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INNOVATION AND ENTERPRISE IN WHEAT FARMING*

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INTRODUCTION AND SUMMARY.

This article is concerned with certain aspects of the entrepreneurial behaviour of wheat farmers—in particular, with their adoption of new techniques and means of production. The study is based on data secured in the course of a field investigation carried out late in 1953, in which forty-eight wheat farmers, residing in a particular locality in northern New South Wales, were interviewed.

The primary aim of the investigation was *not* to estimate the extent to which particular technological innovations are being adopted throughout the wheat belt, or in any particular part of it. Its aim was, rather, to gain some idea of the factors which influence farmers in either adopting or not adopting a particular innovation, or innovations in general. In other words, it sought to *explain* differences in farmers' entrepreneurial behaviour, rather than estimate the relative preponderance of different types of behaviour.

More particularly, the survey was concerned with the influence on the adoption of innovations of factors associated with the farm firm (e.g., its size and the characteristics of its operator) rather than with

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the influence of the physical and social environment. Therefore, every advantage was to be gained from restricting the survey to a particular locality, i.e., to a particular environment.

It was decided to conduct the survey in a wheat-sheep district because, following the wool boom of 1950-51, which dramatically altered the price relationship between wool and wheat, and brought large windfall profits to farmers, new techniques have been and are being adopted at a rapid rate in these areas. A northern wheat district was chosen because farmers there have a greater freedom of choice as between alternative forms of production than do farmers in the southern and central districts, where declining soil fertility and weed problems impose severe limits on the extent to which wheat can be grown.

The sampling procedure adopted was to delineate an area on the map, and interview *every* farmer residing within that area. The interviewing of farmers residing on contiguous holdings has the advantage that it enables the survey to encompass neighbour-neighbour relationships, which may be of importance in the diffusion of new techniques. In delineating the survey area, care was taken to ensure (i) that it was reasonably homogeneous in respect of soil type and topography, (ii) that it was centred upon a small rural township, so that its geographical homegeneity was more or less matched by a social homogeneity, and (iii) that small and large farms were included in the sample, in roughly the same proportion as they occurred in the surrounding district.

This report is divided into three main sections. The first, which describes the various new techniques which are finding favour in the survey area and the extent to which farmers are adopting them, is mainly of technical interest, and may be neglected by those readers whose main interest is in the analysis of farmers' entrepreneurial behaviour, presented in sections 2 and 3.

Summary.

In recent years, particularly since the wool boom of 1950-51, farmers in the survey area have been displaying considerable interest in farming practices and types of equipment which had hitherto been unavailable, or else little used in northern wheat-growing districts. In farming practices the chief innovations being adopted are the sowing of improved pastures, the carrying out of soil conservation measures and the conserving of oats and baled hay, rather than unbaled cereal hay. Prefabricated grain silos (for the storage of oats), bulk bodies for trucks, and spray-type sheep dips are all coming into favour, and, to a lesser degree, so are auto-headers, grain augers and blowers, disc tillers, and pick-up hay balers. Some interest is also being shown in the Mules operation (for the control of blow-fly strike in sheep), in minor element trials, and in the use of superphosphate.

When farmers' behaviour over the whole field of innovation is examined, it is found that they tend either to adopt innovations consistently, or consistently fail to do so. The operation of this tendency is seen in the fact that there are both more farmers who have carried out many innovations, and more who have adopted few or none, than would otherwise be expected.

This consistency in farmers' behaviour does not appear to embrace certain mechanical innovations (bulk handling equipment, disc tillers and spray-type sheep dips), the adoption of which is not (or at best, is only weakly) associated with the carrying out of other innovations. The scale of farm operations (size of farm) appears to be the factor of overriding importance in determining the pattern of adoption of these machines; small and medium-sized farms do not offer the same opportunities for employing these innovations as do the larger farms.

It is only on some of the very small farms (i.e., those less than 500 acres) that an inadequate scale of operations, or a lack of resources, could be said to be limiting the adoption of non-mechanical innovations. In general they are being adopted just as freely on the small as on the large farms.

There are no necessary technological connections between the various non-mechanical innovations to account for their association with one another on the same farms.

Since the pattern of adoption of these innovations cannot be explained by reference to the existence of differing economic or technological opportunities for their employment, it is concluded that this pattern reflects, in the main, the differing entrepreneurial skills and attitudes of the farmers concerned.

Farmers who have adopted many innovations have, in general, earned higher incomes, and had more contact with the agricultural extension services, than those who have adopted few innovations. It is argued that the existence of these relationships, rather than providing alternative explanations of farmers' entrepreneurial behaviour, is further evidence of the importance of differences in their entrepreneurial abilities.

Farmers established on their present farms since 1940—they include both local residents and newcomers from other districts—are carrying out significantly more innovations than those who were established in earlier years. It is argued that this is because newly-established farmers bring a freshness of outlook to farming—there has not been time for their attitudes and behaviour to become hardened into prejudice and habit—and also because their attitudes have not been so profoundly affected by depression experiences as have those of long-established farmers.

Although, in some cases, the propensity to innovate may derive from a special, technical interest in particular innovations, it seems, more typically, to reflect a greater capacity for enterprising action in general. Evidence for this view is provided by the fact that all individuals who were outstandingly enterprising in fields other than the adoption of innovations (viz., in local affairs and in business matters) were also innovators.

It is concluded, therefore, that:—

(i) In the survey area, at the present time, the pattern of adoption of innovations reflects, in the main, the differing skills and attitudes of the farmers concerned, rather than the operation of economic or technological factors.

(ii) These skills and attitudes are of a general, rather than a specific nature, so that the propensity to innovate can largely be identified with enterprise or entrepreneurial ability in general.

(iii) Entrepreneurial ability should not be conceived simply as an inherent capacity; it involves also the possession of certain attitudes of mind the origin of which can be traced to farmers' past experiences —in particular, to their boom and depression experiences.

1. THE INNOVATIONS.

Pasture Improvement.

Undoubtedly the most important change that has occurred in the wheat-growing districts of New South Wales in recent years is the widespread adoption of a diversified system of farming in which the emphasis is shifted from the growing of cash crops towards stock raising—a change that has been made possible by a very great expansion of the area devoted to improved pastures and fodder crops. This trend is evident in the north-western wheat areas, but is not nearly so well developed there as in the central and southern districts, where declining soil fertility and the incursions of skeleton weed have provided more compelling reasons for the adoption of diversified farming methods. The spread of improved pastures in the north-west has also been delayed by the fact that most of the original research into pasture establishment and management was carried out in areas of winter rainfall and cooler climate. However, it is now known that methods evolved from experience in other environments can be adapted to the soil and climatic conditions of the north-west.

In the survey area, pasture mixtures containing several species, including lucerne, *Phalaris tuberosa,* wimmera rye grass and barrel medic, are recommended. There was sporadic interest in lucerne in the area for many years, but, with few exceptions, only small areas, intended as permanent hay or grazing stands, were sown. The sowing of large areas of improved pastures, *as an alternative to, and in rotation with wheat growing,* in order to increase stock carrying capacity, is a new departure for survey farmers, and it is only in the last three or four years that they have become interested in it. This interest has been prompted by the greatly increased returns available from wool growing since 1950-51, and has been encouraged by the local agronomist, who has conducted a vigorous campaign urging pasture improvement and wider crop rotations as a means of preserving soil fertility.

Almost half of the farmers interviewed (23 out of 48) had some of their land under improved pastures in 1953. Areas sown varied from small experimental sowings of a few acres to an area of 235 acres on one large holding. Another ten farmers intended to sow some pasture in the near future: the remaining 15 farmers had no immediate intention of carrying out any pasture improvement. Twenty-two of the 33 farmers comprising the first two groups intended to increase their sowings and/or grow pastures in rotation with wheat, that is, they could be said to have embarked on, or were about to initiate a *pasture improvement programme.*[1] The remaining 11 farmers (four of whom had actually sown some pasture) regarded improved pastures as essentially an experimental or peripheral enterprise; for example, several were interested in improving their grazing land only.

[1] In several cases, the carrying out of this intention was contingent upon the success of sowings just made, or about to be made.

If they have carried out the intentions which they expressed at the time of the survey, 13 of the 22 farmers who are undertaking pasture improvement programmes will have sown 100 acres or more of pasture to date.

The behaviour of survey farmers supports the view that farmers typically make small trial sowings of new crops and varieties. Twenty-seven farmers supplied information concerning the size of their actual or intended initial pasture sowings: only four had sown 50 acres or more in the first year, 12 had sown between 20 and 50 acres, and 11 had sown less than 20 acres. The making of trial sowings of recommended species is to be distinguished from experimentation with species hitherto untried in the locality. Five farmers have introduced and sown small areas of non-recommended species, the most noteworthy case being a farmer who, in 1948, sowed more than 20 species of grasses and clovers on an experimental basis.

The first farmer to commence a full-scale pasture improvement programme did so in 1946. A next-door neighbour followed his example in 1947 and three others made their first sowings in 1948. Three more commenced in 1949, one in 1950, six in 1951, six in 1952, one in 1953, and six intended to begin in 1954. The slackening in the rate of adoption in 1953 is no doubt mainly due to the dry autumn experienced that year. Data on acreages in years intermediate between the year of first adoption and 1953 were not collected, so that it is not possible to show the annual rate of increase in the area of improved pasture. The total area increased from less than 100 acres in 1946 to 1,640 acres in 1953, and, if farmers have been able to carry out their plans, to 2,530 acres in 1954. Taking into account the fact that initial sowings are mainly of a trial nature, it is evident that the trend towards improved pasture could hardly be said to have got under way until 1951 or 1952. Most of the early sowings were of grazing lucerne only. The first pasture mixture (apart from experimental sowings) was sown in 1950, and since then an increasing proportion of sowings has been of mixtures of grasses.

In the United States, studies of the sources of farmers' information concerning new farm practices have emphasized the importance of informal sources, in particular, neighbours. An attempt was made to ascertain where survey farmers got the idea of going in for pasture improvement, and where they sought advice concerning ways of going about it. This information was found to be difficult to obtain. This is hardly surprising in view of the fact that pasture improvement is a topic that in the last few years has received a great deal of attention in the local press, in Departmental literature (many farmers receive the *Agricultural Gazette*), in radio talks, at field days and, no doubt, in informal discussions between farmers. The farmer who said "It's been all the swing around here" summed up the answers of many to these questions. Nevertheless, some information of interest was gathered; farmers' answers revealed, for example, that seven had sought information on pasture improvement from the district agronomist, that six more intended to do so, and that three farmers, who were carrying out pasture improvement in conjunction with a soil conservation programme had obtained their information from the local soil conservation officer. Five farmers said they received their information from field days, and four from reading. These figures indicate a fairly high

reliance on formal sources of information, which is understandable in view of the novelty of pasture improvement in the district. Another noteworthy fact is that eight farmers said they became interested in pasture improvement after they had seen its results in other districts which they had visited or in which they had lived previously.

Soil Conservation.

Approximately half the survey farmers have adopted, or intend to adopt measures to control soil erosion. Twelve have had their properties inspected by the local officer of the Soil Conservation Service, and of these seven have commenced to put his recommendations (or some of them) into effect, and three more intend to do so. One farmer is not yet prepared to adopt the recommended measures, because of their cost. In the case of the remaining farm, inspection revealed that it did not require immediate attention.

Four other farmers have carried out soil conservation works on their own initiative, and two of them now intend to seek expert advice before proceeding further. In addition six farmers expressed firm intentions of taking erosion-control measures in the near future, while two had similar, but more tentative, plans.

In most cases the works that have been carried out include the construction of contour check banks, laying out of grassed waterways, and excavation of dams for water storage.

Many farmers who have not carried out any conservation measures of a structural nature, or sought expert advice, have, nevertheless, adopted common sense methods of lessening erosion, such as cultivating land across the slope, blocking gullies, and delaying cultivation until after the danger of summer storms has passed. In general it can be said that the vast majority of farmers are alive to the dangers of erosion and accept the fact that preventative measures need to be taken. There is considerable variation, however, in what measures they think are necessary, and in what they are actually doing about it.

It is of interest to note that, as is the case with most innovations, some individuals had developed an interest in soil conservation before it became a subject of extension activity. One survey farmer instituted conservation methods of his own devising many years ago. His interest had been stimulated by observations of terraced farming that he had made in France during the first world war.

Soil Fertility.

The survey area is one of high natural soil fertility. Despite the fact that parts of it have been cropped intensively for many years, the problem of declining soil fertility is not acute. This is not to say that this problem does not exist, nor that the effects of overcropping are not becoming apparent, particularly on some of the smaller farms. Furthermore, there appears to be a growing awareness, among the survey farmers, of the need to preserve soil fertility. (Twenty-five farmers appeared to be aware of the role played by legumes in maintaining and restoring soil fertility.) However, the attitude that "this soil will never wear out" persists in a number of cases; for example, eight farmers declared that there had been no reduction in the fertility of their land since they had been farming it.

Superphosphate is not normally used in the area. However, six farmers had, at some time, made trial sowings of crops using superphosphate, generally with negative results. There is also some interest at the present time in minor element trials, "kits" for the carrying out of which are available commercially. One farmer has instituted such a trial, and two others intend to do so.

Fodder Conservation.

Traditionally the great bulk of fodder conserved on wheat farms has consisted of cereal hay, but in recent years there has been a tendency for it to be replaced by oats grain and, with the increased emphasis being placed on pasture improvement, lucerne and pasture hay. Cereal hay is still the principal fodder conserved on the survey farms, but oats grain is being used to almost as great an extent. Reserves of cereal hay were held on 33 farms, oats on 28, and lucerne hay on sixteen.

This trend towards the use for fodder of grain rather than hay has been assisted in recent years by the availability of several types of prefabricated grain silos. These provide a convenient and relatively cheap form of storage, and, at a time when materials and manpower were in short supply, must have possessed considerable appeal by virtue of their prefabrication and ease of erection. Eleven farmers had erected one or more silos, and five farmers said they intended to do so in the near future.

In order to assess the extent to which fodder is being conserved on individual farms, it is necessary to convert quantities of the different fodders to a common measure, and relate total quantities conserved to the number of sheep carried. Quantities of lucerne hay and oats have been expressed in terms of the tonnage of cereal hay yielding an equivalent feed value. In the beginning of 1953, 16 farmers had on hand ten or more tons of cereal hay equivalent per 100 sheep carried, 15 had between five and ten tons per 100 sheep, and 16 had less than five tons per 100 sheep. Included in the last group are two farmers who had conserved no fodder at all.

In order to be able to feed sheep with a balanced ration it is desirable to have both roughage (hay) and high protein feed (grain or lucerne hay) available. Five farmers had conserved all three types of fodder, 21 had conserved two types, and 20 had conserved one type only. (Of these, 11 had cereal hay, eight had oats and one had lucerne hay only on hand.)

Two farmers owned pick-up hay-balers, and two more shared ownership of one baler. Three others said they intended to purchase pick-up balers. Stationary hay-balers were in use on six farms.

Bulk Handling.

In the field of farm mechanization, the most spectacular development in wheat farming in recent years has been the introduction of machinery for handling wheat in bulk rather than in bags. It is of interest to note that the pioneer development of this technique, in Australia, was carried out mainly by farmers themselves. A number of machinery firms were quickly in the field, however, and a considerable range of equipment, including header trailers, grain augers, bulk bodies for trucks, field bins

and grain silos are now on the market. Some of these items, especially bulk bodies for trucks, are eminently suited for fabrication in small workshops in rural areas, and, for the most part, are being supplied by such sources.

The practice of carting wheat from farm to railhead in bulk has been widely adopted, both by farmers who cart their own wheat and by contract carriers. Eleven of the farmers interviewed had fitted and three intended to fit their trucks with bulk wheat bodies. No farmer had adopted full scale bulk handling (i.e. completely eliminated the use of bags in harvesting operations), and none seemed to think that this degree of mechanization was either necessary or desirable; several had toyed with this idea but rejected it. A number had, however, carried bulk handling a stage further than merely carting their wheat in bulk; four had purchased, and one intended to purchase grain augers or blowers, and four others had bought modern auto-headers fitted for bulk handling, and another intended to do so.

Other Machinery.

Brief details of other important machinery in use on the survey farms are listed below:—

Disc Tillers.—These are a new type of large-scale cultivation implement. They were in use on three farms.

Tractors.—All farmers owned at least one tractor. On five of the larger farms crawler tractors were in use.

Trucks.—Twenty-nine farmers owned trucks, and one intended to purchase a truck.

Shearing Plant.—Twenty-five farmers had their own shearing plant, and six others had one-stand crutching plants.

Sheep Management.

All but one of the 48 farmers ran sheep, and of those who did all but one ran Merinos. (One farmer dairied—but intended to replace his cattle with sheep—and one kept Corriedale sheep for fat-lamb production.) Most farmers kept breeding flocks, the only exceptions being five who ran wethers only, and two who kept no regular flock, but dealt extensively in sheep. Dealing in sheep is a common sideline activity in the survey area. Altogether, 16 farmers (i.e. a third of those interviewed) went in for sheep dealing to a greater or lesser extent.

Farmers who bred their own sheep replacements were asked if they classed their sheep. Thirteen said they did no classing, 11 went in for some sort of rough classing, and 13 said they classed their sheep thoroughly, or that they intended to do so. (Three farmers did not answer the question.) There is, of course, no way of checking the comparability of different farmers notions of "rough" and "thorough" classing.

Sheep dips were installed, or about to be installed on half of the survey farms. Eleven spray-type dips and 10 plunge dips were in use, and two more plunge dips were about to be installed. A number of farmers lived near a public dip, which they used; the remainder made use of their neighbours' dips.

As a control measure against blow-fly strike, most farmers crutch their sheep twice a year, and some crutch more frequently. Three own equipment for "jetting" sheep. Five have performed the modified Mules operation on some of their sheep, and five others intend to do so, indicating a quickening of interest in this practice.

TABLE I.

Number of Survey Farmers Adopting Certain Innovations.

Type of Innovation.	Details.	Innovation.		
		Carried Out.	Intended.	Carried Out or Intended.
		Number of farmers.	Number of farmers.	Number of farmers.
Pasture Improvement.	Improved pastures sown ...	23	10	33
	Pasture improvement programme undertaken.	22	...	22
	100 acres or more pasture sown or intended by 1954.	7	6	13
	Pasture mixture sown	8	18	26
	Rhizobium inoculum used ...	3	5	8
Soil Conservation	Soil conservation works carried out.	11	9	20
	Conservation programme drawn up under expert guidance.	12	4	16
Fodder Conservation Innovations.	Grain conserved	28	2	30
	Baled hay conserved	27	...	27
	Grain silo erected	11	5	16
	Pick-up hay baler owned ...	4	3	7
Mechanical Innovations.	Bulk truck body owned ...	11	3	14
	Grain auger or blower owned ...	4	1	5
	Auto header owned	4	1	5
	Disc tiller owned	3	...	3
	Spray-type sheep dip installed...	11	...	11
Miscellaneous Innovations.	Superphosphate tried	6	...	6
	Minor element trial undertaken	1	2	3
	Mules operation performed ...	5	5	10

Basic Plant and Structures.

It is evident from the information presented in the preceding pages—and summarized in Table I—that survey farmers are displaying considerable interest in a diversity of new techniques, and achieving a high level of investment in new types of equipment. This activity is taking place in the context of a high rate of investment in all types of farm plant and improvements. Information relating to farmers' investment in plant and equipment of a basic, non-innovatory nature is given in Table II. It will be observed that, in the three-year period 1952-54, approximately 40 per cent. of the survey farmers have bought, or intend to buy, new tractors, and a similar proportion, new headers. New scarifiers and ploughs have each been purchased, or are intended to be purchased on 30 per cent. of the farms, and new cars, trucks and

combines, each on 25 per cent. When their slower rate of depreciation is borne in mind, it is evident that farm houses, sheds and water supplies are also being replaced and duplicated at a high rate.

TABLE II.

Number of Survey Farmers Investing in Machinery and Structures, 1952-54.

(Includes both new and replacement items.)

Machine or Structure.	Item.		
	Purchased in 1952 or 1953.	Intended in 1954.	Purchased or Intended 1952–54.
	Number of farmers.	Number of farmers.	Number of farmers.
Tractor	15	5	20
Header	14	5	19
Plough	12	3	15
Scarifier	9	6	15
Truck	9	3	12
Combine	9	3	12
Car	11	...	11
Sheep dip	5	4	9
Shearing plant	6	2	8
Shearing shed	5	6	11
Machinery shed	4	6	10
Hay shed	3	6	9
Other sheds	10	5	15
Farm house	4	2	6
Employees' house of quarters ...	...	2	2
Dam(s)	9	5	14
Bore	3	4	7

2. ENTERPRISE AND THE ADOPTION OF INNOVATIONS.

The focus of attention in this article has so far been placed on each separate innovation, and the scale and intensity of its adoption in the survey area. It is now proposed to study the phenomenon of innovation more generally and relate its occurrence to the characteristics of individual and groups of farmers. For this purpose it is necessary to devise some measure of the extent to which each farmer is adopting new practices and acquiring new types of equipment. The method used is the simple one of allotting farmers points for having carried out, or intending to carry out, each innovation. The various innovations have been classified into five categories, viz., those relating to pasture improvement, soil conservation, fodder conservation, farm machinery, and miscellaneous practices, and a separate score calculated for each class of innovation. The sum of these component scores constitutes the total innovation score.

The way in which the various scores have been calculated is set out in Table III. The method of scoring in most cases is to allot two points for the adoption of an innovation and one point for the intention of doing so, except in the case of the soil conservation score where it was thought desirable to weigh the scores so that the maximum possible

score was in line with the maximum score that could be achieved in the other classes of innovation. It should be noted that in the innovation score for fodder conservation no account is taken of the quantity of fodder conserved; it is solely concerned with the types of fodder conserved and the way it is conserved and stored. Similarly the mechanical innovations score refers only to the use of relatively new types of machinery, and not to mechanization in general.

It has been shown in Part I, that there is great variation in the extent to which farmers are adopting individual innovations. Some practices are being carried out more generally than others, and in the case of those innovations which may be introduced by degrees, there is a wide range of achievement on different farms. It is now proposed to put together the data relating to different practices, in order to see whether, over the whole field of innovation, these differences tend to cancel one another out, or reinforce each other.

TABLE III.

Point Scores Allotted for Various Innovations.

Score for—	Innovations considered.	Points Allotted.		Maximum Possible Score.
		Innovation Carried Out.	Innovation Intended.	
Pasture Improvement.	Improved pastures sown ...	2	1	...
	Pasture improvement programme undertaken.	2	...	...
	100 acres or more pasture sown or intended by 1954.	2	1	...
	Pasture mixture sown ...	2	1	...
	Rhizobium inoculum used ...	2	1	10
Soil Conservation.	Soil conservation works carried out.	4	2	...
	Conservation programme drawn up under expert guidance.	4	2	8
Fodder Conservation Innovations.	Grain conserved	2	...	...
	Baled hay conserved	2	...	...
	Grain silo erected	2	1	...
	Hay baler owned	2	1	8
Mechanical Innovations.	Bulk truck body owned ...	2	1	...
	Grain auger or blower owned...	2	1	...
	Auto header owned	2	1	...
	Disc tiller owned	2	1	...
	Spray-type sheep dip installed	2	1	10
Miscellaneous Innovations.	Superphosphate tried ...	2	1	...
	Minor element trial undertaken	2	1	...
	Mules operation performed ...	2	1	6
Total Innovation Score		... ...	... ...	42

The Pattern of Adoption of Innovations.

In Table IV, farmers' progress in respect of pasture improvement is compared with their achievements in the other fields of innovation. It is evident that of those farmers who have adopted modern fodder handling methods, those who have carried out soil conservation works, and those who have adopted innovations of the miscellaneous group, a large majority, in each case, has also made considerable progress with pasture improvement. Analysis by means of the χ^2 test discloses a statistically significant association in each case. On the other hand there appears to be no significant relationship between the adoption of pasture improvement and the adoption of mechanical innovations.

The relationship between farmers' scores for pasture improvement, soil conservation and fodder conservation innovations can perhaps be shown more clearly by considering the proportion of farmers having high scores in all three, in two, in one, or in none of the practices. If there were no tendency for farmers who score well in one practice to score well in the others one would expect the classification of farmers into these four groups to result in a frequency distribution of the order of 6, 18, 18 and 6. But the actual frequencies are 11, 15, 7 and 14, which shows that there is a strong tendency for "low" scores to be associated with one another, and for "high" scores in one practice (pasture improvement) to be associated with "high" scores in either or both of the other practices (soil conservation and/or fodder conservation innovations).

The data embodied in Tables IVA, and IVB may be rearranged, by choosing appropriate score intervals, to form either two-by-three or three-by-two cross-classifications,[2] all four of which yield statistically significant associations. This demonstrates that the relationship between scores extends throughout the range of scores, the highest being in general associated with the highest, the lowest with the lowest. In other words not only do farmers who adopt one innovation tend to adopt others, but those who make most progress in one line of innovation also tend to make most progress in the others.

Although statistical verification of this point is not possible, there is some evidence that within the field of mechanical innovations, the pattern of adoption is similar to the pattern of adoption of non-mechanical innovations: a few farmers have purchased many of the new types of machinery, while many farmers have purchased few or none. But judging by the configuration of Table IVD (and similar cross-classifications of the mechanical innovations score with the other individual innovation scores) the two patterns are independent of one another. However, closer inspection of the data shows that high mechanical

[2] Unfortunately, the sample is too small to permit of three-by-three cross-classifications.

TABLE IV.

Relationship between Farmers' Adoption of Pasture Improvement and their Adoption of Other Innovations.

A.

Pasture Improvement Score.	Soil Conservation Score.	
	High (≧ 2).	Low (0).
	Number of farmers.	
High (≧ 4)	15	9
Low (≦ 3)	7	17

$\chi^2 = 5.372$ Significant at 5 per cent. level.

B.

Pasture Improvement Score.	Fodder Conservation Score.	
	High (≧ 4).	Low (≦ 3).
	Number of farmers.	
High (≧ 4)	19	5
Low (≦ 3)	5	19

$\chi^2 = 16.340$ Significant at 1 per cent. level.

C.

Pasture Improvement Score.	Miscellaneous Innovations Score.	
	High (≧ 1).	Low (0).
	Number of farmers.	
High (≧ 4)	11	13
Low (≦ 3)	4	20

$\chi^2 = 4.750$ Significant at 5 per cent. level.

D.

Pasture Improvement Score.	Mechanical Innovations Score.	
	High (≧ 1).	Low (0).
	Number of farmers.	
High (≧ 4)	14	10
Low (≦ 3)	10	14

$\chi^2 = 1.322$ Not statistically significant.

innovation scores are to some extent related to high non-mechanical innovation scores: four of the eight highest scores for mechanical innovations were achieved by farmers whose total non-mechanical innovation scores were among the highest six (i.e., a few farmers were outstanding in the extent to which they had adopted both mechanical and non-mechanical innovations). On the other hand some farmers have adopted many mechanical innovations while displaying little or no interest in any other types of innovation.

These findings may be summed up by saying that *there is a tendency for farmers either to adopt innovations consistently, or consistently to fail to do so.*[3] (This is not to deny the existence of intermediate cases; a tendency only is being described, but the effect of this tendency is to reduce the number of intermediate cases.) This consistency in farmers' behaviour is of considerable significance for the present purpose since it suggests that in the explanation of the adoption pattern of each single innovation there are elements common to all. The procedure adopted here, of discussing innovations generally, rather than separately, is therefore justified.

Interpretation of the Adoption Pattern.

How are these consistent differences in farmers' entrepreneurial behaviour to be explained? Should an explanation be sought in the characteristics of the farmers themselves, or in the features of the farms that they operate? Are some farmers simply more enterprising than others, or would it be more rewarding to postulate that all farmers possess roughly equal entrepreneurial abilities, and seek an explanation in circumstances which enable some to employ the innovations in question more profitably, or with greater technical efficiency than others? Or rather, since it is obvious that some farmers *are* more enterprising than others and that all innovations are *not* equally suited to all farms, the problem is that of making some assessment of the relative importance of these two factors in determining the adoption pattern. But the importance of the enterprise factor cannot be evaluated directly, as enterprise can hardly be observed independently of its achievements. If, however, it is found that differences in farmers' entrepreneurial behaviour cannot be attributed, in large measure, to the presence or absence of opportunities for the employment of the innovations in question, then it is reasonable to suppose that they reflect differences in the entrepreneurial skills and attitudes of the farmers concerned.

[3] Rutherford came to a similar conclusion regarding the pattern of adoption of improved farm practices on coastal dairying farms in New South Wales: ". . . rather than many farmers adopting a few of the practices, most practices were carried on in conjunction with one another on certain farms but were mostly absent on others". See J. Rutherford, "Further Aspects of Dairy Farming on the Lower North Coast", this *Review,* Vol. 20, No. 1 (March, 1952), page 73.

Size of Farm.

Opportunities for the profitable employment of the innovations under discussion will be affected, primarily, by the scale of farm operations. There is every reason for believing that mechanical innovations, such as bulk handling plant, disc tillers, and auto-headers, being large-scale machinery, can only be employed profitably on the larger farms. Table V shows that these machines are in fact being adopted mainly on the larger farms. It is therefore concluded that the pattern of adoption of mechanical innovations can be explained largely in technological and economic terms, i.e., these machines are not being used on many farms simply because it would not pay their operators to do so.

TABLE V.

Relationship between Size of Farms and Mechanical Innovations Score.

Size of Farm.	Mechanical Innovations Score.	
	High (≧ 1).	Low (0).
	Number of farmers.	
≧ 1,000 acres...	13	3
≦ 999 acres	11	21

$\chi^2 = 9.376$ Significant at 1 per cent. level.

TABLE VI.

Relationship between Size of Farm and Non-mechanical Innovations Score.

Size of Farm.	Non-Mechanical Innovations Score.	
	High (≧ 11).	Low (≦ 10).
	Number of farmers.	
≧ 750 acres	12	14
≦ 749 acres	12	10

$\chi^2 = 3.356$ Not statistically significant.

There are also reasons for expecting the adoption of non-mechanical innovations to be influenced by the scale of farm operations. Taken together, these innovations contribute to an overall change in farming policy, a change involving a reduction in wheat acreage and increased emphasis on sheep raising. It might be argued that this change could be put into effect less easily on the smaller farms than on the larger, because an acceptable income can be derived from the former only if they are farmed as intensively as possible—perhaps to the point of soil exploitation, in which case soil improving practices are unlikely to be adopted. Table VI shows, however, that these innovations have been

adopted just as frequently on farms smaller than 750 acres as on larger farms. It would appear, therefore, that technological and economic relations are of little consequence at the present time in determining the pattern of adoption of these innovations. The wide differences in the degree of adoption of these practices *are therefore probably due to the differing skills and attitudes of the farmers concerned.*

Two qualifications of these conclusions must be made. The incidence of adoption of mechanical innovations cannot be adequately explained without reference to the commonplace observation that many people are "mechanically minded" and derive considerable satisfaction from owning and operating machinery. A striking illustration of the way in which such an aptitude may find expression, in unfavourable circumstances, is the fact that the highest mechanical innovation score was achieved by a farmer operating a property of little more than 500 acres.

Secondly, inspection of individual cases suggests that inadequate size may be a factor preventing the adoption of non-mechanical innovations on some of the very small farms. Of seven farmers operating holdings of less than 500 acres, only two have made any noteworthy progress with pasture improvement, soil conservation, or similar practices. Both have abandoned wheat growing. As both these men were advanced in years, and as neither had sons employed on the farm, it seems likely that their willingness to rely exclusively on sheep-raising to provide their income is at least partly due to their ability and willingness to accept unusually low incomes. On the other hand, the five farmers who have undertaken few or none of the innovations in question have family commitments such that the adoption of these innovations would, in the short run at least, probably reduce (or involve the risk of reducing) their incomes to a level which they would regard as unacceptable. These farms can perhaps properly be regarded as "problem" farms, in the sense that, for economic reasons, the usual technical solutions to the problem of soil exploitation cannot be adopted while they remain separate farm units. Aggregation of holdings may be a necessary condition of the adoption of new techniques on these farms.

It seems, then, that the failure of some farmers to carry out innovations can be explained in terms of technical developments outstripping the institutional arrangements for production. But only a small part of the variation in entrepreneurial behaviour is amenable to such an explanation. As an explanation of the overall pattern of adoption of innovations, such considerations are totally inadequate.

Miscellaneous Factors.

Only in very few cases did farmers refer to the existence of circumstances that prevented them from putting innovations into effect. Two tenant operators mentioned their landlords as restraining influences, while one newly-established farmer had quite ambitious plans for adopting new practices, but was prevented from putting them into effect by a lack of capital. Tenure must be discounted as a significant deterrent in the survey area, however, since the two tenants mentioned were the only two encountered on the survey. Study of the situations of farmers, considered individually, shows, too, that lack of capital is not an important restraint, except in the case of the operators of very small properties mentioned above. As will be shown later (see page 211) newly-established farmers are adopting innovations more freely than long-established farmers, even though they, in general, are in debt, while the long-established farmers are generally free of debt.

Technological Relations.

The tendency for farmers either to adopt innovations consistently, or consistently to fail to do so, is, in itself, *prima facie* evidence of the importance of the entrepreneurial factor, since it suggests that farmers have distinctive attitudes towards innovations in general. It is argued here that this is the case, that some farmers are anxious to keep abreast of new developments, while others regard innovations with suspicion. It is further argued that it is the existence of these attitudes which determines the typical pattern of adoption of innovations and that economic and technical considerations are, in the main, only relevant in determining aberrations from this typical pattern.

It might be argued, however, that what has been termed here the "typical pattern of adoption of innovations" is an illusion, derived from viewing a number of changes in isolation, rather than as aspects of a more general change. Since the various practices which conform most strongly to this pattern contribute to a fundamental change in production policy (as described above) should not *this* change perhaps be regarded as the relevant innovation? But this approach would appear to confuse more issues than it elucidates. Although the adoption of pasture improvement and soil and fodder conservation improvements implies some more general policy decision on the part of the farmer, viz., the decision to grow less wheat and run more sheep, the making of this policy decision does *not* necessarily imply the adoption of these particular practices: sheep carrying capacity can be increased by growing more fodder crops, for instance, rather than by pasture improvement; fodder may be conserved by traditional, rather than new methods, and so on. Innovations do not lose their individualities simply because they are consistent with a certain production policy. There are no technical reasons why the adoption of any of these innovations is dependent on the prior or simultaneous adoption of any of the others. (It may be good *management* to advance along the several lines simultaneously, but this observation can hardly be used to support a point of view which would minimize the importance of the management factor.) Furthermore, the fact, cited earlier, that some farmers have achieved very high scores for both mechanical and non-mechanical innovations shows the danger of relying too heavily on contrasting production policies to explain the adoption of different innovations. But even if it is preferred to describe the adoption of the non-mechanical innovations in terms of an overall change in farming policy, the questions remain, why did some farmers change their policy and others not, why did some make the change earlier than others, why did some prosecute the new policy much more vigorously than others? Thus, although the consistency of most of the non-mechanical innovations with a re-orientation of production might lead to the formulation of the problem in somewhat different terms, this reformulation does not constitute an explanation of the phenomenon being investigated.

Farm Income.

Analysis by means of the χ^2 test shows that "innovators" have earned higher incomes, and have had more contact with agricultural extension agencies than "non-innovators". Can the existence of these relationships be reconciled with the explanation of farmers' entrepreneurial behaviour that has been put forward, or do they provide alternative explanations?

TABLE VII.

Relationship between Farmers' Income and their Adoption of Innovations.

A.

Farmer's Income.*	Non-Mechanical Innovations Score.	
	High (≧ 11).	Low (≦ 10).
	Number of farmers.	
≧ £3000	15	7
≦ £2,999	9	16

$\chi^2 = 4.849$ Significant at 5 per cent. level.

B.

Farmer's Income.*	Mechanical Innovations Score.	
	High ≧ 1.	Low (0).
	Number of farmers.	
≧ £3,000	16	6
≦ £2,999	7	18

$\chi^2 = 9.369$ Significant at 1 per cent. level.

* Average net taxable income for years 1951-52 and 1952-53.

In interpreting the relationship between income and innovation scores (see Table VII) it should be noted, firstly that because the scoring system gives most weight to the *fact* of adoption, rather than the *scale* of adoption of a practice, it is possible for farmers earning relatively low incomes to achieve quite high scores in respect of non-mechanical innovations, without recourse to borrowing. And, in fact, four farmers earning less than £1,000 a year did achieve high scores. It is only on those few farms previously designated as "problem" farms that a lack of funds may actually be preventing the operators from carrying out non-mechanical innovations. (Lack of money is almost certainly a more widespread deterrent to the purchase of new machines, which are costly.) Thus, in most cases, it cannot be said that shortage of funds, in an accounting sense, is limiting the adoption of innovations, even if the possibilities of borrowing are ignored. But income may still be regarded as a limiting factor if farmers' probable behaviour, rather than the financial possibilities, is considered. It is reasonable to suppose that the more a farmer's income exceeds his consumption requirements (or, perhaps, the more it exceeds his expectations) the more likely he is to devote part of it to the carrying out of innovations. However, this sort of hypothesis can probably be used legitimately only in historial studies of the behaviour of aggregates of farmers in different periods of

time;[4] it is far too mechanistic an hypothesis to account for differences in the entrepreneurial behaviour of individuals or small groups of farmers at the same point in time. To attempt to use it for this purpose would involve assuming that farm income is, in the short-run, largely beyond the farmer's control. Now while it was legitimate to assume that the farmer cannot vary the size of his farm in the short run, the same assumption cannot be made concerning the size of his income, even though farm size in one of the most important determinants of income. In so far as income is determined by the efficiency with which a farmer uses his resources, it is within his control. Cases can be quoted of farmers overcoming the limitations of small land resources and achieving high incomes; and, more important, *in most of these cases they have also achieved high innovation scores.* When it is considered that (*a*) income is related to farm size, while (*b*) innovation score is *not* related to farm size, it will be seen that the relationship between income and innovation score can only have been brought about by some innovators earning higher incomes, and/or some non-innovators earning lower incomes than is usual on farms of the size that they operate. The existence of a relationship between farm income and innovation score, *in the absence of a parallel relationship between farm size and innovation score* is, then, evidence for the view that both the adoption of innovations and the earning of high incomes are the results of the operation of a third factor, viz., superior entrepreneurial ability.[5]

Farmers' Contact with Extension Services.

Rather similar considerations apply to the fact, established in Table VIII, that within each class of innovation (except the miscellaneous group) "innovators" have made significantly greater use of the extension services than "non-innovators". This relationship would constitute an *explanation* of farmers' consistent behaviour only if their contacts with extension agencies could be regarded, in all relevant respects, as being made at random. This is clearly not the case. While a chance meeting with the district agronomist, or a chance reading of an extension publication might occasionally provide a farmer with the stimulus he needs to adopt an innovation, there can be no doubt that most farmers' contacts with extension personnel are the result of deliberate decisions to do so. The seeking of expert advice—whether individually or by participation in group activities such as field days—is as much an enterprising act as the putting of that advice into effect. Far from providing an alternative explanation, then, the existence of a relationship between farmers' adoption of innovations and their contacts with extension agencies provides, in fact, further evidence of the explanatory value of the enterprise factor.

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[4] Thus the rapid rate of adoption of innovations in the wheat-sheep areas in recent years, as compared with the relative stagnation of the pre-war and immediate post-war years, can probably be largely explained in terms of farmers' response to the sudden increase of their wool incomes in 1950-51, and the sustained high level of wool prices.

[5] The possibility that high incomes are the *result* of rather than a condition of the adoption of innovations is ignored here because most of the innovations being considered have been in use hardly long enough to appreciably affect the output of the survey farms. Furthermore, the main advantage of some innovations lies in their convenience rather than their profitability.

Summary.

The contention of this article, that the marked differences that exist in the extent to which farmers have adopted new farm practices reflect, in the main, equally marked differences in their entrepreneurial skills and attitudes, rests, then, on the following considerations:—

(1) Small scale of production (size of farm) and/or lack of resources would appear to be the factor limiting the adoption of *all* innovations in a few extreme cases only.

(2) This factor is of more general significance in explaining the incidence of adoption of mechanical innovations, but a full explanation of their adoption pattern must take account of the particular mechanical aptitude and interest of some farmers.

(3) There are no necessary technological connections between the various types of innovations to account for their association with one another on the same farms.

(4) The fact that innovators have, in general, earned higher incomes and have had more contacts with the extension services cannot be cited in rebuttal of the view being put forward here, as both the achievement of higher incomes, and the seeking of expert advice are themselves evidence of superior entrepreneurial ability.

Objections.

If it is objected that this evidence is largely of a negative character, it can only be stated that this is in the nature of the case, as any demonstration of the importance of the factor "enterprise" must largely proceed by showing the inadequacy of other factors to the task of explaining the situation. This is not entirely true, however. Evidence and argument will be presented in the next section as to why some farmers might be expected to be, and, in fact are more enterprising than others. Furthermore, the writer would argue that it does not require a very intimate knowledge of farmers' behaviour to be convinced that they possess entrepreneurial ability in markedly different degrees—in fact this was one of the most striking impressions gained on the survey, even though at the outset the bias of the investigation was towards seeking economic and technological explanations of farmers' behaviour.

This leads to a second criticism that might be made, particularly by persons closely acquainted with the farming community, viz., that the conclusion is trivial. In hindsight this criticism may appear to be justified, but the conclusion has seemed, nevertheless, worth reporting, simply because the factor, "enterprise", has been largely neglected in most discussions of the problem with which this article is concerned. The reasons for this neglect are not hard to find. The bias of the

TABLE VIII.

*Relationship between Farmers' Contact with the Extension Services and their Adoption of Innovations.**

A.

"Contact with Extension" Score.	Pasture Improvement Score.	
	High (≧ 4).	Low (≦ 3).
	Number of farmers.	
High (≧ 4)	17	5
Low (≦ 3)	7	17

$\chi^2 = 10.647$ Significant at 1 per cent. level.

B.

"Contact with Extension" Score.	Soil Conservation Score.	
	High (≧ 2).	Low (0).
	Number of farmers.	
High (≧ 4)	15	7
Low (≦ 3)	7	17

$\chi^2 = 7.001$ Significant at 1 per cent. level.

C.

"Contact with Extension" Score.	Fodder Conservation Score.	
	High (≧ 4).	Low (≦ 3).
	Number of farmers.	
High (≧ 4)	17	5
Low (≦ 3)	7	17

$\chi^2 = 10.647$ Significant at 1 per cent. level.

D.

"Contact with Extension" Score.	Mechanical Innovations Score.	
	High (≧ 1).	Low (0).
	Number of farmers.	
High (≧ 4)	15	7
Low (≦ 3)	9	15

$\chi^2 = 4.332$ Significant at 5 per cent. level.

TABLE VIII—*(continued).*

*Relationship between Farmers' Contact with the Extension Services and their Adoption of Innovations**—continued.

E.

"Contact with Extension" Score.	Miscellaneous Innovations Score.	
	High (≧ 1).	Low (0).
	Number of farmers.	
High (≧ 4)	8	4
Low (≦ 3)	7	17

χ^2 = 0·270 Not statistically significant.

* A farmer's "contact with extension" score takes into account whether he—

(i) had met the district agronomist;
(ii) had met the district soil conservation officer;
(iii) had sought information from any extension officer;
(iv) had attended field days;
(v) had visited the local soil conservation station;
(vi) received the *Agricultural Gazette of New South Wales,* one point being allotted for each affirmative answer.

research worker is, naturally enough, in favour of explanations in terms of factors which can be quantified, or, at least, are easily observable. Similarly the bias of the policy-maker is in the direction of explanations involving factors which can be influenced by policy (e.g., land tenure, availability of capital, adequacy of extension services, education), and there is probably no factor less tractable, in this respect, than differences in entrepreneurial ability.

3. ENTERPRISE AND ITS RELATION TO OTHER FACTORS.

To carry the analysis a stage further, the question might be asked whether anything useful can be said concerning the origin and nature of the differences in entrepreneurial attitude and skill which were so apparent among the farmers interviewed.

It is evident that a multiplicity of circumstances might be relevant to an understanding of how one individual came to acquire the necessary experience, knowledge, judgment and other traits which comprise what we call entrepreneurial ability. However, it is possible that some factors are of such overriding importance that their influence can be readily discerned. For example, age and education are two easily observable factors with strong *prima facie* claims for consideration in this connection.

Age.

American studies have shown conclusively that the individual and family life-cycles profoundly influence the scale and intensity of farm operations.[6] On the other hand, research there has in general failed to find any obvious relationship between a farmer's age and the extent to which he adopts improved practices.[7] A similar lack of association must be reported as a finding of the present survey, but it must be admitted that too few farmers were interviewed to attach much weight to this finding. Nevertheless, the result may be worth reporting if only to show that the often-heard assertion that it is the younger farmers who are the most "progressive" is by no means easily demonstrated. Of course, cases of rank conservatism among elderly people are often observed, but, on the other side, it might be mentioned that in the survey area it was the oldest farmer interviewed who first put a pasture improvement programme into effect and who, in terms of proportion of total farm area sown, has since gone furthest with pasture improvement. Again, the highest innovation score was achieved by a farmer in his near-sixties, while a number of farmers in the same age group attained relatively high scores.[8] It has already been mentioned that the only operators of small farms to adopt innovations at all extensively were the older farmers, and it was suggested that they were only able to do this because their family commitments, and hence their income requirements, were small. A somewhat similar explanation of the two outstanding cases mentioned above might be offered, viz., that the greater leisure and fewer commitments of old age provide a favourable opportuity for the indulgence of an experimental or "hobbyist" bent.

Education.

Too few farmers were interviewed to obtain sufficient data for an analysis of the influence of education. Very few of the survey farmers had received any secondary or tertiary education, but it might be noted that of those who had, all showed evidence of possessing entrepreneurial ability of a high order.

Time of Establishment.

In Table IX the innovation scores of recently-established and long-established farmers are compared. It will be observed that, in respect of non-mechanical innovations, there is twice as high a proportion of innovators among those farmers established in the war and post-war years as among those established in pre-war years. Before attempting to account for this relationship, another distinction must be drawn,

[6] See particularly Erven J. Long and Kenneth H. Parsons, *How Family Labor Affects Wisconsin Farming,* University of Wisconsin Research Bulletin 167 (May, 1950).

[7] See *Sociological Research on the Diffusion and Adoption of New Farm Practices* (Report of the Subcommittee on the Diffusion and Adoption of Farm Practices, the Rural Sociological Society), Kentucky Agricultural Experiment Station, University of Kentucky (June, 1952), page 3.

[8] A survey of farmers' response to extension recommendations in the Murrumbidgee Irrigation Area found that "there is evidence to suggest that . . . farmers in the higher age groups respond more favourably". See, *Report on the Agricultural Extension Services in the Murrumbidgee Irrigation Area,* 1952, Bureau of Agricultural Economics, Department of Commerce and Agriculture, Canberra (November, 1953), page 2.

viz., between the behaviour of farmers who have spent the greater part of their lives in the survey district, and newcomers from other districts. Of the 23 farmers established since 1940, nine are immigrants from other districts, while the remainder are second (or later) generation inhabitants of the area. All but one of the nine newcomers attained "high" non-mechanical innnovation scores; of the locals, nine achieved "high" scores, and five, "low" scores. These data, though too few to be subjected to statistical analysis, are sufficiently suggestive to warrant further discussion, particularly as a number of considerations would lead one to expect the existence of both relationships.

Farmers established in pre-war years may be less enterprising than newly-established farmers because they share a number of attitudes and habits of mind engendered by their common experience of the depression of the 'thirties. Such attitudes as pessimism concerning long-term price prospects, strong aversion to taking risks in general, and to borrowing in particular, are typical products of depression experience and clearly inhibit the development of an expansionist, optimistic outlook which is probably characteristic of the most enterprising individuals.

TABLE IX.

*Relationship between Time of Establishment and Innovation Scores.**

A.

When Established on Present Farm.	Non-Mechanical Innovations Score.	
	High (≧ 11).	Low (≦ 10).
	Number of farmers.	
1940 or later	16	7
1939 or earlier...	8	14

$\chi^2 = 4{\cdot}979$ Significant at 5 per cent. level.

B.

When Established on Present Farm.	Mechanical Innovations Score.	
	High (≧ 1).	Low (0).
	Number of farmers.	
1940 or later	10	13
1939 or earlier...	13	9

$\chi^2 = 1{\cdot}097$ Not significant.

* Two tenant farmers, and one part-time farmer have been excluded from the analysis.

In addition to the particular historical circumstances of the depression, there is another, more general circumstance which is probably of as great, if not of greater significance in accounting for the contrasting behaviour of newly-established and long-established farmers. This is simply the fact that for the farmer long-established on the same property, management probably becomes largely a matter of routine—a quasi-rational process—in which genuine decision-making is to a great extent replaced by habitual behaviour;[9] farm management being reduced to routine, the farm tends, as it were, to "run itself". Farming methods which, through familiarity and constant repetition, become habitual, acquire a value and inertia of their own and are only abandoned reluctantly, in exceptional circumstances, or in the face of overwhelming evidence of the superiority of newer methods.

By contrast, newly-established farmers have a freshness of outlook, a more rational attitude to farm management, which makes them more alive to the possibilities of change and hence more likely to carry out innovations.

This argument applies *a fortiori* in the case of newcomers to a district. Apart from the obvious likelihood that they will make use of techniques which are commonly used in their home district but which are relatively unknown in the new district, the mere fact that they are acquainted with another farming tradiation is likely to dispose them towards criticism of the new tradition in which they find themselves. As they have fewer local contacts, they are more likely to rely on formal sources of farm information, and, in particular, on the extension services.[10] Furthermore, as newcomers are already "outsiders", they are better able to risk their neighbours' ridicule if the new technique that they have adopted proves to be a failure.

These tendencies find fullest expression in the case of those individuals who are newcomers to *farming*. Evidence obtained on the survey suggests that their lack of practical farming experience, far from being a barrier to success, is a positive asset, by virtue of the freedom from preconceptions that it confers. At any rate, by far the most successful farmer interviewed, and another extremely enterprising farmer, both had non-farm backgrounds, and little farming experience before purchasing their present properties.

It might be argued, against the psychological arguments advanced above, that a simple and adequate explanation of the differing entrepreneurial behaviour of newly-established and long-established farmers is to be found in the fact that the former usually have debts to repay—debts which they must incur, if they are to become established at all—while the latter are generally free of debt (see Table X). While it is true that the desire to repay debts (which in most cases will be quite heavy) will act as an incentive to greater effort on the part of the newly-established farmer, it is very doubtful whether enterprise stimulated by such a desire will find expression in the adoption of innovations. A

[9] For a discussion of the distinction between genuine decision-making and habitual behaviour, see George Katona, *Psychological Analysis of Economic Behaviour*, McGraw-Hill, New York, 1951, p. 49.

[10] All but one of the nine newcomers have sought advice of the district agronomist and/or the district soil conservation officer.

course frequently followed by newly-established farmers is to farm the land as intensively as possible during the first few years in order to reduce the debt burden as quickly as possible. During this phase the farmer will probably have little use for technical refinements; he will frequently deliberately exploit his assets by allowing both soil fertility and the condition of plant and structures to decline. However, this period may be relatively short—for many farmers established in the last decade it was considerably shortened by the high wheat prices which they received in the immediate post-war years and the high wool prices which have prevailed since 1950-51—and the farmer is then likely to direct his efforts towards improving and developing his property. The need for and the direction of such improvement will frequently be indicated by the deterioration in the farm assets which occurred in the first years of occupation. This second period will be the period of innovation.

TABLE X.

Relationship between Time of Establishment and Indebtedness.

When Established on Present Farm.	Debt Position of Farmer.	
	In Debt.	Free of Debt.
	Number of farmers.	
1940 or later	16	8
1939 or earlier...	1	17

χ^2 = 13.509 Significant at 1 per cent. level, applying Yate's Correction.

Enterprise in Other Fields.

What justification, apart from linguistic usage, is there for identifying the adoption of innovations with "enterprise" or "entrepreneurial abilility"? Enterprise or ability can manifest itself in many ways other than in the carrying out of innovations. Are innovators more enterprising than non-innovators, or are they simply enterprising in different ways?

A strong impression was gained on the survey that, typically, innovators are more enterprising in every way than non-innovators. They appear to be generally more efficient as managers, to possess greater business ability, are frequently harder-working, and in some cases possess uncommon qualities of leadership. Little evidence of a statistical nature can be presented in support of these views; they are based, rather, on a consideration of a number of outstanding individual cases.

"Leadership".

Five of the farmers interviewed were markedly more active than the rest in local and district affairs: between them they held most of the important positions in the growers' organizations and on local committees. Three of these men had the highest innovation scores of all farmers interviewed, and the remaining two both had high scores.

Business Ability.

The majority of farmers cannot be said to have a business-like attitude to farm management. It might be said, rather, that their behaviour is typically directed towards *avoiding* business obligations and isolating themselves from the forces of the market. They try to rely as far as possible on their own or their families' capital and labour resources, and thus avoid market commitments with respect to these factors. (The reluctance of many farmers to make use of credit—except for the purchase of property—has frequently been noted, and received further confirmation on the present survey.[11] Farmers also appear to be reluctant—though not, perhaps, in the same degree—to employ non-family labour on a permanent basis: the notion that farms should be restricted in size to a "home-maintenance area", besides being embodied in legislation, is widely held by farmers.) This tendency finds

TABLE XI.

Farmers' Attitudes to Borrowing.

Attitude.	Type of Answer.	Number of Farmers.	
Enthusiasm ...	"Borrow all you can"—"You won't get anywhere if you don't borrow". "You can put your property years ahead with borrowed money."	10	10
Approval ...	"Borrow all that's necessary, but cut out luxuries."	4	...
	"It is quite all right to borrow to-day—prices are high and you have a chance to pay it back."	3	...
	Miscellaneous	4	11
Necessity ...	"There is no harm in borrowing"—"You have to borrow to get started."	3	3
Disapproval ...	"The present is not a good time to borrow: if things slump . . ."	4	...
	"Don't borrow if you can help it"	8	...
	Miscellaneous	2	14
Strong Disapproval.	"I have never borrowed"—"I have never considered borrowing"—"I don't believe in borrowed money."	5	5

expression in other ways, too, for example, in wheatgrowers' willingness to delegate the marketing function to a central authority, and their acceptance of stabilization schemes. In farm operations there is frequently a choice available between using purchased or home-produced factors of production, and farmers appear frequently to choose the latter course in principle, irrespective of economic considerations.[12]

The wide currency of the type of behaviour outlined above suggests "willingness to enter into market relationships" as a measure of an

[11] See Table XI.

[12] This attitude has been neatly characterized as "a 'cost-reducing' rather than a profit-maximizing' attitude'. See Alan G. Lloyd, "Subsidizing Approved Farm Practices", this *Review*, Vol. 22, No. 2 (June, 1954), page 76.

individual's business ability. On this criterion, two farmers interviewed possessed "business" attitudes in an outstanding degree. These were the two farmers of non-farm background mentioned earlier. Both made extensive use of credit, including concessional credit. Both employed permanent hired labour and sharefarmers, bought sheep rather than bred them, dealt in sheep and bought fodder rather than grew it. Other evidence of their businesslike approach to farming is the fact that both had been influenced in their investment decisions by the existence of special income-tax depreciation allowances. The behaviour of these men approximated to text-book accounts of the behaviour of entrepreneurs, and both obviously conceived themselves in this role: they devoted much more of their time to management than do most farmers, and were able to do this because they left most of the routine manual work on their properties to their employees.[13]

The behaviour of six other farmers approximated to the entrepreneurial mode,[14] the two outstanding cases of which have just been described. All eight farmers earned high incomes (five earned more than £4,000, and three more than £3,000) and all appeared to have established themselves, and reached their present position of relative affluence largely by their own initiative and effort, not through inheritance or with parental assistance. *They all achieved high innovation scores.* (Two of these farmers are also included amongst the five already mentioned as displaying outstanding qualities of leadership. Thus, all eleven persons who showed outstanding enterprise in fields other than innovation were also innovators.)

Farmers' attitudes to business matters are even more likely to be the fruits of depression or boom experience than are their dispositions towards innovations. Unfortunately it is not possible to test the data for the existence of such a relationship, as no score for "business ability", of precision equivalent to the "innovation score", can be devised.[15] However, in this connection it might be noted that seven of the eight "entrepreneurs" just mentioned were established on their own farms after the depression—six of them at such a time (the early post-war years) that the boom prices of recent years were probably of maximum benefit to them. Furthermore, there is evidence that a number of farmers

[13] The fact that most farmers, for the greater part of their working lives, are engaged in manual labour, perhaps provides a clue to their attitudes and behaviour. These may be understood more easily if the farmer is regarded as an artisan, or a technician, rather than an entrepreneur or a business-man. If this is the case, the policy of the extension services of concentrating, for the most part, on the technical rather than the economic advantages of recommended practices may not be so misguided as some critics have asserted.

[14] They satisfied at least three of the following criteria: a favourable disposition towards borrowing, being in debt, employing permanent non-family labour, dealing in sheep.

[15] This is partly because the aspects of farmers' behaviour which would enter into such a score—viz., their employment of purchased factors of production—are far more subject to particular circumstances than is the adoption of innovations. For example, the connection between time of establishment and indebtedness is, to a large extent, of the nature of a necessary connection which would exist whether or not newly-established farmers had different attitudes to credit than long-established farmers.

are revising their attitudes in the light of recent prosperity. The following are examples of farmers' replies to the question relating to their attitudes towards borrowing:—

"If I had my time over again I would borrow all I could get."

"If I had borrowed more when I first came here I would be much better off to-day. I wasn't game enough: I'm getting a bit gamer."

"Don't borrow any more than you can help. But I have seen young fellows come to this district since the war who borrowed all they could and who are now wealthy."

"It is a lot better to go into debt now with inflation."

Conclusions.

In the light of the preceding discussion it is now possible to come to some tentative conclusions regarding the nature and origin of differences in what has been termed "farmers' entrepreneurial attitudes and skills".

(1) Although, in some cases, the carrying out of innovations represents the indulgence of a special interest—in particular a technical or "hobbyist" interest[16]—all the available evidence points to the fact that the differing propensities to innovate reflect, in the main, personality differences of a more fundamental and more general nature. The identification of the propensity to innovate with "enterprise" or "entrepreneurial ability" is justified both by the evidence, just presented, relating to business ability and leadership, and the facts, cited earlier, that innovators tend to earn higher incomes and seek more expert advice than non-innovators.

(2) The phrase "entrepreneurial ability" might be misleading if it is conceived narrowly, in the sense of an inate capacity for a certain type of behaviour. As our discussion of the influence of time of establishment on entrepreneurial behaviour has shown, farmers' propensities to innovate reflect not only their inherent capacities for this type of action, but also their attitudes of mind, the origins of which can be traced to the situations in which they are placed, or were placed on some past occasion. Depression and boom experiences are particularly significant in the formation of these attitudes and warrant special attention because they are experiences that have been shared by so many farmers.

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[16] A number of references have already been made to this aspect of farmers' behaviour (see pages 203 and 204). The impression was gained that this sort of technical interest, in respect of new machinery, is manifested by so many farmers as to affect significantly the rate of adoption of mechanical innovations. A number of cases were encountered of farmers who displayed little or no interest in non-mechanical innovations, and whose attitudes, on the whole appeared to be unenterprising, nevertheless achieving high mechanical innovation scores. In general, the survey results support the view that, bearing in mind economic and technological limitations, mechanical innovations are accepted much more readily than non-mechanical ones.

A few farmers were encountered who had a similar technical interest in non-mechanical innovations. Such persons appear to constitute a particular sociological type, one or two representatives of which are usually encountered in any farming community. They have been characterized as being "somewhat socially isolated", having "outside contacts through reading and friends" and having "personality characteristics of independence and self-sufficiency"—see *Sociological Research on the Diffusion and Adoption of New Farm Practices* (previously cited), page 5.

To conclude that enterprising behaviour reflects the possession, not only of superior abilities, but also of particular attitudes, which are a response to past experience, in no way impugns the general position put forward in the second section of this article. It is a psychological response that is involved, not a response to the logic of economics and technology. But this conclusion does show that farmers' differing entrepreneurial skills and attitudes are not immutable things, the importance of which may be recognized but about which nothing useful can be said. They are subject to change, reflecting as they do the current and the past economic and cultural climate, and, in this aspect are a suitable subject for study and for consideration in the formation of policy.

WARTIME AGRICULTURE IN AUSTRALIA.

The story of agriculture in Australia and New Zealand during World War II and the immediate post-war period is the subject of an interesting book recently published by the Food Research Institute of Stanford University.[1] The Australian portion of the book was written by three agricultural economists (J. G. Crawford, C. P. Dowsett and D. B. Williams) and one agricultural scientist (C. M. Donald), all of whom were intimately concerned with the wartime administration of Australian agriculture. The official wartime historian for the New Zealand Department of Agriculture (A. A. Ross) was responsible for the section devoted to New Zealand. This comment will be concerned mainly with the major section dealing with Australia.

This is the first detailed description of wartime agricultural policy in Australia and, therefore, of the historical background responsible for some of our present problems. As such alone, this book deserves to be read by those interested in our rural industries. It should do much to stimulate discussion on agricultural policies; a subject which has received much less attention than it deserves and much less than it receives in many other countries. Apart from its particular interest to Australian readers, the book is worth recommending. The authors have told their story well and in a very pleasing and relaxed style. Lucid, theoretical argument, agricultural description and discussion of wartime developments are all well combined.

The order of treatment in a book dealing with wartime agricultural developments poses some essentially insoluble problems. If a strictly chronological order is adopted, frequent changes from one industry to another are unavoidable. If industries are discussed separately, there is much duplication of experiences and problems common to the whole rural economy. The authors have adopted a compromise order of

[1] *Wartime Agriculture in Australia and New zealand, 1939-1950.* J. G. Crawford, C. M. Donald, C. P. Dowsett and D. B. Williams; and A. A. Ross. Stanford University Press, Stanford, 1954. Pp. xiii, 354. $7.50.