AUSTRALIAN AGRICULTURAL STATISTICS: SOME ASPECTS OF THE CLASSIFICATION OF FARMS BY TYPE

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The recent application of an experimental type classification of farms in New South Wales is, I think, the most significant development in Australian agricultural statistics since the war. This operation, carried out for the year 1955-56, involved the classification of statistical returns for the 78,000 rural holdings in the State, according to the nature of activity on individual holdings. A great deal of teamwork has gone into the planning and development of this classification,[1] and I believe that it will provide useful and reliable statistical results. The project is still in the experimental stage and much remains to be done before a fully operative classification can be applied in all States.

BASIC PRINCIPLES AND CONCEPTS

The classification of farms according to type of activity is consistent with the long-established statistical practice of classifying manufacturing and other industrial "establishments" according to their activity. These "industrial classifications" as they are known have in recent years been extended by statistically advanced countries to cover all economic activities, and in fact the Statistical Commission of the United Nations has indicated desirable international standards.[2]

However, in these Australian and overseas developments there has been a tendency to neglect the farm (or rural) sector. The need for a breakdown of the farm sector has long been recognised, at least in this country. The lack of attention to this work until recent years has been due primarily to the inherent difficulties of collecting agricultural statistics and particularly the detailed data at the farm level needed for classification purposes. Another important factor has been the widespread, but I believe mistaken, conviction that farms cannot meaningfully be classified by type because of the extent of diversification of activities on individual farms.

Concurrent with post-war developments in agricultural economics and agricultural statistics generally, farm type classifications have in recent years been successfully developed and applied in a number of overseas countries. However, as this work at the national level is still

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[1] Those primarily responsible for this work were Dr. F. B. Horner (former New South Wales Bureau of Statistics and Economics), Mr. J. Rutherford (on secondment to former New South Wales Bureau of Statistics and Economics from New South Wales Department of Agriculture) and Mr. M. M. Summers (Commonwealth Bureau of Census and Statistics).

[2] United Nations International Standard Industrial Classification of all Economic Activities. See Documents E/795/Add. 1, 26th May, 1948, and ST/STAT/4, 26th April, 1957.

on a restricted scale, neither the United Nations itself nor F.A.O. has yet sponsored international standards for classification of the farm sector.

In Australia, developments in relation to our rural industries since the 1939-45 War have emphasised the need for a detailed and systematic statistical classification of rural holdings by "type", to define as clearly as possible the component industries in the rural sector, and facilitate the meaningful aggregation, grouping and comparison of relevant statistical data for those industries. A start was made in New South Wales in 1954 on the systematic investigation and study of relevant problems of classifying New South Wales farms by type. This work has resulted in the experimental classification for the year 1955-56, as the first major step in developing a classification for all Australian States.

The feasibility of classifying farms by type depends upon the extent of diversity of activities on *individual* holdings. As few macro-statistical studies had previously been made of the combinations of farming activities on individual holdings, it was necessary at the outset to judge the extent of this diversification and to assume that holdings could in fact be classified in reasonably homogeneous groups. As mentioned later, analysis of the 1954-55 sample returns subsequently carried out in the development stages, confirmed the validity of this critical assumption.

Having made that judgment, the initial problem was to design a prototype classification reflecting the basic structure of the rural sector, so far as it was known. Statistics of the counts of holdings reporting various activities were useful for this purpose but, here again, the lack of data on combinations of farming activities necessitated a somewhat subjective initial approach. In practice, a classification was first drafted, very largely on the basis of the knowledge and judgment of agricultural statisticians, economists and other specialists and was then tested using a sample of statistical returns from the 1954-55 collection. Preliminary tabulations for the full-scale operation for 1955-56 suggest that the classification finally drawn up adequately reflects the pattern of New South Wales agriculture by means of a systematic arrangement of reasonably homogeneous groups.

Associated with the determination of the groups and sub-groups comprising the classification were the problems of selecting a consistent basis for measuring the relative importance of various farming activities on individual holdings and of specifying criteria in allotting holdings to appropriate groups or farm types. These aspects were also studied in the 1954-55 sample tests by using several alternative sets of criteria and all decisions at this stage were integrated.

It could be argued that the appropriate measure of the relative importance of various activities on individual holdings should be *net* return to the farmer for each product or, alternatively, statistical "value added" in respect of each product. But there are major conceptual and practical problems in arriving at net income or "value added" in respect of any individual product, especially for any farm product. It is common practice in industrial classification to use gross income from each product as the measure of relative importance of each activity

carried on in individual establishments.[3] In classifying New South Wales farms by type, it was therefore decided to use gross value of production at the farm as providing a reasonably satisfactory measure of the relative importance of farming activities on each holding. In arriving at this decision, consideration was also given to the possible use of estimated labour input for each product but for several reasons this method was considered unsuitable for the pattern of agricultural production in New South Wales.

The basic principle underlying the application of the classification was that a holding should be classified to one of the main types where this was the dominant activity of the holding. Prima facie, it seemed reasonable for this purpose, to define an activity as dominant, if the value ascribed to the product(s) of that activity was 50 per cent. or more of the total value of production of the holdings. Furthermore, this 50 per cent. criterion had generally been used in oversea farm type classifications and had the attraction of being simple to apply and interpret. However, it was considered more objective to assess its suitability for local application, and in the 1954-55 sample tests, separate tabulations were made using the alternative criteria of 50 per cent. and 60 per cent. of total farm value to determine dominant activity. As these tests gave generally similar results, the 50 per cent. rule was finally adopted in classifying to single main types. Special treatment was, of course, necessary in the case of the composite sheep-wheat type (see Section 3).

At a later stage, a further analysis was made of the 1954-55 sample returns, in which a frequency distribution was constructed showing the numbers of holdings classified according to the ratio of value ascribed to the major product to total value of all products from the holding. This showed that almost 25 per cent. of the holdings in the sample had only one product (as defined for the purposes of this classification). The value of the major product was 90 per cent. or more of the total farm value in nearly 45 per cent. of cases; in about 60 per cent. of cases the major product contributed 80 per cent. or more of the farm value, while in over 95 per cent. the major product contributed 50 per cent. or more of the farm value. I suggest that this analysis has confirmed that the application of the general 50 per cent. rule in classifying to main single types was sound.

The results of this analysis also validated critical assumptions made earlier by demonstrating that there is a sufficient degree of specialisation of activities on individual farms (at least in New South Wales) to permit the meaningful classification of farms by types. Further detailed analyses of the structure of holdings in the 1954-55 sample are proceeding, with particular attention to the relationship between main and subsidiary activities.

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[3] This practice is recommended by the United Nations Statistical Commission in connection with its International Standard Industrial Classification of all Economic Activities; U.N. Document E/795/Add. 1, 26th May, 1948.

THE NEW SOUTH WALES EXPERIMENTAL CLASSIFICATION, 1955-56

The New South Wales classification and coding system provided for ten main farm types and an "unclassified" group, viz.:

Sheep—Wheat

Sheep

Wheat

Beef Cattle

Dairying

Fruit

Vegetables

Poultry

Other (one main purpose)

Multi-Purpose

Unclassified (i.e. sub-commercial, special, intermittent grazing, and unused).

In addition, provision was made, firstly, to specify components of the "other" and "multi-purpose" main types as well as the "unclassified" group; secondly, to record subsidiary activities where significant; and thirdly to give a special classification of type of sheep flock.

The original draft classification included several combinations of main and subsidiary activities then considered important enough to be described as main types. These were sheep-wheat, sheep-beef, dairy-beef, and dairy-pigs. However, following the 1954-55 sample pre-tests, the sheep-beef, dairy-beef and dairy-pigs combinations were dropped as main types because of the relatively small numbers of holdings classified to these combinations and the difficulties of devising criteria and procedures which would give stable results. The sheep-wheat (including wheat-sheep) combination was retained as a main type because of its major importance but the criteria used in determining this type were extended to include holdings where the activities occurred in a wide range of proportions. Particulars of other important farming combinations will be available from cross-classifications by main and sub-type.

The basic documents for applying the classification were the New South Wales annual Agricultural, Pastoral and Dairying Statistical Returns for the year 1955-56. As no information on values or proceeds from the sale of products was available from these returns, it was necessary to calculate factors to arrive at imputed values of the products from each holding. The first step was to calculate or to estimate standard factors about the quantitative yield of production

per acre of crop and per unit of livestock. The use of these factors in preference to actual production during the year 1955-56 was intended primarily to eliminate the effect of short-term yield fluctuations, thus giving greater stability to the classification. Average gross farm values per unit of production were then calculated for the period 1948-49 to 1952-53, omitting 1950-51 and 1952-53 in the case of wool. The yield factors and values per unit of production were then combined to arrive at composite factors representing standardised value per crop acre or per unit of livestock.

The initial coding process involved applying these composite factors to the acreage of crops and relevant particulars of livestock reported on the A & P form for each holding, to calculate a standardised value of production of each product. The holding was then allotted an appropriate holding type code in accordance with the criteria and procedures specified. Very briefly, if a single product accounted for 50 per cent. or more of the total farm value of production, that product determined the main holding type. Where sheep and wheat were both reported, the holding was coded to the composite sheep-wheat type, if the combined value of these products accounted for 75 per cent. or more of the farm value and provided the value of sheep was no more than 4 times and not less than $\frac{1}{4}$ of the value of wheat. These broad criteria were adopted following the 1954-55 sample tests which disclosed that sheep and wheat are produced in a wide range of proportions. Another reason for this action was to allow for fluctuations in estimated returns from wheat, based on acreage recorded for the single year 1955-56. The procedure adopted seems to conform with common practice in defining sheep-wheat farms.

For holdings reporting both dairy cows and pigs, the procedure generally was to add together the value of dairying and pigs and if this combined value represented 50 per cent. or more of the total farm value, the holding was coded as dairying. Where no single product accounted for 50 per cent. of the total value of farm production, the holdings were classified as "multi-purpose". Codes for subsidiary activity were allotted where the value of a subsidiary activity was 50 per cent. or more of the value of the major activity. Holdings for which the total farm value was less than £400 were coded to "sub-commercial" in the Unclassified Group. Coding to the six special sheep flock types was done generally on the basis of the breed of ram used.

The type of holding codes have been punched on two punch cards for each holding, together with a wealth of detail on size characteristics and various quantitative data recorded on the A & P form. From these cards, numerous cross-classifications will be obtained thus providing a very comprehensive and detailed analysis of the structure of New South Wales rural industries for 1955-56. A comprehensive technical report on all aspects of the operation has been prepared and copies may be obtained from the Commonwealth Bureau of Census and Statistics, Canberra, by anyone wishing to make a detailed study of the work.

A condensed table of the initial count of holdings by types is given below:

N.S.W. Rural Holdings Classified by Type, 1955-56
(Subject to Revision)

Type of Holding	*Number of Holdings*	*Proportion of—*	
		Total Classified Holdings (%)	*All Holdings (%)*
Sheep-Wheat	10,048	15.2	12.9
Sheep	22,951	34.8	29.5
Wheat	712	1.1	0.9
Beef Cattle	4,236	6.4	5.5
Dairying	14,968	22.7	19.2
Fruit	5,246	8.0	6.7
Vegetables	2,244	3.4	2.9
Poultry	2,713	4.1	3.5
Other (one main purpose)	1,638	2.5	2.1
Total of Above	64,756	98.2	83.2
Multi-Purpose	1,208	1.8	1.5
Total "Classified" Holdings	65,964	100.0	84.7
"Unclassified" (sub-commercial, special, unused, etc.)	11,891	(a)	15.3
All Holdings	77,855	(a)	100.0

(a) Not applicable.

It is of interest to note that the criteria used in applying the classification resulted in a small "Multi-Purpose" type of less than 2 per cent., while subsidiary activity was only recorded in about 10 per cent. of all classified holdings. The fact that "sub-commercial" and other "unclassified" holdings accounted for 15.3 per cent. of the total is very significant in defining rural holdings and highlights one of the hazards of using crude statistics of total numbers of rural holdings, as traditionally recorded.

STATISTICAL ASPECTS OF CLASSIFYING FARMS BY TYPE

In Australia, the existence of the long-established annual A & P collection has in many ways facilitated a classification of holdings by type, but it has also created problems. For example, our present system necessitates a very discerning approach in deciding the questions to be included on the A & P form, which is collected basically by the process of "self-enumeration". In fact, the collection of certain data which would be very desirable for classifying holdings by type would be quite impracticable under existing procedures.

In the initial classification of rural holdings by type in New South Wales, three major procedural problems have arisen because of lack of basic data. Firstly, the absence of information on gross proceeds from the sale of products of individual holdings has necessitated using average "values" based on market prices with deductions for transport and other marketing costs. Obviously, this method can provide only approximate measures of the value of products from individual holdings. On the other hand, this method (in which prices and yields were

averaged over a period of years) could be expected to give more stable results than by using actual proceeds for a single year. Secondly, the absence of quantitative data on turnoff of livestock and sales of fodder has meant a somewhat crude approach in estimating the volume of these sales. And, thirdly, there is the fundamental problem that it has been necessary to use gross value for classification purposes in the absence of cost data to arrive at a net income or "value added" for the individual products of each holding.

In this census type of classifying all holdings in detail, the treatment must necessarily be extensive rather than intensive and I am confident that the foregoing shortcomings in the methods used do not impair the overall reliability and usefulness of the results. But in the long term, I think attempts should be made to measure objectively the effect of the approximations used. When resources are available, I think it will be desirable to go into the field on a sample basis and collect supplemental data on sales, costs of production and related matter with this end in view.

The classification of New South Wales 1955-56 A & P returns by type of holdings also raised serious processing problems. In practice, the processes of calculating product values by applying factors to crop acreages and numbers of livestock and then relating and comparing these values were carried out integrally with the actual coding, by clerical staff. This raised major problems of accuracy control and of cost. Accuracy was controlled effectively by the use of acceptance sampling in the checking process but the overall cost was heavy amounting to 103 man-days on coding and about 55 man-days on check-coding for approximately 78,000 returns processed. It is obviously desirable to mechanise these processes as far as possible and in the long term, with appropriate changes in the design of the A & P form, it may be possible to handle all aspects by electronic data processing techniques.

This leads on to another important statistical feature of the operation. It was found in practice that the processes of scrutinising the A & P form, and of carrying out other operations linked with coding constituted a very effective statistical editing of the return with particular emphasis on internal consistency and the quality of response to individual questions. This seems likely to achieve much in developing improved techniques to cope with the vital problem of response error generally. Similarly, the classification of farms by type has opened the way for a deep probing of the important and difficult problem of devising adequate definitions of rural holdings. The work done in New South Wales has clearly indicated the magnitude and character of the fringe group of "sub-commercial" holdings at present included, and has highlighted problems associated with sharefarming, part-time holdings, the fragmentation of holdings and the use of areas for intermittent grazing. When circumstances permit, I suggest that these aspects should be studied more deeply by means of field surveys.

To date, the application of the type of holding classification in New South Wales has been confined to the one year 1955-56 to provide very detailed analyses and cross-classification. Further detailed classifications along these lines will probably be carried out on an Australia-wide basis in 1959-60 and thence at five-yearly intervals. In addition,

I suggest there is a need to use the classification to compile annual statistics, at least for holdings by main types. However, it will be necessary to undertake careful experimentation in using the classification for this purpose; in particular, there is a danger that chance fluctuations arising from the application of the somewhat arbitrary criteria used in the classification process may wholly or partly obscure genuine trend in the annual numbers of holdings by type. Furthermore, the work involved in annual operations may well prove to be prohibitive, unless it can be extensively mechanised and/or it can be integrated with procedures for editing individual returns.

THE UTILITY OF CLASSIFYING FARMS BY TYPE

I should emphasise that my views on the usefulness of the farm type classification are essentially those of a producer of agricultural statistics. From this point of view, the farm type classification provides an essential and very effective statistical description of the structure of the rural sector. This is done by breaking down the total statistical population of rural holdings of great diversity into reasonably homogeneous component groups. Obviously, a classification of this nature is essential if any dissection is to be made of data which, as a practical matter, can only be satisfactorily compiled on an individual holding basis. For example, it is the only way of providing valid breakdowns of data on numbers of rural holdings; numbers of rural workers and wages paid to them; net value of production of rural industries; and farm income. And, of course, it permits compilation and analysis of the whole range of agricultural statistics, including data on crop areas and production and livestock numbers and production for each farm type separately. In the farm income field, the establishment of the farm type classification opens the way to effective studies of the economic situation of various component groups in the rural sector. It also provides a framework on which to estimate the items of farm income and outlay for industry sector accounts and for research into inter-industry economics and input-output analysis. It is therefore of potential use in social accounting techniques applied to the analysis of data on rural industries.

Agricultural statistics for small areas, classified by type of farm, should be very valuable for preparing maps of types of farming regions. Linked with this is the potential value for sampling for statistical and economic research surveys.

In statistically defining the respective types of farming enterprise in Australian agriculture, it seems to me that the farm type classification will prove to be a potent tool for a variety of research purposes in agricultural economics and other fields. It should also be of considerable help in the operation of certain types of governmental control and assistance schemes, and in the conduct of associated special-purpose surveys.

DISCUSSION

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I am inclined to agree with Mr. Walker that type classification of farms is a very important development likely to be of great benefit to users of Australian agricultural statistics. However, I am a little bit worried by the economic meaning of his classifications. The classification made uses certain data and assumes that they approximate net income which is regarded as the ideal basis for classification. In reality this assumes not one but often as many as four separate approximations. Let me spell out what I mean.

Basically, we are trying to classify farms according to the proportion of net income provided by certain enterprises. As a first approximation we use the proportion of gross income provided by certain enterprises. However, we do not have gross income data from individual farms. We therefore use production as an approximation for gross income.

It is true that production will be a reasonably close approximation to gross income but in some commodities, such as wool, meat and fruit, the price per unit can vary to such an extent that volume becomes a bad substitute for gross value. But the Statistician does not even use production to obtain his classification. He uses units related to production, viz., crop acres and livestock numbers. This is the third approximation. Here again we can have certain difficulties.

Allowance has been made for the difference in average yields in different regions but yields per acre and per unit livestock vary greatly from farm to farm within a very small area and it is quite possible to introduce considerable error into the classification as a result of this approximation.

The last approximation occurs with livestock products where the Statistician is not able to ascertain the number of livestock units which have contributed to the product during the year but has to use the number on the farm as at March 31. For instance, the measure of the importance of the dairy enterprise is the number of dairy cattle on March 31, which in New South Wales happens to be near the end of the main producing period. It is quite possible that farmers have sold a substantial number of their cows by then. Particularly with beef producers the error introduced here could be considerable.

For all these reasons I was rather sceptical about this classification when this project was first started. Nevertheless, the Statistician has produced information for New South Wales which is of considerable interest. But I think he has been lucky because New South Wales is a State where mixed farming is not particularly important (with the exception of the wheat-sheep category) and also because most of the pastoral holdings produce wool and not beef cattle. I feel that he might run into a lot more difficulty in Queensland or Victoria.

Finally, I want to make three minor comments about some of the criteria used in the classification. Firstly, I am not happy with the criteria that a sideline should be defined as one which contributes 50 per cent. or more of the value contributed by the major enterprise. I

think that this criterion leads to some rather strange classifications. For instance, most people would regard pigs as a sideline on most New South Wales dairy farms outside the milk zone, yet they would not account for more than a third of the income obtained from the main enterprise—the production of butter. I feel that the Statistician should lower the value of the sideline to 25 per cent. as opposed to 50 per cent.

Secondly, I am not quite clear how he has got himself in the position where there are no farms in New South Wales which have as their main enterprise the production of pigs with dairying as a sideline. I suspect this is the result of his method of classification. I am almost certain that there should be a fair number of farms in this particular grid of his table.

Thirdly, I would make a plea for some break-up of the present wheat-sheep category. The present criterion is that a farm is classified as wheat-sheep provided the value of sheep was no more than four times and no less than a quarter of the value of wheat.

I feel that this category is too broad and I would like to see a distinction made between a sheep-wheat and a wheat-sheep property. There is after all a substantial difference between the small wheat farmer who runs a few sheep as a sideline and a large grazier who has a sharefarmer putting in 400 to 800 acres of wheat a year.

In conclusion, let me congratulate Mr. Walker for doing what I want Statisticians to do—namely to explain what they are doing and how they are doing it and in his particular case explaining it so lucidly.