Journal of the Royal Agricultural Society of England
London, Royal Agricultural Society of England, [1840-2002]
https://www.biodiversitylibrary.org/bibliography/86012

v.14 (1853): https://www.biodiversitylibrary.org/item/163258

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XVI.—*On a Method of obtaining immediate Fixity of Type in forming a new breed of Sheep.* By M. Malingié-Nouel, Director of the Agricultural School of La Charmoise, President of the Agricultural Society of Loire et Cher. Translated by Mr. Pusey.

It would certainly have been very convenient for French farmers if we could have appropriated the results of the long labours of the English, who have succeeded, as all the world knows, in creating races of sheep the best suited to modern requirements. If the thing had been possible for us, it ought to have been effected without national jealousy, but, unluckily, it was not possible. The chief races of English sheep, formed under certain circumstances, cannot remain what they are, where those circumstances are altered. In all countries south of Great Britain there is great difficulty in fulfilling this condition, and even then the expense is such as to swallow the profit. Merinos have been transferred from Spain to the north, even as far as Norway and Sweden, but English sheep do not thrive when carried southwards to a country even so near as France. It seems, therefore, almost certain that sheep cannot be moved so easily from north to south as from south to north.

But though the races of English sheep could not be kept up in France, we yet might fairly entertain the hope of crossing them with our native breeds. Here then a wide field opened itself for experiments neither expensive nor, as might have been supposed, even difficult. Accordingly there arose a host of experimenters, most of whom, unacquainted with the first principles that govern reproduction, proceeded headlong in the blind hope that chance would afford them that happy solution which they were unable to ask of science, and which chance after all did not give them.

Now, it certainly would be in our power, without quitting French breeds, to form a race of our own, perfect in form, and possessing, like the English breeds, early maturity, with aptitude to fatten. For this purpose we might pursue a course of judicious selection for a long series of years, aiding this selection by a system of constant care and of nutritious food. But besides that such long-winded operations, requiring great perseverance of view and of will, seldom find men determined enough to conceive and, above all, to execute them, they require in fact more than the ordinary life of man, and therefore cannot be carried out without a succession of experimenters animated by the same views, and employing similar means. Such an enterprise cannot be executed unless by a man who, like the founder of the New Kent breed, Richard Goord, commences young, and lives like him eighty-six years.

In France such an improvement of a breed in itself or *from within* has not been even attempted, at least with respect to perfection of form, power of assimilation (or fattening), and quality of meat. As to the wool, indeed, our breeders of Merinos, while their wool was dear, did aim at increased fineness and evenness of fleece by judicious selection, and in some degree too succeeded. But their success is of little interest now that the price of superfine wool has been lowered permanently by the multiplication of Merinos without cost on the untenanted pastures of Australasia.

The most devoted partisans of the Merino breed have now for some time felt the necessity for making up in mutton what they were losing in the price of their wool. This they could hardly effect with that boniest of all races unless by alloying in some degree the purity of its blood. At first this degradation was concealed, but, gradually growing bolder, they pronounced at last the word "cross." Still it was required that the new animal should preserve the Merino countenance, and that its wool, though coarser, should be fit for the same purposes as before. This latter object was much favoured by a natural law, as well as by the progress of manufactures. In fact, through the improvement of machinery new stuffs are now produced from the coarse wool as delicate as heretofore from the fine.

Hence arose a multiplicity of spurious sheep, denominated justly *mongrels*, yielding a wool of little value, that could not be compared with the cleaner and stouter wools of Australasia. The two kinds of fleeces show, in fact, the different treatment by which they are produced. Life in the free air and constant pasture, upon the one hand; on the other, the precarious food, the filth and stench of close yards, to which most of our French flocks are to this day exposed. The depreciation of the wool of the *mongrels* cannot stop even at its present point, for the product of Australasia must go on increasing under the continuance of peace, and the progress of marine intercourse, which tends to draw closer the communion of nations—as close as that of provinces in the middle ages. But if the wool of our *mongrels* bears small promise of future profit, those sheep have certainly little to recommend them in point of mutton, which retains the taint of their origin.

This disfigured foreign race, then, is in the same case with the old native races of our ancient France that have withstood better than she herself has done the endless revolutions of which she has been the sport. These breeds satisfied the simple requirements of our ancestors, but in our days you might as well try to restore the coarse clothes worn by those ancestors and the frugal life which they led, as propose to satisfy the demands of our manufacturers and the wants of our increased population from breeds with coarse wool and unthrifty frame, subsisting miserably

on the spontaneous produce of soils either naturally barren or ill-cultivated.

Many causes thus naturally led our farmers to crossing with English breeds: first, the deplorable state of our old French breeds as to both mutton and wool; next, the imperfection as butcher's animals of the Merino *mongrels* which have replaced the old breeds wherever the goodness of the soil and excellence of the forage allowed their introduction. Besides, a certain amount of enlightenment had evidently penetrated the minds of our farmers, which we must hope will lead to improvement in the feeding and management of French sheep. For hitherto these valuable animals have been, and still are on most of our farms, treated as mere outcasts. They are crowded together without light or air in hovels which are rendered unwholesome by the fermentation of the droppings accumulated under their inmates perhaps for a year. In summer they receive only the natural produce of the soil; in winter, straw, and that straw often damaged. Even this fodder often does not hold out, and then the flocks have no other resource than to gnaw the heath and shrubs with which the commons are covered, or scratch in the snow to find some blades of withered grass. On this sad but true picture a ray of light has at last been shed. In many places our farmers begin to perceive the need of improved management, and, wherever improvement begins in the management, it is soon found to be also required in the breed. The only merit of the old breeds is that they are not destroyed by such management, but they will not pay for more generous diet.

For it is a mistake to improve the flock without changing the management. It is an equal mistake to improve the management without refining the breed. Both should advance together if profit be looked for.

Still it has been found that our old breeds may be crossed with English blood not only without profit, but with heavy loss. To clear up this matter, it will be worth while to enter into particulars, as the question is interesting, and in general not well understood.

When an English ram of whatever breed is put to a French ewe, in which term I include the *mongrel* Merinos, the lambs present the following results. Most of them resemble the mother more than the father; some show no trace of the father; a very few represent equally the features of both. Encouraged by the beauty of these last, one preserves carefully the ewe lambs among them, and, when they are old enough, puts them to an English ram. The products of the second cross, having 75 per cent. of English blood, are generally more like the father than the mother, resembling him in shape and features. The fleece also has an English character. The lambs thrive, wear a beautiful appearance, and complete the joy of the breeder. He thinks that he

has achieved a new cross-breed insuring great improvement, and requiring thenceforth only careful selection to perpetuate by propagation among themselves the qualities which he has in view. But he has reckoned without his host. For no sooner are the lambs weaned, than their strength, their vigour, and their beauty begin to decay as the heat of our summer increases. Instead of growing, they seem to dwindle; their square shapes shrink; they become stunted, and, on the threshold of life, put on the livery of old age. A violent cold in the head completes their exhaustion. This is accompanied with a copious flow of slimy mucus from the nostrils, constant sneezings, and sometimes cough. At last the constitution gives way, or, if the animal last till autumn, the malady indeed ceases but he remains stunted for life. The time lost was the time of growth, and cannot be recovered, for nature never goes backward. Henceforth he looks like a foreigner escaped from the mortal influence of an inhospitable climate, and remains inferior even to our native sheep, which at least have health and hardiness in their favour.

The experiment has sometimes been tried with English rams in a third generation, and the symptoms above described have arisen even more strongly in proportion to the stronger admixture of English blood. Thus experience has shown us that English sheep of whatever breed, being formed under the peculiar circumstances of Great Britain, require absolutely the continuance of those circumstances to remain what they are. These circumstances, again, we have found, cannot be realised in France without infinite precautions, and an expenditure that destroys the most indispensable of all requisites in such operations, namely, profit.

It is, moreover, remarkable that the results described arise equally with each kind of English ram that has been used, namely Leicester, New Kent, and Southdown. Only the foreign influence is more marked in the product of Goord's New Kent or of the pure Southdown than in that of the Leicester or the less pure New Kents or Downs; in fact the principle of antiquity or purity of race is what has most influence upon crosses.* The Leicester and other rams of mixed origin being of very modern origin in comparison with our French breeds, and especially with the Merinos, whose source is lost in the night of ages, their influence must be, and is in fact, weaker than that of the mother. This difference of action, which should be clearly understood, establishes shades of distinction distinctly marked according to the kinds of ram that are used.

Thus, if you put a Leicester ram, a mixed New Kent, or a

* Consult on this subject the excellent work of Mons. Hurard, *Des Haras Domestiques.*

Southdown, that is not pure to a pure ewe of any French race, very little English character is impressed on the offspring, never less than when the ewe is a pure merino. In this last case it often happens that you can see no difference between lambs that are Leicester merinos, Kent merinos, or Southdown merinos, and another lamb of the same age which is pure merino. In compensation, however, for this feeble influence of the English sire, the lambs of such first crosses have no more difficulty than French lambs in getting over the first summer.

If on the contrary the same ewes are put to very pure rams of the Southdown or New Kent breed, the English character is more marked than in the former cases. These facts agree with the principles we have just referred to.

In both cases the offspring is reared; for lambs in which the English blood does not exceed one-half seem to be reared as easily as pure French lambs. But then, since little improvement is obtained, one is tempted to give a new dose of English blood—to put the Anglo-French ewes to English rams—whereupon the disasters described are sure to follow. These are truths which should be generally known, for they are purchased at a great cost of time and money. In fact, if one wishes to procure a breed of sheep such as is now wanted, good for the butcher, of early maturity, with power of laying on fat, above all hardy and economical, one is daunted by the length of time required for such an operation, if it is to be effected by gradually improving one of our native races through selection, food, and management. One turns from such an undertaking to what seems the easier road of crossing. For this purpose one looks naturally to the English breed because they alone in the world possess the qualities sought for. We cross therefore our French ewes, suppose, with the English race earliest known in France, the Leicesters, and obtain lambs showing little improvement. Disappointed we turn to a fresh breed, the New Kents, of recognised excellence. We obtain a degree of improvement more perceptible yet insufficient. Discouraged by these trials in which years have been wasted, tempted almost to despair, one hears of another breed, the Southdowns, as a race hardier and smaller than the other two and therefore apparently better suited to French farming. One makes this last effort, which answers worse than the others; for if the Southdown rams exert an influence in the cross as strong as that of the New Kents, and rather stronger than that of the Leicesters, the effects are less advantageous inasmuch as these rams are inferior in shape and in wool.

I must here remark, that in France we are in error respecting the Southdown breed. These animals are smaller than the Leicesters and New Kents, and therefore more easily satisfied. They are at home upon short pastures, and thrive where other

breeds would perish. This quality seems invaluable to the French farmer, who is accustomed to cultivate no crop (either grasses or roots) for his sheep, and hopes to find an animal that will live and even fatten on nothing. An animal therefore which, as he hears, lives in England on the bare and parched heights of the downs, seems to him much likelier for his purpose than those balls of fat and of wool which roll lazily as they fatten in the rich valleys of Kent or Leicestershire. He would be right if any pure English race could thrive in France, but of this experience has shown the impossibility.

This fact being established, we can consider English breeds only with a view to crossing. Now as in crossing one gains but in part the good qualities of the sire, we require, if the improvement be sought from the sire, that he be of the most perfect type, that so his influence may be greater, but his influence will be the less both on shape and on wool in proportion as in those points he comes nearer to the mother who is the base of the operation. By employing, therefore, Southdown sires which are relatively inferior in those points, we obtain less improvement than by blending with either of the other two English breeds, while the difficulty remains the same in rearing the lambs if we go beyond the first cross. Still it may be said, you have not exhausted the subject by your many and various trials with the three English breeds of which you have spoken. The further question arises in looking for the new animal we require, namely whether some French breeds be not better suited for the purpose than others, whether the ill-success of your experiments have not arisen from imperfect mothers rather than from sires known to be perfect. But these trials have in fact been made with different French breeds, yet with uniform disappointment.

While one is varying these experiments with rams of various English breeds and ewes of various French breeds, years roll on and time slips away. No one of course can expect to solve such a question in the space of one life without making many such trials at once. Hence arises a complication of care and of facts to be registered with exactness, if one hopes to reach the light through so many dark and narrow passages. It is on this difficult ground that the writer has laboured for many a long year, acting on opinions the most erroneous, led by the most varying opinions, subject to mortifying mistakes, often losing almost every ray of hope, and on the point of giving up all result from so much anxiety, so many journeys, and so much expense. But it often happens that the human mind harasses itself long in search of a thing which might have been found easily by acting scrupulously upon laws of nature that were already known, instead of groping in the dark among accidental circumstances.

Now, in all breeding, experimenters attach the greatest im-

portance to purity of race on each side, because of the natural law by which the offspring resemble, not merely the father and mother, but sometimes the grand parents, great grand parents, and further back still. Many other observers as well as myself have seen in young animals the clearest resemblance to some ancestor long since dead who was marked by some distinctive feature. The purer the race of such ancestor, the more strongly do its characteristics overcome the subsequent mixture of breeds and imprint themselves on the new offspring: would it not then have been more reasonable for French farmers to attach the utmost importance to purity and antiquity of blood in the ram, representing as he does the improved type that is aimed at, but to avoid on the other hand those qualities in the ewe whose defects were to be corrected? In giving motion to a projectile (for instance a cannon-ball) the velocity obtained is not merely in proportion to the propelling force, but also to the resistance of the medium (air or water for example) through which the body is driven. Now in our case the ram represents the power of propulsion, the ewe that of resistance: since, if there were no obstacle on her side, the complete effect would be realized by the faithful reproduction of the improving type. Clearly, therefore, the influence of the ram upon the offspring will be the stronger the purer and more ancient in the first place his own race may be; and in the next place, the less resistance is offered by the ewe through the possession of those qualities of purity and long descent which are so valuable in the sire. We have seen above, and it is true of every attempt at crossing in France, that an opposite state of things had obtained in all these trials; since purity and antiquity of blood exist much more strongly in the French breeds than in the English, which have been much more recently formed. The imperfect result then of all these attempts is perfectly accounted for by our reversal of a great law of nature; and it seemed to me necessary to restore this law and give the advantage of it to the English ram. Such was the preliminary condition of success.

It appeared then that in order to untie the Gordian knot whose threads I have traced, inasmuch as one could not increase the purity and antiquity of the blood of the rams (I purposely repeat the first principles of the problem to be solved), one must diminish the resisting power, namely the purity and antiquity of the ewes. With a view to this new experiment, one must procure English rams of the purest and most ancient race, and unite with them French ewes of modern breeds, or rather of mixed blood forming no distinct breed at all. It is easier than one might have supposed to combine these conditions. On the one hand, I selected some of the finest rams of the New Kent breed, regenerated by Goord. On the other hand, we find in France many border countries lying between distinct breeds, in which

districts it is easy to find flocks participating in the two neighbouring races. Thus, on the borders of Berry and La Sologne one meets with flocks originally sprung from a mixture of the two distinct races that are established in those two provinces. Among these then I chose such animals as seemed least defective, approaching, in fact, the nearest to, or rather departing the least from, the form which I wished ultimately to produce. These I united with animals of another mixed breed, picking out the best I could find on the borders of La Beauce and Touraine, which blended the Tourangelle and native Merino blood of those other two districts. From this mixture was obtained an offspring combining the four races of Berry, Sologne, Touraine, and Merino, without decided character, without fixity, with little intrinsic merit certainly, but possessing the advantage of being used to our climate and management, and bringing to bear on the new breed to be formed, an influence almost annihilated by the multiplicity of its component elements.

Now, what happens when one puts such mixed-blood ewes to a pure New-Kent ram? One obtains a lamb containing fifty hundredths of the purest and most ancient English blood, with twelve and a half hundredths of four different French races, which are individually lost in the preponderance of English blood, and disappear almost entirely, leaving the improving type in the ascendant. The influence, in fact, of this type was so decided and so predominant, that all the lambs produced strikingly resembled each other, and even Englishmen took them for animals of their own country. But, what was still more decisive, when these young ewes and rams were put together, they produced lambs closely resembling themselves, without any marked return to the features of the old French races from which the grandmother ewes were derived. Some slight traces only might perhaps be detected here and there by an experienced eye. Even these, however, soon disappeared, such animals as showed them being carefully weeded out of the breeding flock. This may certainly be called "*fixing a breed*," when it becomes every year more capable of reproducing itself with uniform and marked features. Such was my secret, which, however, has been made no secret at all, but has been declared from the first in my entries at the shows of Poissy and Versailles. Such is the origin of the La Charmoise breed of sheep.

We have already seen how important it is that you should not infuse into a new breed more than fifty per cent. of English blood, if you would preserve the French constitution, which alone suits the circumstances in which they have to pass their lives. The Charmoise breed not exceeding that proportion does retain the hardiness of a pure French race: the lambs are reared as easily as those of any French breed, getting over the summer just as

easily: neither then nor later do they suffer more than our native breeds from heat or from drought.

The mixed-blood mothers had been formed from breeds in general small, and possessing the usual qualities of small breeds, delicacy of shape, smallness of the head and the bony structure, temperance as to food. The Merinos alone had not these valuable qualities, but they entered in the proportion of 25 per cent. only into the mothers, and consequently of 12½ per cent. only into the offspring. Their disadvantage, too, in these respects was compensated by their influence on the fleece.

I may here remark that, in founding a breed, it is far better to choose ewes from small breeds, with the qualities already mentioned, than from breeds that are strongly timbered, bony, coarse, greedy, like those of northern and western France, which I tried myself, to my own heavy loss. Accordingly as fine or coarse ewes are used, so in proportion do the offspring show that coarse or fine character, difficult to describe for a writer, but easy to perceive for a connoisseur.

Besides, it is an admitted fact, that a sheep affording 112 lbs. of meat is more expensive to feed than two sheep, each of 56 lbs. Luckily, on this head the interest of our butchers, the taste of our consumers, and the profit of our farmers are all in unison. The weight generally preferred in France for sheep is 56 lbs. At this point it is easy to stop the Charmoise breed. I say stop them, because weight is one of the things which man can most readily increase or diminish in any breed; in fact, as the size of the being to be fashioned depends upon the ram, it will be reproduced similar to the sire, if no obstinate resistance of another fixed breed be opposed to it. It will then develop itself more or less in proportion to the food received by the lamb. It is not difficult, by increase of food, to double, or even more than double, the result. By feeding differently lambs born from similar parents, we have brought some to the dead weight of 75 lbs. at 14 months, while others gave only 30 lbs. of meat at the same age. The weight of 56 lbs. may be taken as the mean between these two extremes.

In putting my small mixed-blood ewes, that weighed alive not above 56 lbs., to heavy New-Kent rams which weighed often 225 lbs., one apprehension alarmed me—the fear, I mean, of losing ewes which had cost so much trouble, when the time came for their giving birth to the large offspring one naturally expected. But no such danger arose; and the reason seems to me clear. Whatever be the size of the ram, the germ develops itself only in proportion to the nourishment it receives. Now, while it remains in the womb of the small ewe it obtains but little support; consequently the lambs remained small, and the births took place without difficulty. In 2000 labours we had but one death that was

occasioned by the immoderate size of the lamb. It was curious to see such small offspring engendered by such huge sires. But these little creatures, if well fed, soon began to grow rapidly, and it was not uncommon to see ewes sucked by lambs larger than themselves.

From the first dropping of our lambs, the strongly-marked English character gave us the strongest hope that they would retain the excellences of the English fathers; and this hope was not disappointed. The young animals as they grew up preserved their beauty of form, maintained their condition without extraordinary food, and did not suffer from weaning. The ewe-lambs were carefully preserved, a few ram-lambs selected, and the rest castrated. The good condition of these tegs at the end of the first autumn induced us to fatten them. These young things fattened just like old sheep of French breeds, and at the end of winter yielded 56 to 65 lbs. of meat, with 11 to 13 lbs. of tallow.

The next year the same cross was tried with the same success.

The third year was still more interesting. Our first ewe-lambs, at the age of 20 months, had been put to the rams which had been saved. The offspring was most equal in quality, though proceeding from parents which were a first cross; indeed they were more level in appearance than the offspring of some native flocks.

From that time now for some years there has been at La Charmoise a double set of lambs; one set from the New Kent rams and the mixed-blood ewes, another from rams and ewes the result of that cross.

A remarkable circumstance continues to this very year—I mean the perfect resemblance of the two sets of lambs obtained by the two different methods. I have often divided them into lots, and then found it impossible, even by careful examination, to distinguish one set of lambs from the other. This fact is most important—it proves that the breed is established. It only remains, in order to attain the utmost fixity and perfection, that we select carefully the rams and the breeding ewes. This is what will be henceforth done. At first we kept all the ewe-lambs, in order to reach the amount of 500 breeding ewes, the limit of our establishment. We have now the power of selection, in order to keep up that number; and we have great encouragement, in the prizes* already won, still further to improve this breed by careful selection.

Note.—It was in the first number of this Journal the late Lord Spencer stated, he had observed that the worse bred the female is, the more likely is the offspring to resemble a well-

* It is stated that the La Charmoise breed have taken prizes whenever they have been shown at Versailles or Poissy.

bred sire; and he told me that, practically, he should prefer a cow of no breed, to an indifferent pure-bred cow, for a good thorough-bred bull. The principle, however, has never been so thoroughly carried out as in the above experiments at La Charmoise, for the communication of which I am indebted to Mr. Rives, the late diplomatic representative at Paris of the United States. Besides their practical value, I cannot but think they throw some little light on one of the most mysterious of all physiological problems—the renewal of the features of parents in the reproduction of animals.

PH. PUSEY.

XVII.—*On the Subsequent Manuring Effects of Burned Clay.*

By J. J. MECHI.

To Mr. Pusey.

DEAR SIR—On the 10th of October, 1846, I made a communication to our Society on the subject of burned clay (vol. vii. p. 299). I therein stated that I had burned 400 cubic yards per acre on a poor plastic yellow clay, that 250 loads or yards per acre had been removed to other fields, and that the remaining 150 yards per acre were spread where burned. The field is opposite my residence, and, years having elapsed, it may be interesting to deduce the results after so long a period. The field, before burning, was a poor 2-years ryegrass lea, and my neighbours seriously predicted that by removing 250 yards per acre of the top soil I should ruin the field. Fortunately, anticipating such objection, and desirous to arrive at comparative results, I left about half an acre of the field undisturbed. It has been, since, all equally treated, viz. oats sown down with grass-seeds, and is still in grass: so far from the burning and removal of so much soil being injurious, in every crop and to this very day the worst portion of the field is that which was unburned and unpillaged. The fact is interesting and encouraging to earth-burners of strong clays. In every case in which I have used burned earth (I mean poor cold argillaceous subsoil clay, free from organic matter), I have during the last 7 years had reason to be satisfied with its advantages, which are still obvious.

I am, dear Sir, yours truly,

J. J. MECHI.

Tiptree Hall, Kelvedon, Essex,
May 30, 1853.
