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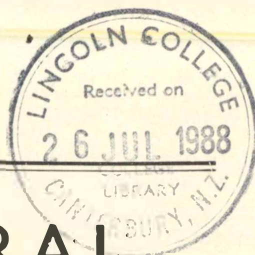

RURAL EDUCATION BULLETIN

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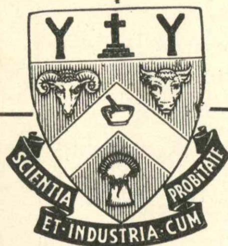


SCHOOL OF AGRICULTURE
UNIVERSITY OF NEW ZEALAND

HIGH COUNTRY

David McLeod

———— :: ————

VI.

It's time I told you something of the men who work in the High-Country and the jobs they have to do. There are many of the smaller places, particularly in Otago, where the early stations have been cut up into comparatively small areas and the owner and his family do most of the work, but it's the true station life that I am trying to describe, so I shall be speaking of stations which run from ten to twenty thousand sheep.

In the winter time the number of men is small, perhaps only a single shepherd and a cowman besides the owner or manager, but in the summer the stations really come to life. Three or four musterers will be engaged for the season and probably a cook packman. Later on comes shearing with an influx of anything up to twenty extra men—men of all ages and backgrounds, lean Australian blademen from "the other side" across the Tasman, tough old Merino shearers who know half the stations in the South Island, and a mixed bag of young shearers and shed hands from farm and wharf, street corner and university.

There used to be a class of station rouseabout who specialised in fencing, wood cutting or any labourer's job which required no tools of trade, but these have almost died out since the war. Often they were highly skilled, but usually they kept their earnings only as long as it took to reach the nearest "pub."

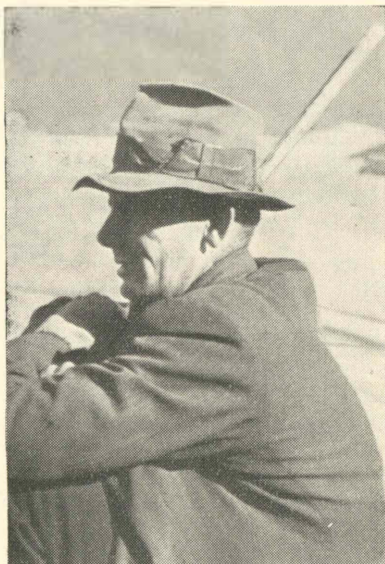
Cooks, cowmen and rabbiters, teamsters and tractor drivers, all go to make up the floating population. Of these last there are none so "buoyant" as the cooks. They rise and fall with the tide, drifting ashore with no money and a terrible hangover, and slipping their cable some dark night when they have earned enough money, and leaving behind them only an aroma of greasy stew.

But I must go back to the musterers because they're the backbone of the High-Country and without them it would be impossible to run a single sheep on the hills.

They again come from many walks of life. Small farmers' sons who have got a bit tired of the "old man" and want to get away from home for a bit; sons of country

tradesmen or stock agents; station owners' boys who may one day have a station of their own; English boys who come to New Zealand and are attracted by the freedom of the life—they all shake down together in the close companionship of huts and camps.

Very often a lad starts as cowboy on a station, buys a dog from one of the shepherds and spends all his spare time hanging around the musterers' hut, listening to dog talk and watching the men at work. Next season he asks for a beat as a learner. Picking up a dog here and there, he soon qualifies as a full grown musterer. It's not hard to understand what attracts them—an outdoor life appeals to most of us at the age of 17 or 18 and this is more truly an outdoor life than most. It has a certain glamour—the wide-brimmed hat, the horse and pack of dogs, the independence and the freedom of the hill. Here a boy can be a man, the master of his environment, the ruler of the wild. His tools are the tools of the pioneer—the axe, the rifle and the knife. The pay, at any rate during the last thirty years, has been fair and except on his dogs and a few rough clothes he has nothing he needs to spend. His worth is usually respected by his employer because that man must be able to do the same himself. Usually he keeps on doing it too, and so a mutual respect exists between master and man.



[John Pascoe
"The musterers are the backbone of the High-Country."

Round about October the ewes have their lambs and lambing will last about six weeks. The musterers will be booked to arrive for tailing at the end of November. In the old days most of them had their own horses and you would see them riding up the winding gorge roads, their blankets in a canvas sleeping bag rolled across the front of the saddle, and a string of still unruly dogs before and behind. They would stop and yarn with anyone they met, pick up the news of the gorge and drop in for a cup of tea

or a bed at the stations they passed. I remember one who toiled up the Rakaia against the inevitable nor'wester with a push bike, one blanket, one dog and two pups. He was the stuff that makes a musterer though, for he left at the end of the season with a good horse which he had handled and broken in, and a pack of five dogs which would do him credit anywhere he went. He still had only the one blanket though!

Nowdays some of them come in old cars or light trucks and many have to be fetched from the nearest township by the station truck. I like to see a man come on his own horse though—it shows he really cares for the things which make up our lives and takes a pride in them.

When they arrive on the station they pull in to the stable where there are probably one or two of the other musterers or regular hands. The greetings are rather stiff unless they know each other already and everyone's eyes are on the horse and dogs.

Our high-country dogs are of every shape and size and often look more like mongrel pets than working dogs. All the same, there is a look; an air of competence, an indefinable something about the good sheep-dog which shows in his face and in his bearing. The watchers will pick out a likely looking dog and nudge each other and say, "That'll be that "Corby" he's got. I heard about him from Jack Buckley. Great stopping dog on shingle, Jack reckoned."

They show the newcomer the way to the musterers' hut and where to tie his dogs, tell him where the killing house is to get some dog tucker, and drift over to the cook-shop with him and yarn over a cup of tea.

Often a bright spirit will bring a bottle of whiskey with him and the first evening in the hut will be lively with yarns and laughter and a bit of big talk and boasting.

In the old days no liquor was supposed to be brought on to the stations, but of course it was at times. Provided it didn't happen too often there was no harm in it and it gave all hands a bit of fun. Unfortunately there's a catch in it and the men know it quite well. Few cooks can resist it and when there is liquor on the place it can't be concealed from the cook. All the old passion is revived and the next thing will be a bout of what we call the "dry horrors," not to be cured except by a trip to town and a week's soaking in the waters of forgetfulness. Then the whole station is disorganized, scratch meals upset everyone's temper and

the boss comes up looking for the blood of the man who started the cook on the booze.

There may be a day or two of odd jobs, shoeing horses, erecting tailing yards and so on, while the men get used to the place and each other, and the head shepherd finds out what each man is worth and how his dogs shape. Then it will be—"tailing tomorrow, three o'clock breakfast and early to bed."

VII.

There are long days at tailing time. A whole block of hill has to be mustered and the sheep yarded and then all the tailing, earmarking and castration has to be done. There may be 1,000 ewes on the block, with 80 per cent. of lambs in a good season; 800 lambs to catch and mark, besides a certain amout of dagging among the ewes—clipping away the dirty wool round the tail. It's a day's work in itself without the mustering.

The men turn out an hour before daylight, eat a couple of chops and a slice of bread and cut themselves some lunch. I always notice that the first morning there's quite a lot of talk, but after two or three days, it's a very silent meal. It's not easy to eat much at that unaccustomed hour and often one wishes after that one had eaten more.

Sometimes its a riding day—much of the easier country where the ewes are run, can be covered quite comfortably on a horse. Horses have to be fed and saddled in the dark before breakfast and dogs unchained and the chains hung on the saddles as the first pale glow begins to show in the east. As the men ride out, tussocks and bushes about them begin to take on faint shapes, the markings on the different dogs begin to show up and before they have gone very far they will suddenly realise that it's light; the day has crept upon them unawares; the stars are gone; "night's candles are burnt out." The men ride in twos or threes making a little straggling group, surrounded by the shifting pack of dogs, running to and fro, sniffing at tussocks and snarling at each other. Every now and then a man will shout "get in behind, Dark", "come out o' that, Ben" or "Wareleggo Maid."

Dogs are usually given names of one syllable to make them easily said:—Jock, Moss, Bounce, Rock. Don, Flirt, Sharp, Mac, or Flo. A few of two syllables like Lady, Corby, and Lassie, are popular, and I know one station where a per-

fect crop of fantastic names sprang up. I've forgotten most of them now, but "Sporrigal" and "Doodleum" have stuck in my mind. There are two or three popular names taken from the ever present weather:—Storm, Rain, Cloud and Gale; and certain breeds or strains are marked by a recurrence of the same names. When a man has a dog descended from some famous dog like Alan Eade's Rock, or Joe Casey's Laddie, he often goes back to the old name and hopes the pup will turn out to be as good as his ancestor.

Some dogs are " hard " and some are " soft." By this we mean their temperament. Hard dogs are full of go, tough and obstinate, difficult to control and will stand much shouting and whistling and even beating, without turning a hair. Soft dogs cringe at a rough word, are timid and tractable, work easily at command and don't need the stick to keep them in order. It's not quite as cut and dried and simple as it sounds though, because you cannot have four hard dogs and one soft one in a pack, or all the shouting at the hard ones will drive the soft one home. So men tend to collect either hard dogs or soft ones and become hard or soft themselves. If they like hard dogs they sometimes succeed in making even soft dogs hard, and I believe myself that the man who works dogs gently and keeps his temper always, can keep a hard dog soft provided he gets him young before he's been spoilt. It sounds so easy to say "keep your temper," but how difficult it is to do. At the end of a long day when you're hot and tired and hungry, you see a bunch of sheep being driven relentlessly in the wrong direction by the pig-headed stupidity of a dog half a mile away from you; and know that it may mean an hour more on an already endless day. No wonder you give way and swear and shout and dance with rage; driving the dog, of course to further defiance by your loss of control.

I always say that the man who loses his temper at a game like golf should take a season's mustering and he would never again feel tempted to swear at a silly little golf ball. I know one humourist who used to say that you were never really wild with a dog until you lay down beside him and chewed his ear!

I'm sorry to say that the standard of training of dogs has not been high in the past. Our term "breaking in" is rather too near the truth to be healthy. It's rather amazing that the pups turned out as well as they did, considering the methods employed. Often a man wouldn't teach his pup anything at all before he took him amongst sheep—not even the rudimentary lesson, to sit down when told.

He would encourage the pup to follow his natural instinct and run after sheep; then, when he ran too far or charged in amongst them, he would shout at him and make it very clear that he was wrong. Often the stick was used at this stage to show the pup he must obey, although the unfortunate creature didn't know what the command meant. He either learned by trial and error, and became pretty hard in the process, or he refused to run any more and was written off as useless. Not a very creditable picture! I don't want you to think that it's universal though. Many of the men take trouble with their pups, training them first on a long cord and treating them with insight and

[John Pascoe

"Dogs who understand what you want by instinct."

sympathy. Such men usually get a name for being able to "get a pup to go." Often they have a lot of pups and get into the most awful tangles with sheep and pups in all directions, but they usually manage to sort out the mess without upsetting the pups. Such men are always easy-going and good tempered and usually have a good sense of humour.

I knew one man with a pack of nine dogs, in which there were three separate pairs with the same names! How on earth he ever got the right one to go without the other I never discovered.

Breaking in huntaways and heading dogs is quite a different business. The huntaway is simple to break in, as long as you have plenty of mustering and driving sheep and the country is fairly open. Lots of little runs can be

found for the young dog where he can hunt a sizeable mob of sheep along, stopping on command and barking, and learning to come to the right or the left as his master moves to one side or the other. Gradually the distance is lengthened until you can hunt him as far as you can see. Then he must be taught to run "on the blind"—that is, to go up or down hill as directed, looking for sheep he hasn't seen. So it goes on; improving a little every day until you have a dog who understands what you want by instinct, and works with you and not against you. I have one inviolable rule. A dog may make many mistakes but there is only one crime—failure to stop when told. Anything else is the fault of the man for not being able to make his dog understand.

Heading dogs are much more difficult. A lot of their breaking-in must be done off the hill in your spare time; getting them to cast round a few sheep in a flat paddock without cutting in too close; teaching them to move up quietly and lift sheep which do not want to move. They mustn't bounce on them like a huntaway or dive in and make a grab, but move up quietly, forcing the sheep to turn and come towards you by sheer personality. It sounds silly, but I'm perfectly serious. Some dogs have it and some do not—just like girls and boys. I have two heading dogs now, both good dogs in their way, but one will get sheep to move without the slightest trouble and the other can go through any sort of performance and they will not shift. He's got it all over the other dog for heading though; he will catch sheep no matter how fast they run or how rough the going—"Head a Nor'wester, that dog" as the saying goes.

It's a long time before you can safely run a heading pup on the hill. You mustn't let him be bustled or he learns to run close; you musn't overtire him or let his feet get sore or he may learn to bark. You must pick out easy little runs where he can't get into trouble and lose his sheep. In fact he may follow you for days on end and never get a chance of a run.

Heading dogs must work more on their own. You must be able to trust them to handle sheep out of your sight without losing or leaving them. If, after a couple of seasons' work, you can say that you have got a dog that you can send after sheep with the absolute certainty that he will catch and hold them till you come to him, you have something that is worth its weight in gold and you can go on the hill with confidence and security.

I KNEW THESE FARMERS

II.

J. W. Calder

(This is the second of a series describing personal impressions of some overseas farmers. They are printed as they were originally broadcast from 3YA, Christchurch.—Ed.)

England is a land of surprises wherever you go. Nearly 40 million people live in an area less than that of the South Island of New Zealand. You could scarcely think you could find yourself on a farm in remote country recalling some of the bare narrow valleys which terminate the tributaries of our Canterbury mountain streams. In earlier talks I have described some of the farmers of the South and East of England where a high level of mixed farming is practised, but let me take you to two specialists —one at the outlet and the other at the top of a remote valley in Westmoreland.

In company with the local agricultural advisory officer we left Kendal one dull misty morning in August. It was not raining—nor had it rained for the past week—an unusual experience for a visitor to the lovely "Lakes District," but a heavy cloud covered the top of the hills. We made for Windermere through undulating rocky country with narrow roads—all tar sealed—and with green fields bordered with meandering dry stone walls. These walls were built from local rock by skilled craftsmen over a hundred years ago during the enclosure era. Most of the land was too broken and rocky to plough but luscious green grass and herds of Ayrshire cows bespoke intensive dairying under moist climatic conditions.

We stopped at the entrance to Troutbeck Valley to call on Alan Barker, a dairy farmer. He was a young returned serviceman and was gaining a good livelihood from a herd of 28 pedigree Ayrshire cows. He was very proud of this herd which were as clean and well groomed as if prepared for the show. For five to six months of the year the herd was housed in the barn. This barn had recently been renovated with the assistance of local tradesmen and was bright, clean and well ventilated. From the foundations and walls remaining and from Alan's description, it was easy to picture the old barn built a hundred or more years ago, with its thick stone walls, small windows, with accompanying lack of light and ventilation which previous tenants had enjoyed. Alan was justifiably proud of the improvements he had made as well as proud of his fine herd. His

one expressed disappointment was that he had been unable to get a girl to help him with the milking and feeding and to help his wife with her young family. His farm of 105 acres was all undulating and rocky except for 20 acres of ploughable land. On this he produced his winter feed—some 20 tons of hay, 120 tons of silage, 4 acres of kale and 6 acres of oats. His pastures were topdressed every second year with 10 cwts of slag and 1 cwt of nitrochalk per acre while lime was applied at the rate of 2 tons per acre every fifth year. No wonder his pastures were luscious. He knew quite a lot about New Zealand's dairy production but was keen to hear the details of our pasture management and our seasons. I thought he was doing a pretty good job considering the awkward layout of his irregular fields, without water, bordered by these ancient stone walls, and the short grazing season.

I was interested to see that when our host was leaving to spend the day at the Kendal stock sale he drove off in a new car—a sign of the prosperity of specialists in British agriculture. My guide who was a keen grassland-adviser told me that after his demobilisation, Alan, who had no previous farming experience, took a year's course at the Newton Rigg Farm School and secured the lease of Broadgate Farm for £150 a year. I gathered that my guide had played an important part in the development of this farm and in setting this young modern dairyman on the road to sound management.

Our next call was seven miles up at the head of Troutbeck Valley to a store-sheep wool-producing farm. As we proceeded up the valley it narrowed. Bracken fern covered hundreds of acres on either side. We passed several fields which had recently been cut and further a couple of men scything bracken. This practice is subsidised as the only practical method of control. Live stock are apparently too valuable to use for control of this weed as we use them in New Zealand. Along the road I was introduced to many breeds of sheep that I hadn't seen in the lowlands—but what an experience it was to see **Swaledales**—a small, horned sheep with black head and long tail cutting about 4lb of hairy wool; the **Rough**—a better woolled sheep, slightly bigger and producing 5-6 lb of wool; the **Scotch Blackface**—the hardy mountain breed covered with what appears to be long hair; the **Lark**—a large sheep with goat-like covering and the **Herdwick**—a small, brown, hairy breed producing about 3½ lb wool; all these breeds in this narrow valley providing a livelihood for the farmers under the cold, hard and wet climate. I was told that Merinos had been tried but the climate was too wet and humid

for these fine-woolled sheep. It was also an experience to hear in the local tongue the use of names such as wedders, gimmers, hogs, tups—my guide was a well informed sheep man.

By now we were getting towards the head of the valley and the country was looking bare, cold and hard as the sides of the valley closed in. The dry-stone walls looked rougher. Some bordered the small fields on the valley floor; others, higher up the sides of the valley a few hundred feet, enclosed larger fields, and others running more or less straight up the hillsides merged into the rocky country towards the tops. The fells, here covered with dense short heather, comprise the land above the walled fields. Many questions were asked. What do the sheep eat here? Well, the moor grasses and young heather shoots. Is the heather burnt? Yes, regularly, as the sheep won't eat old heather. What are the grasses?—Oh, Nardus and Molinia. I asked him to show me some. We got out and walked across the damp fields. I recognised browntop and Yorkshire fog and further up a small, stiff, wiry, harsh, rush-like grass—**"That's Nardus,"** and another finer-leaved but more tufted —**"That's Molinia."**—Well I was glad to see them but I didn't like the look of them, so we returned to the car.

Another mile or so up the valley with "High Street" now showing through the clouds we approached a white-washed two-storied rectangular house with slate roof in cold, bleak surroundings. One lonely tall elm and a few shorter hardwoods provided some relief to this lonely home-stead. This is Troutbeck farm—deeded to the National Trust by Beatrix Potter. **Well! Well!** I looked round in case Cotton Tail and Peter were still about—but hardly expected to see them in these harsh surroundings where they were born. Beatrix Potter was a keen breeder of the native Herdwick sheep and to maintain it against extinction she gave the farm to the National Trust with the condition that 1,000 Herdwick ewes be maintained on it. The farmer's wife welcomed us and said that dad was out at the Kendal stock sale but was expected back by mid-afternoon. They haven't a car so dad walks a mile or two down the road to his neighbours and they go on by car. She was equal to the occasion, however, and showed us round the buildings; first the stone-paved yard about a chain square, with grey stone buildings of ancient vintage on three sides, one the cow byre with loft. We climbed solid, narrow stone steps on the outside to the loft which was full of small brownish, hairy fleeces. Shearing had been finished about three weeks previously and the wool stays here till they receive instructions to deliver it to the

market in sacks. She described the shearing of the 1,000 ewes and later showed a photograph which had been published in a London paper. Ten local farmers with their families gather daily for several days and the shearing is done in the yard. The sheep are placed on short wooden stools or creels and the men sit on three-legged stools while shearing. The wool is picked up by the womenfolk and carried up to the loft while the children ply the workers with refreshments. The evening meal in the stone-walled barn is a local family festival.

A hand pump by the back door provides the main water supply to the houses. The house inside was beautifully warm and comfortable, the rooms large with whitewashed walls and spotlessly clean. A large, shining, hot, open range in the kitchen and a girdle hanging over the fire, kerosene lamps on the mantelpiece. Our hostess loved the remoteness of the valley but she hoped she would be out of it before the children became of school age. Just before we left she took us into the front sitting room. Here was a large open fireplace and on the mantel were engraved these words of Beatrix Potter's:

"An honest heart and Tarrie Wood
Sweet Martin."

One could have spent a pleasant evening round that fire.

Dad wasn't in sight when it was time for us to leave, but we hoped we might meet him on the road. So we said farewell to Troutbeck farm and started back down the valley.

As we reached the first farm a youngish man wearing cap and knickerbockers, with a couple of dogs and a long shepherd's crook, came out of the gate. Here's the owner of Troutbeck Farm. We stopped and I was introduced. He sat in the car and told the story of his farm. He has about 1,000 acres walled and stint over the fells. "What is stint?" "Oh, the right to graze my sheep on the open unwalled land in the fells for about four months of the year. I carry 1,000 Herdwick ewes and also about 200 Swaledales —they pay me better. I also carry about 400 grimmer hogs." I knew by now what gimmer hogs were. Woolweights—3½ lb from the Herdwicks and 4-5 lb from the Swaledales. Lambing percentage? Herdwicks 70-75 per cent, Swaledales up to 100 per cent. Snowlosses? Some years 3-400. He keeps his gimmer lambs and sells 500 wedder lambs in September (6 months old). Besides the wool, for which he was then getting 1/9 per lb, (1949) he sells 200 old ewes each year. Besides shepherding he cuts 26 acres of hay and grows 3 acres of swedes, 5 acres of oats and 2 acres of potatoes. Only about 15 acres is

ploughable. He works this farm with one permanent hand and pays £300 a year rent as a going concern. He said he was doing quite well. Well, we did not delay him further as it was running late and he had two miles to walk back home up the lonely valley.

I had met that day two individual farmers working a one-man and a two-man unit and it was a complete change from the high-producing mixed farming I had begun to feel was the typical English system. One realised that farmers in England are much like those in New Zealand. They adopt a system-specialised or not, intensive or not, according to the economic and climatic conditions they have to work under and when agriculture is in one of its prosperous eras, as at present, the farmer is a very contented man taking a justifiable pride in looking after his land and livestock and in securing high production from the land.

PUDDLE EROSION

Soil Conservation versus Mud Conservation

W. D. Ellison

In "The Land"

Despite the fact man has engaged in a struggle with soil erosion ever since he first started stripping the mantle of native vegetation from the surface of the earth, he scarcely has advanced his conservation concepts and practices beyond a stage of mud conservation.

This situation arises, I believe, mainly through a general failure to recognize puddle erosion and other destructive effects of raindrops beating on a soil, and to control the splash erosion process which causes these damages.

To prevent confusion, let me define my terms. The wearing away of land by water flowing over it may be called the scour erosion process. The resulting hollow place is called a gully erosion product. Gully erosion, then, is the product of scour erosion. Another type of erosion process which is caused by the impacts and splashes of failing raindrops I call splash erosion, and the puddled soil which results from it, puddle erosion.

The raindrops that fall in violent storms have great capacity to erode, damage and destroy soils. Their blasts, when they strike bare ground, resemble miniature bombs. Their sharp impacts, as they beat on the naked earth, shatter the clods and crumbs of soil and break down its structure. The beating puddling actions of the rain then compact the soil's finely broken parts into an impervious layer of surface mud.

This compact surface layer is made still more dense and impervious as it strains some of the colloids and other fines out of turbid rainwater that infiltrates from the surface down into the soil. Rainwater that accumulates on top of the land, while falling drops are splashing the soil, is churned heavy with mud. Some of this muddy water may flow down through large surface openings to reach points deep in the soil. Here they often plug important seepageways leading to the underground. Small amounts of colloidal material may even filter down through surface pores. But as this filters into the soil it completely destroys porosity in the muddy surface materials. Then the important entrance channels to deep soils are closed. The profile materials can no longer breathe freely of air, nor can they receive and store abundant supplies of rainfall.

A single storm stirs visible effects only on the surface of a soil. These show up as a crust on ploughed fields. The surface is glazed like the icing on a cake, but over a long period of years the inflow of turbid water, particularly through temperature cracks and other large openings, causes the sealing effects of puddle erosion to extend deep into a soil's profile. I have observed this further underground sealing on certain shales at depths of more than ten feet.

When you use a garden hose to make a heavy spray, you can see puddle erosion taking place on the surface. But wherever low-growing plants, or a cover of mulch shield the earth against drop impacts, puddle erosion is prevented. Under these conditions the soil retains its natural structure, and any water that accumulates on the surface remains clear. These are the conditions that obtain in nature, or under conditions of cultivation which simulate natural cover.

Where the raindrops move slowly down through crop or mulch covers, to contact the soil without impact, their movements are largely under the control of capillary forces —adhering to stems and leaves of plants. Upon contacting the soil, they come under the influence of still-stronger capillary forces which tend to pull them into the profile, just as ink is pulled into a blotter. We can observe this action when water strikes the surface of a porous brick. Since high-velocity raindrops can not puddle a brick, the clear water is pulled into the open pores by capillary action. These important and well-regulated workings of nature are violently upset by baring a soil to the challenge of the storm.

Dr. W. C. Lowdermilk seems to have been the first American scientist to give special attention to some of the ill effects of muddy water filtering into a soil. Dr. Lowdermilk conducted experiments in which he applied muddy water to soils in an experimental setup and observed that it did not infiltrate into the soil as readily as did clear water. He noted also that the longtime effect of applying muddy water on the soils was that it eventually sealed the soil so that little water then infiltrated into the soil.

In 1939, and again in 1942, I made some tests on the infiltration of waters that had been made turbid with different kinds of amounts of soils. Results showed clearly that some soils, when churned into suspension in the water, would plug pores much more effectively than would others. Different amounts of the same soil also had an important effect. There was the added fact that some soil masses were more easily sealed than others.

These tests demonstrated clearly that puddle-erosion damages varied widely from one soil to another. It was evident that some soils were damaged much more than others by puddle erosion, and that different amounts of cover would be required to protect them. This was an important part of the information which inspired the development of new techniques for measuring and studying each of the factors that affect puddle erosion.

The techniques developed will now enable us to measure the destruction capacities of the raindrops in natural storms, the vulnerability of each soil, and from these we can determine the amounts of protection that are needed. After these things have been measured, our techniques enable us to determine how much protection is afforded the soil by different kinds and amounts of growing crops and mulches. This provides the basic information of selecting kinds and amounts of covers required to prevent our soils being beaten into a puddled mass—a mud.

According to a popular definition there is no particular distinction between mud and a wet soil. But the conservationist must recognize a wide difference between these two materials. A wet soil retains its structural properties, while a mud is only a heavy mixture of soil and water in which the natural structure of the soil has been seriously damaged or destroyed. The splashing raindrops make mud of exposed field soils. We may think of this mud as being a product of soils plus water plus the impact (energy) of raindrops. Covers of growing crops and mulches are employed to remove the energy factor from rainfall. With

this removed there remains only soil and water, and the product of these is a wet soil. This wet soil retains its structure even though it is filled with water, and in this condition it resembles a honeycomb filled with honey.

Contouring operations and terraces, while holding back muddy runoff, have no effect whatsoever on controlling splash erosion. It follows that where these are used on bare lands, their purpose is to retain as much mud as possible on the hillsides. They do not protect soil structures against puddle erosion damages. These damages are done before contouring operations come into play. A study of past experiences reveals that while the checking of mud flow curtails some of the erosion damages and reduces rates of soil decline, yet it is a poor substitute for a basic conservation programme which protects a soil to the full extent of its protective requirements.

The first effects of puddle erosion will rob crops of important rainfall and cause droughts. Crusts formed on the surface impede the emergence of new plants, and curtail essential soil aeration. As this puddling extends deeper, it impairs soil throughout the entire root zone. This increases the difficulties of tillage, and it impedes the replenishment of ground waters.

Many attempts have been made to overcome the ill effects of puddle erosion by adding organic matter to soils, in hopes of producing aggregates so strong that raindrops will not break them. It is recognized that a well aggregated soil which is high in organic matter is less susceptible to puddling than is one having very little organic content. However, to expose a high organic soil to uncontrolled splash erosion hazards is believed wasteful practice. In some respects these attempts to develop unbreakable aggregates remind me of a poultryman attempting to make hens lay eggs with shells so strong that pigs cannot break them. Even though strong shells are to be desired, yet the more practical solution would be to close the gate and keep the pigs out of the nests.

I believe the basic approach to soil conservation is through the control of splashing raindrops. This is necessary to prevent puddle erosion, along with preventing related damages that have been discussed elsewhere. I believe that our present position in matters of soil conservation which I have compared to that of the one-eyed doe, springs from our seeing and fearing only the erosion that is caused by runoff, while failing to recognize the splash erosion process, and the resulting wreckage of the lands.

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