

**Bulletins 87-90.**

**June, 1904.**

# **The Agricultural Experiment Station**

OF THE

Colorado Agricultural College.

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## **THE PLAINS OF COLORADO**

**Bulletins by J. E. Payne.**

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# INTRODUCTORY.

BY THE DIRECTOR.

These particular bulletins, as well as several already issued, are a contribution from the studies made by the Experiment Stations on the Great Plains of Colorado.

When the agriculture of the state is under consideration, attention is usually confined to the irrigated area of the state and the plains are not considered. It has more commonly been thought that the plains were material for future development rather than of present importance. It has, however, been felt by the more careful observers that they were agriculturally of considerable importance, and that their extent is so large that the product from any given area does not need to be large to make the aggregate worth consideration. The plains of Colorado are limited on the West by the foot-hills of the mountains and on the East they extend to the state line, hence their extent East and West is two hundred miles, and North and South the whole width of the state. There is thus an area of forty thousand square miles, forming the Plains in Colorado.

Irrigation is confined to a limited region near the mountains and tongues of land extending along the Platte and Arkansas rivers. The area under irrigation east of the mountains is less than four thousand square miles. Almost every foot of the Plains is intrinsically as productive as the areas under irrigation, provided it could be supplied with water. This condition has been so evident that there have been many dreams that the whole area of the Plains would be irrigated in the future, not realizing that such a hope is an impossibility from the failure of the water supply, hence the Plains must substantially remain as plains, and their development must recognize the limitations of climate and of water, taking advantage of every favorable feature, and based on conditions as they are.

The settlers who came with the expectation of growing the same crops and using the same methods as in a humid country, instead of adapting themselves to the conditions, were doomed to

failure and gave a bad name to the Plains. With fuller understanding, a more just appreciation of the capabilities is being obtained.

In 1893 the Legislature caused a branch Station to be started near Cheyenne Wells. The trials for the first few years were under the hope of finding the means of growing the same crops grown on an eastern farm. As the failures were many, and each from whatever cause meant the loss of a year's work, the experiments on this line were both costly and time-consuming. They resulted, however, in indicating such crops as might be partially or wholly successful. During the first few years, Mr. J. B. Robertson was superintendent, and was succeeded by Mr. J. E. Payne, a graduate of the Kansas Agricultural College. The results of the first few years are published in the Annual Report of the Experiment Station for 1900, and also as an excerpt in "Results of Six Years Trials of the Plains." When the Station was organized, it was expected that the State would make appropriations for its maintenance, but it did not and the expense fell upon the Hatch fund from the General Government. The Department of Agriculture has ruled that this National appropriation could not be used to maintain a sub-station.

When the present Director took charge of the Experiment Station it was evident that it was time to change the method of investigation. It was found that there were many settlers on the plains who were more or less successful. Mr. Payne was set free from the confining duties at the sub-station, provided with suitable field equipments to visit the settlements to learn their successes and failures, and especially to study the causes, whether due to crops, to local condition of soil or rain-fall, or to a personal element of a skilful and persistent leader. A great part of the Summers of 1901, '02 and '03 were spent in the field, mostly between the Platte and Arkansas Rivers. Some reconnaissance trips were also made South of the Arkansas and North of the Platte.

The previous work of the farm at Cheyenne Wells, though unsuccessful as a farming enterprise, was of great value in preparing for this work on the plains. It has already led to the publication of Bulletin 77 on "Unirrigated Lands in Eastern Colorado;" to Press Bulletins, 16, 17 and 18, on the "Prairie Dog as a Range Pest," "Trials of Macaroni Wheat," and "Crops for Unirrigated Lands," as well as to the present series of Bulletins. The Station has kept closely in touch with some of the Communities and the active individuals in the communities as mentioned in Bulletin 77. It has distributed Macaroni Wheat to many settlers on the plains in small quantities, and through the aid of the Department of Agriculture, to a number in quantities sufficient to plant several acres with good success.

These studies were made to get the facts necessary for an intelligent understanding. They show that the conditions of the plains are changing, and with the passing of land into private ownership, that the conditions of the open range are different from what they were a few years since. A large portion still remains public land and is likely so to do for years to come. In one respect it has been unfortunate, because it is then to no one's interest to protect the grasses but rather to get as much return as possible, without regard to the killing of the grasses and the deterioration of the range which was inevitable. The range will support fewer cattle than it used to do. A consideration of the situation inevitably brings up the consideration of the range question as an important public factor. These introductory statements can scarcely be made without a word as to the irrigation of the plains, and to answer the numerous inquiries of this kind which are received. There are no running streams on the plains. There are many dry channels which contain water after floods. Some of the streams like the Republican or Cherry Creek have water near their heads which soon disappears. The possibilities of irrigation from streams are therefore limited. It takes the water from three to five acres of mountain water shed to irrigate one acre of land. If a corresponding ratio could be maintained on the plains through storage reservoirs and catchment of floods, 20 per cent. would be an extreme estimate.

There are almost no attempts yet made for irrigation from storm waters other than catching floods in stream channels and conducting them into reservoirs. Some small attempts have been made to catch water in plow furrows on gentle slopes. The result has been promising enough to encourage further trials. There is an increasing tendency to raise water by windmills. From all these methods small areas may be expected to be developed and give a small percentage of irrigated land, with the unirrigated lands used under range conditions.

# Colorado Agricultural Experiment Station

BULLETIN 87.

JUNE, 1904.

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## Cattle Raising on the Plains.

By J. E. PAYNE.

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*History in Brief.* In 1867 a Massachusetts editor, when traveling from Omaha to Denver by stage, spoke of the country from Fort Kearney to Denver as 400 miles of uninhabitable space. The whole country between a short distance west of Omaha to the Rockies was considered a desert by nearly all hunters and travelers. Notwithstanding this the same men today will say that that country then supported more roving buffaloes than the number of cattle now kept on the same area. Between 1860 and 1875 the buffalo were driven out of this space and the Indians were subdued so that it was comparatively safe for men to keep cattle there. Cautiously at first, and recklessly afterwards, men went into the cattle business, until in the eighties the tally books of the various outfits whose cattle ranged eastern Colorado summed up nearly half a million head. The most of these cattle were owned by large outfits, supporting high-salaried officers and employing superintendents and foremen to do the real work. These large companies took possession of the open water along the streams and soon it became an unwritten law among them to allow each ten miles of open water and the valley adjoining it, and from the stream half way to the nearest open water on another stream or in another locality. It was the custom then to allow the cowboys to run their own cattle with those of the company and have them cared for the same as if they belonged to the company. The care consisted usually in rounding up, counting what could be found, branding the calves, and selecting animals to be sent to market.

For sometime all the range was entirely open and cattle whose owners lived on the South Platte might drift to the Big Sandy, or possibly as far as the Arkansas river. Under this system it was impossible to improve the range stock, so in the eighties the large companies began to fence large pastures and use pure bred bulls of the beef breeds. The pasture method was quite

economical as the only hands needed were enough to ride the fences to see that they were kept in repair and do a little extra work around the home ranches.

Following this era came a wave of settlement. As all the country was fenced as cow-pastures, the people had to settle in the pasture claimed by someone. During this era of claim-taking the cow-boys of the different outfits, after finding it impossible to bluff the settlers out of the country, filed in many cases on the land containing the open water of the streams, leaving the smooth upland for the settlers who came to farm.

This wave of settlement came just after the hard winter of 1885-86 had destroyed fully one-half of the cattle on the plains and had caused many owners of cattle to be discouraged and ready to quit the business. At the same time an order was issued by President Cleveland ordering all men having public lands fenced to take down their fences. This, with the crowding of settlement and the losses from the storms during 1885-86, caused the majority of the large companies to go out of business and be succeeded by men with smaller herds.

Haste of these men in getting out of the cattle business probably helped to make the period of low prices experienced in 1889-93. During these years cattle were considered very poor property, still those who stayed in the business found themselves on the top wave of prosperity a few years later when ordinary calves sold for \$15 and \$20 per head at five months old. But the old way of raising cattle by turning them loose and leaving them without further attention except at round-up time, had passed. The day of large herds had also passed and could not be recalled. Today a man in eastern Colorado owning as many as 1,000 head of cattle is as rare as was the man or company owning 20,000 in 1885, and between the South Platte and Arkansas rivers individual holdings of less than 500 are the rule. The majority of the cattle in that region are held in herds of less than 300. During the eight years I have been among the cattle men on the Plains the oldtimers have spoken of the winter of 1885-86 with awe, and remarked that another winter like that was likely to come at any time, "and when it does come it will clean us out," is the remark which usually followed the statement.

The winter of 1902-03 was the hardest since 1885-86. Oldtimers say that the reason the losses were not greater then was that the cattle are kept closer home and owners are able to get their cattle in and feed them. Some who attempted to winter without feed lost nearly all they had. Some fed so much that the cost of the feed was more than the value of the cattle. The owners of cattle are now compelled by public sentiment to feed so as to keep their stock from starving and they did this in 1902-03.

If they had not the losses would have been seventy-five per cent of all cattle on the Plains instead of probably less than twenty per cent as it was.

The settlers came to the country to farm and settled so thickly that they left no range for stock. After the crop failures in 1893-94, settlement was thinned so much in many communities that there was room for the remaining settlers to pasture as many cattle as they wished. From that time settlers began to gather herds about them until now the country is again almost as much overstocked by the small herds as it was before by the large holdings. Two years ago it began to look as though the grass would soon be eaten out, but the losses during the winter of 1902-03 probably checked the increase sufficiently to postpone the evil day indefinitely. Practically all settlers are now cattle owners, and many of the men own just the number that can be well cared for by the owner and his family.

*Water Supply.* In early days the water supply was limited to that furnished by running streams, springs and storm water which collected in basins on the prairie during heavy rains. This, during dry seasons, limited the pasture used to areas within three to five miles of water holes. This caused the grass to be badly tramped and eaten out at times near the water while there was plenty of good grass on the divide. When settlers came in on the divides they dug and drilled wells so that in a few years the whole country could be used the year round, while before wells were made the divides far from the stream were used only occasionally after heavy rains. I have observed the Big Sandy valley and the adjacent grazing land from Limon to the mouth of the creek. The upland near it was never homesteaded as was the upland along the headwaters of the Republican, so it has been left practically as it was in the days of range cattle. During the time I have been acquainted with this valley, the grass and even the sage brush have been kept eaten down quite closely, especially in winter, for one to three miles back from the water. Then the grass would improve from that point until it appeared to be practically untouched over large areas. Cattle ranging in the Big Sandy valley often go out or are driven out to some water hole on the prairie where the water has gathered during a heavy rain and remain there until the water at that place is gone when they return again to the valley.

Some of the best and most humane cattle men claim that cattle should never be compelled to graze more than two miles from water. If this be true, it would double the value of the Big Sandy range if wells were put down four miles from the stream and about three miles apart on either side of the open water. The Sand Hills are counted the best grazing land, but if they are



grazed too closely they lose the sod which holds the sand in place and again become moving hills as those of Colorado were forty or more years ago. Some of the sand hill country is considered capable of carrying forty head of cattle per square mile, while the best clay land pasture will carry only about twenty-five head per square mile.

*Numbers Today Compared with Number of Buffalo and Number of Cattle in the 80's.* Concerning this question we find no way of getting a fair comparison concerning the number of animals living east of the Rocky Mountains at different periods. It resolves itself into a guessing contest with no one able to decide who is the winner, and one man's guess is about as good authority as another's. Assessors' returns would be official and we believe that these are more nearly correct for 1902 than for 1885 or 1879, but we find by observation that some assessors find nine-tenths of the stock in the country they canvass while others may not find more than half. Arapahoe County comprised the same territory in 1879 that it did in 1902. An estimate made by stock men and dealers in 1879 credited Arapahoe County with 60,000 cattle and 87,000 sheep, while assessors' returns for 1902 credit the same territory with 67,000 cattle and 85,000 sheep. A few years later (in 1885) there were probably more cattle and sheep in the country than in 1879. I have tried to get estimates of the number of cattle and sheep pasturing in the county in 1885. Have received estimates from several old time cattle men. These estimates give the numbers owned by different outfits. They differ so widely that I cannot credit any of them. One gives 10,000 cattle and another 20,000 cattle to the same outfit. Taking averages of the estimates it appears to me that the stock pastured in eastern Colorado in 1885 was about equal to that kept on the same territory in 1902. But much of the stock was then kept only a part of the year and then sent to market. It is my opinion, (which I cannot prove to be true, neither can anyone prove it to be untrue) that more stock is kept the year round on the Plains of eastern Colorado today than ever before in the history of the country.

As a cattle range the territory under discussion is broken up by the irrigated lands along the Platte and Arkansas rivers which now feed thousands of cattle and sheep during winters and also by small dry-farming districts near Wray, Idalia and Colorado Springs. The adobe land in the Horse Creek region and also northeast of Hugo and other places was for a long time a death-trap for cattle companies which were managed by inexperienced men who tried to use adobe land for winter range. That variety of soil is now used only as summer range, and cattle are not put on grass there until the spring storms are past. In summer the

the grass on these ranges is extremely good, but when the soil is soaked with water, cattle cannot travel far enough on it to get enough grass to sustain themselves without gathering great balls of mud on their feet which wear the animals out completely. These factors change the conditions so much that we cannot compare the eastern Colorado of today with the eastern Colorado of 1885 and treat it as a cattle range.

Today cattle are raised mainly by what might better be called "stock-farming" than cattle raising pure and simple, that is, crop production in some form usually goes with the stock raising. Comparatively few men now attempt to raise cattle entirely without feed.

*Buffalo Once Ranging Over the Same Territory.* The buffalo was a range animal—pure and simple. Natural laws would govern its numbers. When the buffaloes became too numerous the feed would be so scarce that the extra number would starve and this would give the range a chance to recuperate. Old-timers have often told me that there were more buffaloes in the country in the early days than there are cattle in the same region now. Travelers told of "traveling all day through a herd of buffalo." Suppose that they did "travel all day through a herd of buffalo" how many would it take to make the show spoken of? The buffalo is preeminently a gregarious animal and it might be more than one hundred miles from one herd to another. I have seen 3,000 head of cattle scattered over a range three by five miles, and at a little distance one on horse-back, or in a wagon would consider them as covering the country as far as he could see. Then 6,000 would have covered the space for the same distance on each side. This would make 6,000 cattle on the range for every five miles. 250,000 cattle spread in that way would make the same show along the Kansas Pacific Railroad from the Kansas line to Denver. Travelers could travel for days and weeks without seeing buffalo. Also the buffalo were limited in their grazing to within a reasonable distance from water. This would compel them to congregate along streams just as the cattle do along the Big Sandy now. If there were as many buffalo watering at the Big Sandy now as there are cattle watering there, it would excite the imagination of the hunter so that he would think he saw a half million where there might be 50,000.

*Pastures vs. Open Range.* Only a few have tried keeping their cattle in fenced pastures. Those who have kept their cattle in such a way find it more a question of water supply convenient and sufficient than of range. Without doubt if the whole range was divided into numerous small pastures with plenty of good water conveniently located in each, so that no animal had to walk more than one or two miles for water, the country could support

a much larger cattle population than it does now. The cattle could be moved from one pasture to another so that one pasture could recuperate while the cattle were grazing in the others. This plan when tested in Abilene, Texas, increased the value of the pasture quite rapidly. The important question in every case is the water supply. If only one square mile is available, then dig the well in the middle as nearly as possible and fence in four pastures and have watering troughs in each of the four pastures into which the tract is divided. Such a small holding as this would necessarily mean a dairy in connection and cows of the dual-purpose class. Those having larger areas under control could afford to raise beef cattle exclusively and all could improve their stock at their convenience without interference from the scrub stock kept by neighbors. The expense of fencing is the main argument against the keeping of cattle in pastures in communities where the land is all in the hands of private parties. But in a few years the amount which is saved in wages for hunting stray cattle and following the round-ups will pay for the fence. Also the owners always know where the cattle are and if he wants to sell one the buyer does not have to wait a week or so until the cattle can be found. Of course as long as there is Government land the pasture idea cannot be used fully, but it can be used partially. At present the men who own land often fence their own land and save the grass on it for winter range for their stock, running their stock on the open range in summer.

The use of "drift-fences" on government land is often quite beneficial to all who use the range partially enclosed by them. Often combinations of them almost enclose large tracts of pasture land. These immensely reduce the labor of controlling the cattle and keeping them on their own range. I have seen 3,000 head of mixed cattle handled by two riders by the judicious use of "drift-fences."

*Range Improvement.* Improvement of the range under present conditions may be classed with "iridescent dreams" of the cow man. No man is considered a good business man who will spend his money, strength and thought in improving something which is subject to being taken possession of by another as soon as it appears to be desirable property. For this reason the prairie dogs are allowed to increase while the cow-boys ruthlessly kill every hawk, badger, rattlesnake, and bullsnake that they can, thus leaving the real enemies of the range (the prairie dog) to increase without hindrance until they make their homes in the front yard of the "home ranch." Occasionally a prairie dog is killed for sport, but such cases are comparatively rare. Usually the range deteriorates so slowly that its lessened value is not noticed until some extremely dry summer or very severe winter.

The range cow-man is accustomed to seeing large numbers of cattle very poor and is not surprised when several of the poor ones die. He takes the hide and philosophically remarks that "the old cow's time has come." When cattle are high in price the range man buys cattle to the limit of his credit instead of the limit of his pasture and winter feed. The rule is, the more cattle a man has the less winter feed he gets stored for them. Then after running all summer on an overstocked range the cattle start into winter poor. In buying the cattle it is likely that the man has bought a goodly quantity of mange and contagious abortion. If to this combination is added an unusually cold winter with much snow evenly distributed so as to cover what little grass is left, then the greatest factor in "range improvement" under present conditions, thinning out by death from starvation, gets to work. After the winter is over the creditors take what is left and the range is allowed a few years of comparative rest, while the same man or others gain the "*nerve*" to restock it to its capacity. Eras of extremely low prices for feeder steers work the same beneficial results in range improvement as in the above case.

Methods of range improvement have been suggested in another paragraph. As yet we have found no grasses better than our native grasses, so it seems that the best way to improve is—rest and time for recuperation.

*Winter Feeding.* Twenty-five years ago a cow man in western Kansas remarked "If there was a hay stack on my range which my cattle could get to, I'd burn it and pay the owner for it rather allow my cattle to eat it." That kind of talk has been very popular among the cow men on the plains. But during the past few years the sentiment in favor of feeding during the winter has grown rapidly. Chief among the factors which have brought about this change of sentiment is the Humane Society which now has agents who travel over the plains looking for cases of cruelty to animals. Some say that most cattle men are subject to fines if the strict letter or spirit of the law was enforced. Some make no attempt whatever to provide feed for their cattle, even for times of storms. Some prepare to feed during storms and very few put up enough to feed all winter, practically none do this. Usually six weeks feeding would exhaust the feed of the man who has put up the most feed. In ordinary winters it is only necessary to feed all cattle during storms and the weak ones all the time. The feed which can be raised consists of roughness such as corn fodder, Kaffir corn, sorghum, wheat, barley and rye hay and millet. I have found sorghum and some varieties of flint corn to be the surest crops tried on the Plains. These practically never fail to produce fodder. Many find spring rye the most economical crop to raise and some stick to millet as best for

their conditions. I would not advise anyone to try to raise any of these crops by dry farming on adobe soil, but on sandy loam or the lighter clay soils these crops are fairly sure to pay in a series of years. Sorghum fodder can be produced at a cost of \$2 per ton in a series of five years on sandy loam land. This will certainly be cheaper feed than shipping in feed, hay and corn.

When cattle are pastured during the summer on adobe land it is necessary to get them to some other place for wintering. Those who pasture the adobe soil near Horse Creek usually take their stock to the Arkansas Valley to feed during the winter. Hundreds of cattle are wintered now in the little nook of farming country about Wray, Vernon and Idalia. In the winter of 1902-03 many took their cattle to that country to winter and thus saved a large per cent of them from starvation. Some of the cow men have not fed a cow for so long that they have no idea how much feed an animal needs. Some men feed such a small amount that it will not sustain life, while others feed so much at the first feed that often animals are foundered and never recover. Many feed grain altogether when they feed during the winter, and allow their cattle to get their rough feed from the prairie. The way roughness is usually fed, strong cattle will not rustle for grass after having been fed a small feed of fodder, but will if fed a small feed of grain. I have seen fodder fed by scattering it over the range. Those who fed their cattle in that way claimed that the cattle would eat the fodder and then go on eating grass the same as they would if they had happened upon a few bits of grass which grew taller than the ordinary grass. This method can be used when a man can keep stray cattle away from his herd.

It has been the experience of cattle men that after they have begun feeding an animal the feeding must be continued until the grass comes. It is also better to feed the weak animals full feed instead of trying to make them rustle for a part of their living. If given a partial feed they die and all that is given them is lost, while if well fed and sheltered they get through the winter in good shape and are soon equal to the stronger cattle that rustled all winter.

*Shelter.* This is one of the most important factors in stock raising. Cattle kept warm and dry do not need as much feed as those exposed to the rain, snow and winds of winter. A cow covered with an overcoat of frozen snow soon loses ability to eat and her owner is lucky if he gets even her hide. If both food and shelter cannot be furnished, shelter should be chosen, because cattle in warm quarters, like a sod-sided shed covered with a water-proof roof, will go out on the range after a three days' storm and soon fill up on the dry grass, while without shelter cattle can eat very little during the storm. Fodder and hay cannot be fed

in an open lot during a wind storm, and it is very hard to feed grain even in troughs in the open during the progress of a storm. But as a rule those who have no further preparation for shelter than a corral made of barbed wire seldom have to face the problem of feeding their cattle there during a storm. Usually their cattle are scattered over the range sometimes as much as fifty miles from their home corrals. Such cattle are lucky if they range in a hilly country as they can then find some shelter in the gullies and beside bluffs along the creeks. In rough country the snow does not usually cover all the grass as there are so many varieties that grow comparatively tall in such locations, instead of being limited to a few inches in height as are the grasses which grow on the level lands.

*Diseases.* During the time of high prices, cattle were shipped into eastern Colorado from many places and nearly every man there bought cattle to the limit of his credit. With these cattle were imported a few undesirable diseases. Diseases like ophthalmia could be seen, and the man who bought cattle affected with those could blame himself. But itch or mange was not in evidence among the cattle during the summer so as to enable a man to see it on wild cattle. Neither was contagious abortion visible when the cattle were shipped into the country. But the next winter after the cattle came in, itch developed in a large proportion of some importations, and some herds of fine looking heifers, which were sold at high prices, were found to be infected with contagious abortion to the extent of ninety per cent in some cases. The contagion spread to the sound cows which were in the herd before the purchase of the strange cattle. The remedies for these diseases were simple, but extremely expensive. The mange on the cattle had to be destroyed by dipping the cattle, and the corrals and all scratching places disinfected. If these measures were thoroughly carried out all over the country, the mange would be stamped out in a season.

There are various remedies suggested for contagious abortion, but the most effective one is to send the whole herd to the slaughter house and stock the range with calves, or with cattle from a range where the disease does not exist. Afterwards when one sees a fine-looking lot of young cows offered for sale, he had better leave them alone until he knows their history or the condition of the herd from which they came.

There is one neighborhood where I have never heard of a case of contagious abortion and practically no mange. In that neighborhood no cattle have been sold by the speculators. Those people started several years ago with only a cow or two apiece and have bought no cattle except bulls since.

*Loco.* This is one of the bug-bears which lurks about the range country. I have never found a man who has seen enough of the progress of a case of locoed animal to be able to give a complete history of a single case. The history given is, "I turned a horse out one time and did not see him for several weeks. He then acted strangely. I saw him eating the loco plants and later he would eat nothing else. He became weak and emaciated and finally died."

I have seen a great many animals that were said to be locoed. I have seen a few eating loco plants. I have also been, in a few cases, unsuccessful when attempting to make a "locoed" animal eat the loco plant. At one time we heard of a man who had 200 steers, ninety-five per cent of which were said to be locoed. We spent sometime on that range and we could not find enough of either loco weeds or brown sage (which was also accused of causing the trouble) to support an animal more than a few days. The loco plants growing in the pasture where quite a number (about fifty) of the locoed steers were confined, were mostly untouched by them. We saw a few plants which had been partially grazed off. I tried to feed green loco plants to a steer which was confined in a shed. He would not eat the weed, but ate corn and alfalfa hay with a relish. The range on which these steers were kept was a very poor range. There was very little grass which they could get. Later one steer which was badly affected when I was at the range the first time, died, and the bone of one hind leg was found to be decayed so that it broke with but a slight pressure.

In every locality where loco was said to be prevalent I found the range to be very poor. This scarcity of food seems to go with loco outbreaks. I have often found a scarcity of loco plants as well as a scarcity of edible grass. At one place where I saw loco plants so thick that at a distance the patch showed but little else except those plants, the party using that range told me that his herd had never had a case of loco.

I have noticed that there is more talk of loco when there is danger of new settlers coming in on the ranges occupied by old-time cattle men than at any other time. A "terrible outbreak" of this kind occurred just as the U. P. Land agents began to bring buyers into the country four years ago (in 1900). Some of the parties who talked the most about loco have since told me that the U. P. R. R. was getting to "thinking too much of their land and putting too high a valuation on it, so the old settlers there wanted to show the Railroad company that the land was not worth so much." Others told me that an animal would not eat loco until it was almost starved to death.

Such a variety of symptoms are described by different parties who describe locoed animals that it is possible that quite a num-

ber of as yet unnamed diseases (at least unnamed by the stock men) exist on the range, and whenever an animal acts queer it is called "locoed."

The remedy usually applied is to take the animal away from the range upon which it has become diseased and feed it plenty of nutritious food.

*Financial Results of Stock Raising.* The main question at issue is, "Does stock-raising on the Plains pay?" The answer cannot be a definite "yes" or "no." The results of a venture depend upon the man behind the business, and also upon the conditions which he happens to meet in the work. We have known some men who made money raising cattle when prices were lowest and have met others who have broken up when prices of cattle were at the highest point. Close attention to details, an accurate acquaintance with the conditions existing upon the range used and good judgment in buying and selling are all among the factors which give success. If the herd is small the cows must be milked in order to make the profits sufficient to support a family. A man with ten cows can make a good living for his family and get ahead financially if he selects cows which give a fair amount of rich milk, and milks and cares for them properly. This man can raise feed enough to feed seven months in the year and keep his young stock growing all the time. He has but a small amount invested, and therefore his taxes are light. His stock stay near home and the expense of hunting for strays is small.

The man who has one hundred cows must hire some work done even if he raises no feed. He will be lucky if wintering does not cost him at least \$3 per head in feed and losses from starvation. If he sells fifty head of cattle at \$25 per head, his total income will be \$1,250 per year. Out of this he must pay all store bills, feed bills, lumber bills, etc., and by the time he has paid all bills and the interest on his investment he may not be ahead of his poor neighbor who milks the cows. But one man cannot figure out the results in advance for either himself or another and get them as they will come out in actual practice. Taking it all around the personal factor is the main one in this, as in every other business venture.



# Colorado Agricultural Experiment Station

BULLETIN 88.

JUNE, 1904.

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## Dairying on the Plains.

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BY J. E. PAYNE.

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*History.* During the days of mail coaches a milch cow was a curiosity on the Plains west of Fort Kearney. Probably the old hunters occasionally captured a buffalo cow and amused themselves trying to extract enough lacteal fluid to tone their strong coffee, but I doubt that their efforts were successful, except as an amusement. Those were the days of condensed milk, and they all found it easier to milk the can than to can buffalo milk. Later, when the Texas longhorns had taken the place of the buffalo, the cowboy who had the hardihood to try milking the dun Texas heifer probably extracted as much fun per quart of milk obtained as did the hunter who milked the buffalo "bossy." When the large companies took possession of the country, the horde of high-salaried officers who occasionally visited the "home camps" of the companies, had to have more delicate food than the jerked steer and drop biscuits which prevailed at many cow camps. So good milch cows were brought in and kept in enclosures near the permanent camp or home ranches of the outfits. These supplied plenty of milk, cream and butter and enabled the cooks to manufacture dishes fitted for the palates of the rulers of the range. Of course the old hen also lent her portion to the feasts. Ranches fitted in that way were exceptions in those days, but some of those located hundreds of miles from towns would be able to furnish many luxuries to the visitor.

When settlement first came into eastern Colorado there was a good local demand for dairy products. A few settlers brought cows with them, many had worked at dairying in their old homes and they saw the opportunities open to them in that line in the new country. When new settlers were constantly coming into the country, times were good and poor men could live by working for those who had brought money with them. But when the hard years of 1893 and 1894 came, this source of revenue for the poor man was cut off. Most of the men who had extra riches left the

country, or ceased making improvements. Then the poor man who had no cows could not stay in the country. He had to go where he could work for somebody. Those who had a few cows and a flock of chickens could stay and many of them did stay where they were by taking care of their cows and chickens. Many of these people had not enough property at that time to sell for enough money to pay their little store bills and pay their car fare to their old homes. Many old settlers have told me that they were "unable to leave the country during those hard times, so they stayed and grew comparatively rich."

In 1895 beef cattle increased in price, and the increase continued in 1896-97, until almost any calf would sell for \$12 to \$20 when old enough to wean. With beef cattle at these prices, it became more profitable to raise calves than to milk the cows and make butter. Also, those who had a few cows in 1893 had so many by 1898 that they could make a living from the herd without milking the cows, and often they had not much time for doing much dairy work when they had so many cattle to look after. Herds continued to increase until the range was overcrowded so much that the calf crop grew lighter, and often many of the cows would starve to death during the winter. A period of speculation came in 1901 and 1902, when many of the settlers bought cattle to the limit of their credit. This overstocked the range almost everywhere on the Plains and this overstocking caused immense financial losses. With many it again became necessary to begin milking the cows in order to get money to pay the interest on the money they owed. So we found many cows being used for dairy purposes in 1903. The low prices obtained for feeder steers compelled the people to milk their cows. During the early days attempts to support creameries were made at a few points, but these failed for lack of patronage when beef cattle took the country. A skimming station has been in operation at Burlington a few months at a time for several years. This was not in operation in 1903 as it had been superseded by hand separators.

During the past two years hand separators have grown in favor among dairymen. They find that they can raise better calves by giving them the freshly skimmed milk than they could by feeding skim milk which had been to the skimming station and back. Also, by use of the hand separator, they take only the cream to market and thus avoid handling so much weight uselessly. In 1903 there were ten hand separators in use near Wray, ten near Akron, about the same number near Burlington, and one at Cheyenne Wells. I also heard of some being in use at other points.

The cows first in use for dairying were such as were brought

to the country by the settlers or such as could be bought at the ranches. The dairy type of cows had a chance to become prominent during the hard times. In 1896 there were some Holstein and Jersey cross-bred animals in the country. But as beef cattle rose in price the dairy types of cows diminished until now they are hard to find. Cattle which are grades of one of the beef breeds are seen everywhere. In Washington county, Polled Angus and Galloway grades occupy most of the range. In Yuma county the honors are about even between Shorthorns and Herefords. The same is true of Kit Carson county. In Cheyenne and Lincoln counties Hereford grades predominate, but the other three leading beef breeds are well represented. Then there are many Mexican cattle in some of the country which is purely a range country. Practically all the cattle on the plains in other counties, as well as in the counties named, are of the same character. Nearly all of the cows have been allowed to run with their calves during the season. Very few of them have been touched by the hand of man, except at branding time.

Cows raised and trained in the manner described and which are cross-breeds of beef-making breeds instead of dairy breeds, are not likely to prove to be very profitable dairy stock. After the settler has decided to return to dairying, it will require two or three years to train cows for the business so as to make it profitable from the business-man's standpoint. The range cows give milk during only about five months of the year. They must be trained to give milk during ten months. The cow that has become accustomed to running with her calf will not readily consent to adopt a man to take the place of the calf. If forced to submit to being milked by a man, she cannot be compelled to give all her milk. In order to get a herd ready for dairying, the heifers must be broken to milk and developed as milch cows. By choosing the best from large numbers, a herd may be obtained which will give some profitable returns the second year. If the heifers pay expenses the first year, they will do well. Some men milk a large number of cows after the calves are weaned, getting a little from each cow for a short time. This is pure gain to the man who does his own work as nothing is fed the cows and they are milked in order to keep the udders from spoiling.

Some milk their cows during the summer, or during the time when grass is good, and allow them to go dry when the cold weather begins and it is harder for the cow to get plenty of feed on the prairie. With the average range-bred cow, this is probably the best way, because she will not respond to heavy feeding by giving more milk. Instead they will put on flesh when fed heavily. When they have dairy cows they can then find profit in feeding costly feeds during the winter. As it is now it will re-

quire from one to five acres cultivated in sorghum to feed a milch cow through the season of poor grazing. A man who has ten cows can milk them and raise enough feed to feed them and their calves through the winter. The feeds that he would be likely to raise are wheat and millet hay, corn fodder and sorghum. Some years he would raise enough grain to make a good ration for the cows, and during some years he would have only roughness which he could profitably use with some of the concentrated feeds which are on the market. At present practically all the settlers use the forage and grain which they can produce and buy as little as possible. Ensilage should in the future be a part of the winter rations of the milch cow. I have frequently been asked about ensilage by settlers who were thinking of doing winter dairying. No trouble should be experienced in making good ensilage anywhere on the Plains. In fact the Australian stockman makes ensilage by stacking the green forage above ground just as it is cut, and weighting the stacks heavily. I would not advise this, however, because forage is too scarce on the Plains to afford to waste the amount that is lost by making ensilage in the stack. In many locations it is easy to make a pit near the bank of a creek or ravine so that a door may open from it into the ravine. This will resemble the costly silos which are built above ground. On level ground an immense cistern will answer the purpose perfectly. These underground silos will be used at less expense than the silos built above ground, as the green fodder does not have to be elevated. It can be merely thrown into a pit and trampled down solid. Of course the pit will be better and more substantial if the walls and bottom are cemented. In filling the silos the green forage should be run through a cutting machine and the stalks should be reduced to pieces one half inch to one inch in length. An ensilage cutter suitable for filling small silos which can be run either by a windmill or by horse power can be bought for about \$40 or \$50. By making the green feed into ensilage the waste caused by the hay and fodder being covered with dust by the wind storms, may be avoided. The pit silo can be made by the home labor with no cash outlay. After it is filled it should be covered to a depth of one and one half to two feet with hay or straw, or any trash which will keep the dirt out of the cut feed, and then earth should be thrown upon that covering to weight it down. About one foot of earth should be enough, but the weight of earth should be put on according to the depth of the ensilage in the silo. I have seen one foot of earth put upon eighteen feet of ensilage with good results.

*Sodding.* In nearly every locality good sod is available for building purposes. The adobe soil furnishes the best sod for this purpose, but any stiff clay soil will make a strong wall. Light

sandy loam soils do not make good soils for building. The wall may be built two feet thick of sod, then a good roof of either lumber or shingles should cover the building which is to be the winter shelter of the dairy cow. Some make the covering of rough boards and lay sod on top of the boards. Some thatch the building with sorghum or other rough hay. All the coverings except those of wood must be frequently renewed or they leak so badly that the building ceases to be a shelter.

*Results.* Comparatively small returns from dairying on the Plains are the rule. One creamery man remarked to me that "a settler could milk a three-year-old steer out of a cow every year." That may be true but in order to do that the cow must be fed, and it will be a good steady job for one man to milk twenty cows and raise feed for them. If then, three-year-old steers are worth \$35 each, a man by hard and confining work, may get \$700 for his years work. This is a theoretical illustration. Usually one man and his whole family manage the twenty cows or less. Some parties near Akron report a return of five dollars per cow during five months in 1903 from grade Shorthorns. This is a report from only one season's work, presumably with a selected herd of cows.

One of the oldest dairymen in Burlington, a man who never quit the business since he came to the country fifteen years ago, milks twenty grade shorthorn cows and heifers every summer. He tries to raise good calves as he counts the calves as his profit. His estimate is that the average range cow running on buffalo grass and getting no other feed will give about two dollars worth of cream per month during six months of each year. By milking enough cows the settler can make his living from the cream sold, and the calves will be the gain.

At Wray the estimates were similar. That is the cream will make expenses leaving the calves clear gain, and the weight of evidence all around pointed the same way. Of course, the better beef animal the calf is, the greater the gain, and the nearer the cow approached the dairy type the more cream she would have to yield in order to make up to her owner the difference between her bony calf and the fine calf of the grade shorthorn.

We may safely count dairying, in a modest way, a success from the standpoint of the settler in eastern Colorado. This is especially true when it is practiced in connection with the production of medium to good feeding steers. Of course choice steers cannot be produced in connection with dairying on the range without using so much feed that the cost is likely to be too great for the returns obtained. If the dual purpose cow has a place anywhere it is on the Plains of eastern Colorado, where men

must milk the steer's mother in order to be able to keep the steer until old enough for the feed lot.

Dairying is a confining business, but it is a business which will give employment at modest wages to all who are able to get a few cows and settle on a piece of government land. With dairying the plains country will support five times the population it will support under the system of raising beef alone. All who can get a location within fifteen miles of a railroad station can sell cream. Those farther from shipping stations would better work at cheese making which has proved very profitable in many localities.

The greatest source of profit in dairying in eastern Colorado is not in the production of dollars or steers, but in the training of the boys and girls to habits of thrift and industry. Where no cows are milked about the only thing left for the children to do in the purely stock-raising sections is to ride around the country on ponies and drive cattle. If any feed is raised they may work in the crop-raising a part of the season, but the chances are that they will grow up comparatively idle and not learn to do any work systematically. But with cows to milk and care for regularly and the calves to feed, there will be something for every child to do who is strong enough, and each member of the family may be helping to earn something to provide luxuries as well as necessities. Also, the income from the sale of cream will come monthly, while if the sale of steers is depended upon the income, as a rule, comes yearly.

### Wheat Raising on the Plains.

BY J. E. PAYNE.

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Eastern Colorado was settled mainly by people from Kansas and Nebraska. These people had raised wheat as a main crop in their former homes and as a matter of course began planting wheat when they came to the new country. The usual successes and failures followed. In 1892 an immense crop was raised, but 1893, 1894 and 1895 were hard years for the wheat growers. The years following were not so bad as 1893 and 1894. Wheat planting began in earnest in 1888. The average of wheat per acre reported by a number of representative farmers now living near Vernon and Idalia for the eleven years, 1888 to 1899, inclusive, is ten bushels per acre. This includes the years when the crop was an entire failure, on account of drouth, hail or insect enemies.

In common with other new countries, this country seemed poorly adapted to the growth of fall wheat when it was first settled. Many tried fall wheat, and sowed it until they lost their seed and then quit. In 1900 there were only a few small fields of fall wheat in the country, but a series of comparatively damp autumns have encouraged the settlers to again sow fall wheat, until in 1903 fields of fall wheat were seen to be quite common. Those who grow fall wheat claim to get one to two bushels more per acre from it than they get from spring wheat, and the buyers pay five cents per bushel more for it than for spring wheat, so there is considerable inducement offered for trying to raise it. On the Idalia divide, about one half the wheat seen by me in 1903 was fall wheat, while on the Vernon divide about ten per cent of the wheat was fall wheat.

During the years 1902 and 1903, a spring variety of macaroni wheat has been introduced into the country. It is a hard wheat and seems to be quite drought-resisting, although it has as yet, given only about the same yield as the ordinary spring wheat. About 2500 bushels of this wheat were grown on the two divides in 1903. For a time the growers seemed unable to find a market for their macaroni wheat after they had raised it, but when deal-

ers in Kansas City learned that they could buy it by the car-load, the growers found no trouble in selling all they did not need for home use. Local millers and dealers thought that they could not handle the wheat. Millers needed special machinery for getting all the flour out of it and local grain dealers were afraid to handle it lest it should become mixed with the other wheat and render it unsalable. Recently a miller at Fort Collins has been trying to get macaroni wheat for sowing above the ditches where irrigation is impossible. He promises to buy all that can be raised at the same price that ordinary wheat commands.

Varieties of wheat used in the most of the wheat-growing districts are not usually known. Certain types of seed wheat happened to survive the drought years, either successfully resisting the drought or by having been kept in granaries through these years, have since been sown continuously. These are now known as "white wheat" or "red wheat" sometimes with the name of some settler prefixed to the type-name. I failed to trace the origin of any of the seed used, but believe that quite a number of varieties are grown there, usually very much mixed now. When the macaroni wheats were introduced, it was feared that they too would become mixed with the other varieties and reduce the value of the common wheat. In time the growers of macaroni wheat may fear that the soft varieties may become mixed with macaroni wheat and reduce its market value.

*Preparation and Seeding.* Probably almost every method of preparation of the seed-bed and planting has been tried by someone at some time since settlement began. In some years success "chased" the farmer who used the most slovenly methods, while in other years she outran and kept out of reach of the man who used the best methods known in the art of farming. This happened so often that some settlers have contracted the habit of putting the seed into the ground by use of the least possible amount of work, and they say they are sure of a good crop if the rainfall comes right, and are sure of a failure if the rainfall does not come right, no matter how the grain is planted.

Following out this idea, some have continued to sow the seed broadcast, either with a broadcast sowing machine which is attached to a wagon bed, or by hand. The seed is sown on the ground which has received no preparation to fit it for a seed-bed. Weeds may cover the ground, or it may be bare. The seed is then covered with either a corn cultivator or a disc harrow. Sometimes the ground is not harrowed after the seed has been covered, and sometimes it is harrowed with a smoothing harrow.

Some good farmers tried plowing the ground thoroughly before sowing the wheat. But after a time so many failures were received by using this method that the best farmers ceas-



ed to plow their ground for wheat. As a rule the ground which is plowed for wheat is not worked enough to make a good seed bed for the plants. So the soil dries out and injures the crop when droughty periods come. With ordinary tools it is next to impossible to make a seed-bed sufficiently compact for the wheat plant after the soil has been plowed shortly before sowing. Too much air space is left in the soil and this is fatal to the feeding roots of the wheat plant. With special tools for packing the soil after plowing an ideal seed-bed may be made. But this requires so much work that one man could not seed a large area to wheat as is the custom now. It is possible for one man to plant 300 or 400 acres to wheat, but if he plowed the land and then prepared it properly after plowing, he would be able to plant only 80 or 100 acres. In seeding on plowed land, the hoed drill has been used. The press drill is superior to the hoe drill as a machine for planting where drought is so often a prominent factor in determining the results. The disc press drill is also considered an especially good tool for use in the dry farming country.

For a long time some farmers claimed that broadcasting the seed and then covering with a disc harrow or a cultivator so as to thoroughly stir all the top soil and put the grain into the ground in contact with firm soil was the proper method to sow wheat. Then the disc seeder was invented. It did, at once going over the land, exactly what they held was best. With plenty of teams, a man could put in a large acreage single-handed, then if the crop was a failure, he would lose nothing except the seed and his own labor, while if the crop was good, he could well afford to hire plenty of help to harvest and thresh the crop. But as land becomes more valuable, I notice that more work is put on the preparation of the soil, and seed drills grow in favor.

When I first visited the wheat growing district of eastern Colorado, many of the best farmers told me that they had grown wheat on the same ground year after year, sometimes as much as ten crops in succession, and the soil did not show any signs of being worth any less for wheat growing than it was the first year wheat was sown upon the land. Two years later all admitted that the land was surely failing when wheat followed wheat. In 1902, I noted fields which demonstrated the difference between wheat after wheat and wheat after corn. In some cases wheat following wheat gave a yield only five bushels per acre, while wheat following corn in the same field, produced fifteen bushels per acre. It is now generally admitted that it does not pay to sow wheat after wheat. The rotation usually practiced is corn one year and wheat the next.

Fall plowing for spring wheat has not been a success. The best explanation for this is that during the winter the soil dries

as deep as it is plowed and this through drying seems to lock up the plant food temporarily so that the wheat plants do not grow well. Sorghum before wheat is bad for the yield of wheat, in fact it seems that any crop which is not cultivated thoroughly during the growing season is a poor one to precede a wheat crop. It is probably true that if the corn is not thoroughly cultivated the yield of the wheat crop following it will be materially reduced. One man has for a few years practiced listing his ground in the fall for the wheat crop of the next spring. He reports an increased yield of from one to two bushels per acre by using this method, as compared with the ordinary method of preparing the ground. One year a heavy rain came after a part of the ground was listed. The next year that part of the listed ground which was packed down by the rain gave no better yield of wheat than the ground prepared in the ordinary way.

*Crops Raised Outside the Main Districts.* Wherever one goes he hears of the enormous crops of wheat raised in 1892. At Akron the visitor found wheat piled up everywhere during the fall of 1892. They could hardly get cars enough to carry it out of the country. Yields of 30 to 40 bushels to the acre were common. At Thurman about the same yields were obtained. Settlers at Cheyenne Wells and Burlington also obtained heavy yields of grain that year. But outside the Vernon and Idalia divides, very little grain has been produced since. This may not be because it could not have been produced, but because the drougthy years following caused nearly all the settlers who did not favor making a stock country of the region to become discouraged and leave the country, leaving its population sufficiently thinned to permit those remaining to have all the free range they could use. Under these conditions stock-raising was so profitable that the settlers could not afford to raise wheat.

*Soils and Other Influences.* The soils of the Plains are quite well adapted to the growth of wheat. This has been proved whenever the rainfall has been properly distributed during the growing season. The soils near Vernon, Idalia and in the eastern one-third of Kit Carson county, are very much alike, and under similar conditions, would produce about the same yields of wheat. But the Vernon divide is protected from the ravages of hot winds by the groups of sand hills which lie on the northern and western sides of it, each of these groups being about twenty miles across. The influence of the sand hills dwindles rapidly as the location is farther to the south and east. The Idalia country is not quite so free from hot winds as is the Vernon country. By the time Burlington is reached the influence of the sandhills is practically nothing, while at Cheyenne Wells, one could not possibly know that the hot winds were tempered by any influence. These sand

hills absorb all the water which falls upon them. They also receive in addition the drainage from about as large an area as they cover which lies west of them. They seem to cover the lower courses of the streams which start on the clay lands west of the sandhills. This moisture influences the humidity of the area which the hills partially surround, and while the rainfall is practically the same at Wray as at Cheyenne Wells, the air is more humid and so does not absorb the water from the soil and from vegetation so rapidly as does the air in less protected localities.

The rule seems to hold good that the greater the percent of clay a soil contains the more water it must have in order to produce a crop. It is a noticable fact that during dry years the men living on black sandy land produce better crops of all kinds than those living on clay lands, but where the rainfall is abundant the clay lands will give larger yields, especially of wheat, than the sandy lands.

One encouraging fact which should be here noted is that the samples of macaroni wheat grown in eastern Colorado have been pronounced to be the best seen which has been grown in the United States. The rainfall is never enough to damage the quality of macaroni wheat. From present indications it is possible that in a few years very little wheat except macaroni wheat will be grown in eastern Colorado, and it is also likely that the wheat-growing districts will be greatly enlarged by the use of this variety.

*Use of Straw.* For a long time the wheat-raisers had little use for their straw. Sometimes the straw would accumulate for several years if it was not burned, but during the past four years they have been wintering cattle in the wheat growing districts because the range has become so crowded that there was no winter range in many localities. This influx of cattle from the pastures surrounding the farming districts has furnished a profitable market for all the straw which is produced. At the same time the feed raised in the farming country has saved the lives of thousands of cattle.

*Results.* The real results of a business are not correctly estimated if only the volume of the business is known. While the yield of wheat per acre will not average more than eight bushels on the two divides during the fifteen years it has been grown there, that does not tell of the profits and losses sustained by the settlers. Of course the settlers have been forced to raise corn in order to raise wheat. Then they raised hogs because they raised corn. They gathered cattle because they had so much rough feed as a by-product from the wheat and corn raising. This has changed the period during which the farmer had employment for himself and family from 90 days during the year

which was necessary in wheat raising alone, to 365 days which is necessary under the mixed farming of the present day. Some men have lost all the property they brought to the country, but others who came with practically nothing are quite well-to-do now. The banker at Wray, who is an old settler himself and is personally acquainted with almost every man on the Vernon divide, especially from a financial standpoint, told me that a large majority of the settlers there are better off, financially, than they were when they came there. The good dwellings and barns seen there seem to prove the statement.

*Magnitude of the Wheat-growing Industry on the Plains.*

At Cheyenne Wells, no means of threshing grain is available except a little tread-power machine. At Burlington, very little threshing is done because no threshing machine is near enough to afford to come there for the work it can get. The wheat there is used for feed, usually for hay. At Yale, several stone rollers are in use at times when a crop of grain is raised. At Seibert, there is a small horse-power thresher which usually operates near Tuttle, Kirk and Cope. At Thurman is another small horse-power which threshes a few jobs each season. At Akron I saw no threshing machine. The flail is the only weapon in use there at present. But on the Vernon and Idalia divides, nine threshing outfits are in operation nearly every year. Some of these are large steam-threshers which carry hands enough to do all the work so as to deliver the grain to the owner's wagons. Often the machines are all busy from the middle of August until far into December. Of course the machinery in use for threshing indicates the relative production of grain. There are three grain buyers at Wray, and besides what these men buy, much goes to Haigler, Nebraska, St. Francis, Kansas, and Burlington, Colorado. There is a good flouring mill at Wray and another at Burlington.

Next to stock raising under the range system, wheat growing requires fewer days work in the year than any other farming business, so wherever wheat can be successfully grown, farming may gain a foothold. Where it fails habitually, the stock must occupy the country.

# Colorado Agricultural Experiment Station

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JUNE, 1904.

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## Unirrigated Alfalfa on Upland.

BY J. E. PAYNE.

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Since the wave of settlement flowed into eastern Colorado in 1886, men in isolated localities have been testing alfalfa as a forage plant for the unirrigated lands.

During my travels I have had several small plats of alfalfa under observation, usually seeing the crop one or more times during each year. Near Vernon, Robert Brady had a field which he used for a hog pasture for several years. The plants kept dying out until there were practically none left. Another patch near Vernon survived as much as five years or more. It was cut for hay a few times. One year it was nearly three feet high when cut. When seen in 1903 it still showed a thin stand. Another patch on the same farm was sown in the spring of 1900. In 1901 it gave a heavy crop of hay, but has not grown tall enough to cut since. Jas. Slick had a small field of alfalfa which he used as a hog pasture for several years. The grasshoppers destroyed what was left of it in 1902. In 1902 he sowed five acres, but the grasshoppers have kept this down so that so far it has yielded very little forage. Russian thistles also came in and occupied the field as soon as the alfalfa plants were killed out.

Near Logan, Geo. Bond had about four acres in alfalfa which he used for hog pasture for several years. He thought that it payed well. A. C. Brown, who lives on the Kansas line about seven miles northeast of Lansing, had three acres in alfalfa when I saw the place in 1900. This patch had been seeded about seven years then. Mr. Brown told me that he cut it twice some years, once some years and during some other years it did not grow high enough to cut for hay. The average yearly yield of hay Mr. Brown estimated at one ton per acre.

Near Idalia, John Gillespie sowed eight acres to alfalfa in 1902. Both 1902 and 1903 were so droughty in his neighborhood that he has not yet cut a hay crop from it. The same experience was met by John Reidesel and Chas. Ingalls, and also by some others who sowed about the same time. Near Vona, S. L.

Howell sowed five acres to alfalfa in 1902 with the same results as were obtained in Idalia.

In 1897 one half an acre of alfalfa was sown at the Plains substation at Cheyenne Wells and a good stand was obtained. The weeds were kept mown down that year. In 1898 one half a ron was cut from the plat at one cutting. The grasshoppers took the other cuttings. In 1899 the plat was mown once for hay, yielding about one-fourth of a ton. The grasshoppers killed many plants and the Russian thistles took the place of alfalfa. In 1899, 1900 and 1901 there were fewer alfalfa plants left each year and no hay crop was cut either of those years. By 1901 there were so few alfalfa plants left that the land was planted to another crop.

Again in 1899 four acres were seeded to alfalfa May 20th. A good stand was obtained, but during the hot summer weather that on the higher land died. About one acre on low land which was occasionally overflowed by water drained from the prairie across it continued to grow well. In 1900 this part yielded one cutting at the rate of one ton per acre. Grasshoppers gradually killed this patch out until in the spring of 1903 so little was left that it was plowed up and the ground planted to other crops.

*Planting.* The important factor in getting a stand of alfalfa is getting a good seed bed for it. My experience has taught me to plow the ground early in the season five to eight inches deep, harrow until it is thoroughly packed and then wait until the ground is thoroughly wet before planting the seed. If this occurs before the middle of July go on the ground with a light drag harrow as soon after the rain as the surface appears to be dry and break the crust thoroughly. Then sow the seed broadcast and follow with the harrow. A good stand has been obtained every time I have followed this rule, but if a drill is available the same rule should be followed except that the seed should be drilled in as soon as the ground shows dry on top. Some have been successful with the hoe drill and some have used the press drill. One man seeded his alfalfa with a lister, taking off the shares and running the seed in behind the subsoiler part of the machine. The time to sow alfalfa may be any time when the ground is in good condition between the 10th of May and the 15th of July.

Having a stand of alfalfa the next question is how shall it be maintained against its enemies, the drought and the grasshoppers? It has been demonstrated in western Kansas that thoroughly discing the alfalfa field usually increases the yield of hay, while it also prevents the deposit of grasshopper eggs in the field.

*Enemies.* Drought is one of the worst enemies of alfalfa without irrigation, but this may be overcome to a considerable extent by cultivation after the plants are well established, and

thorough preparation of the ground before planting. After leaving the drought out of consideration, the next enemy of importance is the grasshopper. These, working in conjunction with the drought, make the planting of alfalfa a very discouraging proposition. Grasshoppers are fond of almost all kinds of green food, and alfalfa being green in summer when the native grasses are dry, the grass hoppers come to the alfalfa patches in countless millions when other food becomes dry. When the soil is left undisturbed, they breed in the fields and in such cases keep the plants eaten down throughout the season. Thoroughly stirring the soil with a disc harrow prevents the grasshoppers breeding in the field and it has to contend with only the hoppers which grow on the prairie. By using hopper dozers the number of grasshoppers may be kept down without damaging the crop. These machines can be used only in fields where the plants are but a few inches high. Poisoning by using arsenic in bran or other substance which is relished by the hoppers is often successfully used. But the most profitable method I have ever seen employed is the poultry remedy. Some people keep so many chickens and turkeys that the grasshoppers are held in check by them. In August 1901, I visited the orchard of A. E. Tabor who lives ten miles southeast of Wray, and found many trees entirely stripped of bark and leaves by the grasshoppers. I visited the same place in 1903 and found the trees and garden in a good condition. He told me that the presence of about 400 chickens and turkeys were responsible for the good condition of the trees, and also for the scarcity of grasshoppers which I noted.

Mr. B. D. Prentice and Mr. Rufus Roberts, both living near Laird P. O., both gave testimony which coincided with what I observed at the home of Mr. Tabor. Dozens of other cases of the same kind could be cited showing the same results. The main difficulty in working the poultry remedy, is that the coyotes must be kept away or they destroy the poultry.

*Location.* There are many locations which catch water in considerable quantities from surrounding land. These, if occupied by moderately light clay or sandy loam soils, are ideal places for sowing alfalfa to be grown without irrigation. I have seen places where from 40 to 80 acres could be found in such alocation.

*Conclusion.* Alfalfa growing without irrigation deserves a trial upon a larger scale than I have yet seen, and when grasshoppers are held in check sufficiently it will certainly pay. As it is, it is the only perennial forage plant which I have seen that I would plow up buffalo grass to test upon a large scale. And when large fields of it are planted, the grasshoppers will not cut such a figure as they do now when the grasshoppers from several square miles concentrate upon a few acres.