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FAT LAMB CROSSES IN CANTERBURY

By I. E. COOP and V. R. CLARK, Lincoln College.

Introduction.

THE province of Canterbury extending from the Conway river in the north to the Waitaki in the south and stretching back to the Main Divide occupies $9\frac{1}{2}$ million acres, and carries $5\frac{1}{2}$ million sheep of which $3\frac{1}{2}$ -4 million are breeding ewes. On the tussockland hill country store sheep are produced, while on the plains fat lamb production associated with arable farming takes place. Owing to the relatively dry climate and cold winter, supplementary feeding of ewes in winter and of weaned lambs in the summer is necessary on most fat lamb farms. Over Canterbury as a whole fine woolled sheep predominate, there being approximately 3 fine woolled halfbred and Corriedale ewes to every 2 Romneys, both on the hill and on the plains. These factors should be borne in mind when considering the fat lamb industry of the province.

From an analysis of the proportions of fat lamb to breeding ewe sires it is estimated that $1\frac{1}{4}$ million ewes are mated each year to fat lamb sires, and 2 million to halfbred, Corriedale and Romney rams. Of fat lamb sires used 60% are Southdown, 20% are Border Leicester and 20% are Ryeland, Suffolk, English Leicester and other breeds. The considered opinions of experienced Canterbury farmers and fat lamb buyers place the percentage of lambs drafted fat off the mothers on fat lamb farms at well below 50%. An analysis of lamb killings at all Canterbury freezing works puts the percentage between 30-35%. From this it is clear that even for Southdown cross lambs the figure is well below 50%.

This very brief introduction to the position in Canterbury serves merely to give a background to the experiments now to be described. It was decided to compare and investigate on a strictly comparable basis the relative merits of the Southdown and Border Leicester as fat lamb sires. The Southdown is usually considered to be best suited for production of milk lambs of light weight and high quality and the Border Leicester for feeder lambs of heavier weight though of poorer carcass quality.

Design of Experiments.

The experiments were carried out over two complete seasons 1947-48 and 1948-49 at the Kirwee Experimental Farm which was then on loan to Lincoln College from the Department of Agriculture. Uniform lines of 5 and 6 year old Romney and Corriedale ewes were randomised into the following groups, each of 60 ewes.

Group	Ram	X	Ewe
I	Romney	X	Romney
II	Southdown	X	Romney
III	Border Leicester	X	Romney
IV	Corriedale	X	Corriedale
V	Southdown	X	Corriedale
VI	Border Leicester	X	Corriedale

Just prior to lambing each group was subdivided into two, one of which was placed on a high plane of nutrition and the other on a low plane. The high plane feeding, consisting of first-class pasture, was designed to produce a large percentage of lambs drafted fat off the mothers. The low plane feeding, consisting of poor pasture heavily stocked, was intended primarily, to provide store lambs for subsequent fattening on rape, and secondarily, for comparison of breed crosses under poor feeding conditions.

In order to make the sheep used as representative of the breed as possible, an entirely new set of ewes bred on different country was used in the second year and a new set of rams was also used. All the rams were College bred.

All ewes and lambs were weighed at approximately monthly intervals. The final weighing and drafting were done on one day. The lamb buyer who drafted the lambs was instructed not to take many "seconds" and not to go harder on any one cross than another. Individual carcass weights, grades and measurements were made at the freezing works. The lambs could have been drafted on a purely objective live-weight basis—Southdown cross 65lbs. and over, pure Romney and Corriedale 70lbs. and over, Border Leicester cross 75lbs. and over. We believe that this is more accurate and have included in the tables a column representing the percentage of lambs that would have been drafted on such a basis.

Results obtained.

The results obtained for the High Plane single lambs during the seasons 1947-48 and 1948-49 are given in Tables I and II respectively. Twins have not been considered as the numbers in both seasons were very small. The number of singles per group averaged 20 with extreme variations of 15-25.

TABLE I. (H.P. lambs. 1947-48. Singles only).

Ram-Ewe	Average Live Wt.	Per cent. Drafted	Per cent. Drafted Wt. Basis	Average Carcass Wt.	Per cent. Second Grade.
R X R	66.8	40	40	33.4	14
SD X R	67.8	70	65	35.4	7
BL X R	78.4	62	80	38.8	0
C X C	62.9	33	35	35.3	0
SD X C	62.3	33	42	33.6	0
BL X C	76.6	78	67	38.2	21

Note (1) The percentage drafted (third column) is that drafted by the lamb buyer. The average carcass weight (fifth column) and percentage of seconds (sixth column) refer to this draft of lambs. The fourth column gives the percentage which would have been drafted on the objective weight basis mentioned.

(2) No corrections have been made for male to female ratio.

(3) The average age of all Southdown and Border Leicester cross groups was 111 days at drafting while Romneys were 109 and Corriedales 113 days.

TABLE II (H.P. lambs. 1948-49. Singles only).

Ram-Ewe	Average Live Wt.	Per cent. Drafted	Per cent. Drafted Wt. Basis	Average Carcass Wt.	Per cent. Second Grade.
R X R	78.1	83	78	37.5	7
SD X R	77.9	100	100	37.1	0
BL X R	88.5	100	100	41.4	5
C X C	67.6	60	43	34.0	33
SD X C	72.9	90	85	35.7	5
BL X C	82.5	74	70	39.9	0

Note (1) See note (1) above.

(2) See note (2) above.

(3) Owing to the Christmas-New Year break the lambs were on an average 121 days old at drafting, with extreme group averages of 120 and 122 days. It could be said that the lambs should have been drafted earlier. They were weighed at 90 days and on the 65/70/75lb.

live-weight basis already mentioned the percentage drafted would have been as follows:—

R X R—67%, SD X R—69%, BL X R—70%, C X C—5%, SD X C—59%, BL X C—35%.

Low Plane Lambs Drafted.

Very few lambs were drafted fat from the Low Plane groups. On an average the lambs were 10-15lbs. lighter than those on the High Plane. As an average over both seasons the Southdown increased live-weight by 4lbs. in comparison with the pure breeds, and increased the percentage of single lambs drafted fat from almost zero to 35%. The use of the Border Leicester increased live-weight by a further 5lbs. over the Southdown but with a drop of 20% drafted fat. Here the superior conformation of the Southdown enables more to be drafted.

Rape Lambs. The weaned lambs were fattened on rape for a period of 7-8 weeks in both seasons. There were 20-40 lambs per group. In Table III are recorded the live-weight gains and the carcass weights of these lambs.

TABLE III. (Live-weight increases of Store Lambs on Rape).

Ram-Ewe.	1947-48			1948-49		
	Initial average live Wt.	Average live Wt. gain.	Average carcass Wt.	Average initial live Wt.	Average live Wt. gain.	Average carcass Wt.
R X R	57.3	24.6	36.3	56.3	25.0	35.8
SD X R	58.8	21.9	37.9	53.0	24.0	35.9
BL X R	65.2	27.3	41.5	62.4	25.9	40.5
C X C	56.8	23.0	36.1	55.9	21.8	35.2
SD X C	55.6	21.7	35.7	53.9	21.4	35.3
BL X C	60.4	25.4	38.6	60.4	25.5	38.9

From the results quoted the following conclusions may be drawn:—

(I) By comparison with the pure breeds the Border Leicester increases live weight, percentage drafted and carcass weight whereas the Southdown increases percentage drafted only.

(II) Comparing the Border Leicester with the Southdown on good feed, lambs by the former are invariably 10lbs. heavier in live weight and 4lbs. heavier in the carcass weight at the same age at weaning. The percentage of lambs drafted has varied somewhat between seasons and between dams, but on average there has been no difference between the Border Leicester and Southdown crosses.

(III) The percentage of second grade carcasses was low, and what variations there were between breeds, do not alter the conclusions mentioned.

(IV) From live-weight data, there is no evidence that the comparisons would have been altered significantly by drafting earlier.

(V) On the low plane feeding the Border Leicester cross lambs had a 5lb. live-weight advantage over the Southdown, but this was offset by a lower percentage drafted (20% as compared with 35%). This is a strong point in favour of the SD under conditions of poor feeding.

(VI) As feeder lambs on rape the live-weight gains in a given time were consistently in the order—Border Leicester, Pure Breed, Southdown, though the differences were significant in only one of the two seasons. The carcass weights of the Border Leicester feeder lambs were 3½-4lbs. heavier than those of the Southdown, with no differences in the percentage of Seconds. This offsets the advantage of the Southdown mentioned in the previous paragraph.

(VII) Comparing the effect of the breed of ewe, lambs out of the Romneys proved to be superior to those out of Corriedales in live-weight, percentage drafted and carcass weight.

Interpretation of Results.

The results of the trials described may be summed up by saying that in comparison with the Southdown sire the Border Leicester sire gives a 10% increase in meat production, with little loss in grading. This applies both to milk lambs and feeder lambs, and to lambs out of both Romney and Corriedale ewes.

It is realised that the trials extended over two seasons only and on one set of environmental conditions only. For this reason they are being continued at Ashley Dene (Lincoln College). Nevertheless, in spite of these limitations, it is believed that the trials have indicated, or even shown, something which has hitherto not been realised fully.

We have always been led to believe that the Southdown is the fat lamb sire par excellence, without serious rival from any quarter. Indeed the good name of New Zealand lamb and the present status of the fat lamb industry in the country as a whole is, to a large extent, dependent on the use of the Southdown sire. The greatest care must therefore be exercised in interpreting the results of our trials. Accordingly several aspects of the Border Leicester-Southdown comparison must be mentioned. The Southdown gained its popularity as a sire for the 28-36lb. lamb, which was in demand before the war and for which a differential price schedule and grading system was evolved. For such lambs there is still no rival to the Southdown. But if we wish to produce more meat it seems a little incongruous to encourage us to produce light weight carcasses. If the trials carried out over two seasons at Kirwee can be considered a fair and accurate comparison, then it appears that meat production could be increased by at least 10% by no other means than using a different sire—a heavy weight sire in place of the light weight Southdown.

It might be argued that the 10% more weight may not contain 10% more calories. Certainly at equal carcass weights the Border Leicester cross lambs contain less fat and hence fewer calories than the Southdown cross. But with a Border Leicester cross carcass 4lbs. heavier than the Southdown cross the difference in calorie content is probably small. A few Border Leicester cross lambs have been dissected and shown to contain approximately 1% more bone, $\frac{1}{2}$ % more fat, and $1\frac{1}{2}$ % less muscle than Southdown cross lambs 4-5lbs. lighter in carcass weight.

On the question of grading it should be remembered that in Canterbury we have only two grades—Prime and Second. In the North Island where there is a third and top grade—Down cross, there is no doubt that the Border Leicester would be handicapped. The Border Leicester cross carcasses are longer in the leg and few would grade Down Cross, whereas many of the Southdown cross carcasses would. This difference in quality grading together with a higher weight grade means that in the North Island the Border Leicester cross carcass is worth $\frac{1}{4}$ d per lb. less than the Southdown cross lamb. Instead of getting 4/- for the extra 4lbs. the North Island farmer receives $\frac{1}{8}$ and the South Island farmer $\frac{2}{4}$. There is little doubt that if advantage is to be taken of this means of increasing meat production the lamb grading system must be revised, so that the farmer is encouraged to produce heavier weight lambs and rewarded in proportion to the extra meat produced.

Throughout the Kirwee trials the Border Leicester sire has been used as representing the heavy fat lamb sires. Others may well produce a similar result. Suffolk, Shropshire, Dorset Horn, Ryeland, South-Suffolk and Southdown X Border Leicester and other similar rams might be expected to produce heavier lambs than Southdown cross lambs. Whether they would give the same percentage fat off the mothers has

yet to be investigated. It is possible that more favourable results even than those achieved with the Border Leicester might be obtained from the heavy Down breeds, since they are less leggy and their lambs might grade better under the North Island grading system. Any change from the Southdown to the heavy sires must of necessity be slow, since the ram breeding flocks of the latter breeds are small in number and size. While a change in this direction should certainly be made if more meat is wanted, another, but less tangible possibility remains to be explored. Some breeders maintain that the present-day Southdown is much smaller than it used to be 20 or 30 years ago. Such a belief would be difficult to confirm, but it suggests that Southdown breeders having achieved conformation might now concentrate on getting size into the breed. In other words, it may be possible to evolve within the Southdown breed itself a larger and heavier strain than that now in use. Such a procedure, if it is possible, would probably take a longer time, but would have the advantage that there are already many Southdown flocks in the country and it would cause less disturbance to the present organisation of the fat lamb industry.

Basically, however, the problem lies in predicting the long-term fat lamb market. For the next 5-6 years we have a guaranteed market, but what lies beyond? Will we again have a quota and a highly selective market? If so, we should not make any move that would hinder a rapid return to the light weight Southdown cross lamb. But if world food shortages, and meat shortages in particular, are to continue for another 10 years or longer, as food production struggles to keep pace with world population trends and increasing standards of living a different situation exists. For such a situation it seems that we are not exploiting to the full our meat producing potentialities by using a light weight sire.

Probably in no place is there a brighter future for the heavy sires than in Canterbury. The low percentage of lambs drafted fat, the absence of a Down Cross grade, the highly seasonal nature of pasture production, the association of fat lamb production with arable farming and the presence of heavy sire studs within the province all favour continued and even greater use of the heavy sires. But if the alleviation of long-term world food shortages is taken seriously by the meat producers of New Zealand increased meat production should be possible in all provinces.

The authors would like to thank the Department of Agriculture for the loan of the Kirwee farm where the experiments were conducted.

Discussion on Papers presented by Miss Walker and by Prof. Coop and Mr. Clark

Mr. MITCHELL Senr.: I am a North Island lamb fatterer. Last year I tried out Border Leicester and Southdown rams. The ewes and the lambs all ran together and they were drafted separately. The first draft went off about the middle of November. The Southdowns averaged 36.5lbs. and 64% were graded Down Cross and the Border Leicester cross averaged 14lbs. more and 33% were graded Down Cross. The difference in price was 3d a lamb. In January the difference in price was 4d, and the difference in weights was practically the same. The Southdowns graded 83 per cent. Down Cross, and the Border Leicesters 54 per cent. Down Cross. The difference in price was 3d and 4d in favour of the Border Leicester, though there was 14lbs. difference in weight. As this was a very good season for lamb fattening I wondered how the Border Leicester would show up in a less favourable season.

PROFESSOR COOP: In our work at Kirwee we found that on low-plane feeding conditions, the Southdown had an advantage over the Border Leicester. In other words, the Southdown showed up to greater advantage under poor feeding conditions. If, however, you fatten those lambs which do not go fat off the mother on rape, the Border Leicester provides a carcass which is 4lbs. heavier.

Dr. McMEEKAN: The Ruakura story is that the 1947-48 season was the worst fat-lamb season and the differences in that year tended to be smaller. The difference between the two experimental groups involving the Southdown and the Suffolk was over 7lbs. in the first year 1946-47, 4lb. in 1947-48 and 5lb. this year which was a very good year. The Southdown Cross lambs were heavier than in the previous seasons by about 4lbs. a lamb. I would like to see the subject discussed from the angle of the general principles involved. There are a lot of wide angles—political, economic and financial—involved in this proposition as well as humanitarian considerations.

Mr. SIMPSON: In the Gisborne district there are a lot of late lambs and the attitude of the farmer is "better a late lamb than no lamb at all." I wondered whether it would not be a good idea to put out one of these bigger frame rams such as the Border Leicester.

Dr. FILMER: Accepting Dr. McMeekan's suggestion about broad issues, a friend of mine came back from Great Britain recently and said that he had had so much fish that his stomach was going in and out with the tide. It seems to me that the meat shortage in Great Britain is something we do not yet sufficiently realise when we continue to pay a premium for light weight lambs. Someone this morning said that Great Britain had always wanted light weight lambs. I even question that. Pre-war London wanted light weight lambs, but I think there has always been a sale for heavy weight lambs in other parts of England. We discussed this question at Ruakura some months ago with a prominent British Southdown breeder. He entirely sympathised with the idea of producing more meat for Britain by the use of heavy weight rams or by any other method. He said that he, himself, in Britain to-day was producing fat-lambs by swinging over to the Suffolk ram since he could not get the weight of Southdown cross lambs above 45lbs., whereas he could sell the Suffolk cross at 65lbs. and he was being paid about 2/- a pound for it. It has been said we have to guard our market in Great Britain. It would appear that there can be no immediate solution of the meat shortage. If the demand for small fat-lambs ever comes again in Great Britain there is surely no evidence that it can come overnight and surprise us. As long as we maintain our Romney

flocks in the North Island and halfbred flocks in the South Island we should be able to revert readily to the lighter lambs. My only concern is that the change to a heavier lamb is likely to be too slow if we rely on the use of a large breed of ram. I would like to hear the views of some more people who have used the cross bred rams because it seems to me best to put a breed like the Suffolk over the Southdown ewes. There should be sufficient rams available in Australia to make at least an appreciable start along those lines.

PROFESSOR COOP: In answer to Dr. Filmer, I think that he is quite right that the quickest way to do this is to produce a Suffolk Southdown cross. What sort of a lambing percentage would you get using a heavy sire on a Southdown ewe? I do not know whether it has been done. Lambing would be more difficult than by using a Southdown ram on a Suffolk ewe.

Dr. McMEEKAN: Dr. Hammond used a Shire stallion on a Shetland mare and managed to foal her quite successfully. It has been done and is being done at the present time by people in the North Island and I understand in the South. In this connection I would like to read a letter of this particular subject which I have just received from Dr. Hammond, who as some of you know has been one of the staunchest advocates of the light weight lamb situation as far as the New Zealand-Great Britain meat relationships are concerned. I explained the story to him as it has been described to-day and asked his opinion. He replied along these lines. "If you saw the meat ration this week-end, a knuckle end only of a leg of lamb for three people for one week the small joints of 28 to 34lb. lambs becomes an absurdity. You would have to knock them down to 15lb. lambs to give us a whole joint for a week. If you make any change there is one thing you must not do if you wish to maintain the quality of your meat and that is they should not carry any more fat than the present lambs do. We buy meat now for the lean meat and not the fat. If you do change your policy tell the farmers exactly what you are doing and advise them to use Suffolk or half-bred Suffolk-Southdown rams for a few years at least until the shortage has been made good and then if necessary go back to the Southdown. As you pointed out, the change is easily reversible. You should also warn Southdown ram breeders not to give up their purebred flocks but to breed a number of Southdown-Suffolk rams for crossing purposes. As you know we are hunting South Africa and Australia for meat. This will take a few years to come on to the market. If it does you should then reconsider whether you should go back to the small carcass. I do not see that lambs should not take the place of much of the beef we get from the Argentine. People like it better than beef provided the price per pound is not too much above beef, for our ration on a money basis is 10d for fresh meat and 2d for canned meat which is not very high."

Mr. HUNT: We have been told by geneticists that the dam has a much greater effect on the size of the progeny than the sire. Would it not be more practical to increase the size of the Romney dam than to use a different sized sire?

PROFESSOR COOP: I would be very hostile to that. I think we ought to go the other way altogether and make the ewes smaller so that we can carry more of them and get more lambs.

Dr. RICHARDSON: How does the efficiency with which these various crosses convert grass to meat compare? It is obviously not much use producing a lamb of say 5 per cent. extra weight if to produce that weight it consumes 20 per cent. extra grass. Dr. McMeekan has mentioned the need for lean rather than fat meat. Is there any information available as to the amount of grass necessary to produce lean meat rather than fat?

Dr. McMEEKAN: Dr. Richardson has put his finger on what is one of the fundamentally weak spots in our knowledge of nutrition as related to animal production. It will be obvious that we will not be able to go far in solving those problems or problems inherent in this question until we can measure the intake of the free grazing animal. As I think I have mentioned here on previous occasions, that, to my mind, constitutes the greatest single problem facing nutritional workers at the present time. Until it is possible to measure how much a grazing ewe or grazing lamb consumes per day or per pound of live-weight increase we will not progress far with that particular issue. Arguing on general principles from work on some Southdowns where one has been able to measure intake I would be surprised if the fat type of meat animal can be produced with the same efficiency per pound of nutrient supplied as the lean type of animal. In other words, I would expect under free grazing conditions greater efficiency in terms of total calorific value and protein value per pound or hundred pounds of dry matter of pasture consumed from Suffolk cross than the Southdown. Mr. Candy has put Dr. Richardson's question from another point of view but it is the same question essentially. He asked me whether we could carry as many per acre as we could of the lighter Southdown type. I would say on most fat-lamb farms in most years grass goes to waste during the lamb fattening period. It is for this reason that we expect the stepping up of the fertility of our fat-lamb ewes to be one other means of attacking fat-lamb production and bringing it to higher levels. I believe we could fatten 150 per cent. of lambs on the same farm as we fatten 105 or 110 per cent. at the present time if we had the lambs available.

Mr. ROACH: There were two very interesting addresses last year. The first was Fawcett's address on the world problem of a growing population catching up with food supplies and Mr. Greig's paper on the theoretical inability to increase very substantially the output from New Zealand. I come from an ordinary English family and I believe we bought New Zealand lamb because it was advertised as "Prime New Zealand lamb" or "Best Canterbury lamb" and it had a sales appeal. The average housewife would not know the difference between a 38lb. and a 34lb. carcass. For the time being the problem is a monetary one. I think we have to convince them that they should buy the heavy carcass.

Mr. CRAWFORD: I was very interested to see that the Southdown was beaten for early maturity in some of the figures Miss Walker showed. Regarding the question of cross-bred rams as a quick way of changing from the Southdown. Speaking as a veterinarian I do not think Professor Coop need have any worry over using another sire because the Southdown has a very broad head and a swing to the Suffolk and Border Leicester which would apparently be the two sires used would be a help to the Southdown ewe rather than a hindrance. I have some little experience of Border Leicester-Southdown cross rams being used in competition with the Southdown. In open competition they have very decisively beaten the Southdown ram as lamb producers. I know one property, where, due to lack of water this season, the whole place had to be run as one block and three of these Border Leicester-Southdown rams produced as many lambs as five Southdowns which as far as I know were all fertile. Mr. McGuinness is not here but two years ago I persuaded him to try the Border-Down cross on the flats near Gisborne. He is very satisfied with them. He produced in his case 2lbs. of meat more per lamb. One breeder in the Gisborne district on the low hill-country, brought in with subterranean clover, showed an increase of 2lbs. per lamb. He took it further and showed that he was producing something in the nature of 10lbs. of lamb per acre more than he could with the Southdown in the same area. I think that the work will need to be carried out in various parts of New Zealand before we take it up nationally.

Mr. BLAIR: It seems to me that the major part of our problem is the attitude of the Meat Board to this question of a heavier and larger lamb carcass. As long as the present situation exists where a Meat Board is prepared to pay a premium for a light lamb I think there is a certain amount of difficulty in persuading many farmers to change over to a heavier lamb in spite of the greater monetary return that they get from the Suffolk. A great many of them I have spoken to seem to take a pride in the fact that they get 96 per cent. of their lambs to the works graded Down-Cross lambs and the rest graded Primes and no Seconds. A decrease in the percentage of Down-Cross lambs and an increase in Primes and Seconds resulting from the change would prejudice the farmers against the change in breed. Unless, therefore, pressure or persuasion of some kind can be brought to bear on the Meat Board to change their gradings I do not think we are likely to get very far.

Mr. PHILLIPS: In connection with the influence of the Meat Board policy I personally think that it makes very little difference whatsoever. Although we hear a lot of the influence of those sale price differentials I do not think that the experience over the last 25 years has shown them to be the source of the trouble. As Mr. Barton pointed out this morning, the average weight of lamb has not altered to any appreciable degree and his figures were given in five-year groups. If you take annual variations you will find that the fluctuations which do occur are associated very closely with the seasonal growth of pasture. If we are going to increase our total production of meat we must first increase the total amount of pasture. We could not hope to achieve a change over to the larger breed in less than ten years—the number of rams to make a change in the national policy would take years to breed. Therefore as a short-term policy I think we shall have to go for increased pasture production. To stress the point that I made earlier, it is the seasonal variation in pasture and not the structure of the Meat Board's schedules which influences the weight of lamb. I would quote the instance of one farmer over the last two years. Admittedly he cut down his rate of stocking for this year and there was more feed available because of the better season. Last year his lambs averaged 33lb. There was no change in price differential for grade or for weight differences. This year his lambs averaged 41lb. He was not influenced by Meat Board schedules. It was simply that 12 or 18 months ago because of the shortage of feed and the dry summer the first draft of lambs went to the works at the end of November, the second draft in January and the third in February. This year there was ample feed so he carried his lambs through till January or February. Similarly the grade of lamb is very closely associated with weight. In the same year as the average weight goes up the percentage of Down Cross lambs as against Prime grades in the North Island goes up. The other point is if we are going to change over to a heavier breed or carry our lambs to a heavier weight, will we have to put in a crop? If we are going to have land under cultivation for crops to feed lambs for heavier weight it may result in fewer ewe numbers.

PROFESSOR COOP: Dr. McMeekan has already answered your first question. I agree entirely with him that it is a question of pasture utilisation in October, November and December when you have more grass than the sheep are capable of eating. Of course season has a big effect. However, the 10 per cent. extra meat can be produced with practically the same amount of feed, as far as the milk lamb is concerned, without growing any more pasture. If as suspected, Border Leicester lambs may eat more, a little more rape perhaps 5 per cent. could be grown to produce that extra weight.

Mr. BULL: There has been a considerable swing away from the Border Leicester in the South Island—I think 20,000 or 30,000—and I just wondered if there had been any decrease in the average weight of lambs in that period.

PROFESSOR COOP: The number of Border Leicester in the South Island has certainly decreased and the reason for that is largely the price schedule. I think we pointed out in our paper that for an extra 4lbs. of meat we received two shillings, half of which is taken in taxes.

Dr. RICHARDSON: Could not the question be that the problem is that of winter pasture or winter feed? If it were possible to produce sufficient pasture or other feed to enable more ewes to be wintered you would be able to produce sufficient lambs to eat the spring flush of growth.

Dr. McMEEKAN: Dr. Richardson is quite right. Let us look at the broad issue of how we can tackle this question of increasing meat production from New Zealand with reference to sheep. Our target is 150,000 tons increase. One obvious way is that farmers should carry more ewes per hundred acres. We have in the fat-lamb industry fat-lamb farmers running fat-lamb ewes at the rate of from three to ten ewes to the acre on comparable country. Obviously if they all raise their carrying capacity to six ewes to the acre there would be an enormous increase in the production of lambs per acre. A drive towards increasing carrying capacity would produce dividends. Where are the ewes coming from? Ewes could be retained for a longer time as fat-lamb producers than they are at present but the economics of that policy, of course, are a little dubious. Certainly there are limitations to increased carrying capacity as a national policy. We could get those extra ewes if we could increase the fertility rate of breeding flocks which is deplorably low in the Romney breed. Such a policy would obviously be a very long-term one but one worth tackling. I do not think that on a short term national basis, carrying capacity is the solution to increasing production. A second method is the one we have been discussing to-day of change of breed. Admittedly this would take a little time to gain momentum unless tackled on a national basis. We have two sources of fat-lamb sires at present. There are a few stud Southdown sheep in the hands of Southdown men who supply rams to a large number of men with smaller flocks—50, 60 or 100 ewes—who breed rams for commercial fat-lamb breeding, a cheap ram for the ordinary farmer's ewes. Secondly, in Australia, as Dr. Filmer pointed out, there are plenty of Dorsets and Suffolks. If we imported 1,000 Suffolk rams and distributed these amongst breeders of fat-lamb sires, in two years we would have at the normal rate of increase somewhere round about 15,000 Suffolk rams available which number could be maintained steadily for quite a few years. If we continued a few more imports as well it would accelerate the rate of change. This method could be tried. The third method which has been suggested is the practice of non-castration of ram lambs as a means of increasing the weight of lambs. Ruakura experiments have shown that ram lambs yield a dressed carcass weight one or two pounds heavier if not castrated. Such a lamb is one that Dr. Hammond requires, one with less fat. This method would mean quite a few thousand tons of extra meat. The only other method is a general all-over increase in fat-lamb production efficiency. I don't think we will get much from that direction, nor that we have a hope of producing 150,000 tons of extra meat in the next five years, but we can get some of it, if we like to try the techniques suggested. They have the advantage of being at least "costless," requiring no great change in farming method nor in the basic structure of the fat-lamb industry.