valuable real estate is accumulated through parsimonious living on the part of farmers, the conclusion to the debate may be different to that if wealth is accumulated through windfall gains such as inheritance or because incomes were relatively high in past periods. Maintenance of high net worth through public assistance would be difficult to justify on welfare grounds.

Jacobson and Paarlberg¹⁷ suggest that income parity is an inappropriate goal because of the saving and consuming propensities of farm people. They believe that because farm people regard net worth more highly than non-farm people, efforts to lift farm incomes in the direction of parity have been blunted by the propensity to convert this lift to added net worth. It follows that net worth will be a better welfare measure than relative income.

Though it is by no means clear, the 'annual income' and the 'total wealth' approaches to measurement of farmer welfare have usually

¹⁵ Yang, W. Y., *Methods of Farm Management Investigations*, Food and Agriculture Organization of the United Nations, Rome, 1958, pp. 228, p. 40.

¹⁶ Hathaway, Dale E., *op. cit.*, p. 374.

¹⁷ Jacobson, M. A., and Paarlberg, Don, 'Parity of Net worth', *J. Farm Econ.* 48(1), 1966, p. 127.

been adopted by studies examining rural poverty. The welfare standards adopted in these studies have been those which yield the minimum acceptable level of living. A third approach to welfare evaluation considers welfare on an essentially different basis.

Equitable Return to Factor Approach

With this approach incomes are considered equitable only if they are commensurate with the resources individuals have employed. The income standard is not simply a level which would provide a satisfactory standard of living but rather is a level which provides an 'equitable' return to all resources which generate the income. This level will be determined by the volume of resources committed.

The definition of 'parity returns' in a U.S. study illustrates this approach.

'... parity returns to commercial farmers are those required to make the rate of return to labour and capital in commercial agriculture . . . equal to the rate of return to comparable labour and capital in other segments of the economy.'¹⁸

This approach is implied in other studies using taxation data where farmer incomes are compared with personal incomes earned in sectors where individuals employ both labour and capital to earn income just as in farming.¹⁹ Such comparisons imply that for income to be equitable, farmers should receive a return to capital as well as labour.

The case developed by Schultz²⁰ for compensating 'unforeseen' capital losses fits into this third approach to farmer welfare. Low returns to capital assets result in capital losses when salvage values are less than acquisition prices.

Review of Welfare Considerations

Because there are no rules determining an ideal or satisfactory distribution of welfare, it is not possible to specify the most appropriate approach to welfare judgements. The decision presumably must ultimately be decided by political processes and will be a function of the values of the community making the decision. The foregoing review emphasizes that specific studies of farmer welfare need to make quite explicit the criteria used in welfare judgements since the criteria themselves will be controversial. The review also demonstrates the possible wide divergence in the circumstances of efficiency problems and of welfare problems in agriculture.

Summary and Conclusion

Evaluations of efficiency of resource use on farms and of farmer welfare have commonly failed to specify the precise nature of problems which are often described in terms such as 'low-income'. The criteria used for evaluating resource use efficiency and farmer welfare are, in effect, the conditions for superior resource use and welfare positions.

¹⁸ Masucci, Robert H., 'Income Parity Standards for Agriculture', *Agric. Econ. Res.*, 14(4), 1962, p. 121.

¹⁹ See, for example: Slattery, M. M., 'Relative Incomes of Farmers—Some International Comparisons', *Qtlly Rev. Agric. Econ.* 19(3), 1966.

²⁰ Schultz, T. W., 'Policy to Redistribute Losses from Economic Progress', *J. Farm Econ.*, 1961, p. 554.

Terms such as 'low-income' do not indicate these superior positions. Hence they are frequently not sufficiently specific for the policy formulator devising policies to correct defined problems.

This paper has attempted to show that there can be fundamental differences in the circumstances of efficiency and welfare problems and hence fundamentally different policy measures can be required for their solution.

Conceptual difficulties in establishing criteria for defining efficiency and welfare problems have been examined. Difficulties involved in establishing appropriate and valid income standards in empirical evaluation of resource allocation and of welfare for particular situations were also examined. These difficulties, if recognized, influence the definition of the nature and extent of efficiency and of welfare problems. Errors of definition can also cause mis-specification of solutions to the defined problems.