
UNIVERSITY OF THE STATE OF MISSOURI.

COLLEGE OF AGRICULTURE AND MECHANIC ARTS,

Agricultural Experiment Station

BULLETIN NO. 56.

Dairy Husbandry.

COLUMBIA, MISSOURI.

January, 1902.

Press of E. W. Stephens, Columbia, Missouri.



University of the State of Missouri.

COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

Agricultural Experiment Station.

BOARD OF CONTROL.

THE CURATORS OF THE UNIVERSITY OF THE STATE OF MISSOURI.

THE EXECUTIVE COMMITTEE OF THE BOARD OF CURATORS.

HON. CAMPBELL WELLS,
Platte City.

HON. G. F. GMELICH,
Boonville.

HON. WALTER WILLIAMS,
Columbia.

ADVISORY COUNCIL.

THE MISSOURI STATE BOARD OF AGRICULTURE.

OFFICERS OF THE STATION.

THE PRESIDENT OF THE UNIVERSITY.

H. J. WATERS, B. S. A.	DIRECTOR
PAUL SCHWEITZER, Ph. D.	CHEMIST
J. C. WHITTEN, M. S.	HORTICULTURIST
J. M. STEDMAN, B. S.	ENTOMOLOGIST
J. W. CONNAWAY, M. D. C.	VETERINARIAN
C. THOM, Ph. D.	BOTANIST
C. H. ECKLES, B. Agr., M. S.	DAIRY HUSBANDRY
W. L. HOWARD, B. Agr., B. S.	ASSISTANT IN HORTICULTURE
J. G. BABB, A. B.	SECRETARY
R. B. PRICE	TREASURER
ESTELLE HICKOK	CLERK AND STENOGRAPHER

The Bulletins and Reports of the Station will be mailed free to any citizen of Missouri upon request. A cordial invitation is extended to all persons to visit the Station grounds at any time. Address, Director Agricultural Experiment Station, Columbia, Boone County, Missouri.

Dairy Husbandry.

INTRODUCTION.

The excellence of Missouri beef cattle, both the thoroughbreds and grades, is fully attested in the show and sale rings and on the great markets of the country each year. The good quality and splendid finish of these animals pay high tribute to the intelligence and progressiveness of our stockmen. That we cannot point with pride to an equally well developed, prosperous and progressive dairy industry, is due entirely to the fact that our farmers have not interested themselves in this specialty, for the intelligence that was necessary to develop the splendid beef herds would bring the same success in Dairy Husbandry.

It is the history of all countries that the intelligent management of dairy farms has been one of the most profitable and most permanent branches of farming. It is with a view therefore to awakening an interest in this important industry and of disseminating reliable information on this subject that this bulletin is issued.

DAIRYING AT THE COLLEGE AND STATION.

Dairying has received attention at the College of Agriculture to the extent at least of manufacturing butter and maintaining a herd of cows used partly for dairy purposes since the Institution was organized. In 1887 five registered Jersey cows and a bull, the foundation of the present College herd, were purchased by Professor Sanborn. About this time

a dairy room was fitted up and some experimental work in feeding dairy cows was begun. In 1890 Dr. Porter equipped this Dairy with a separator, hot and cold water, modern churns and butter workers, etc., and in 1894 ^{Exp. Sta.} ~~the~~ ^{no. 24} bulletin was issued by the Experiment Station giving detailed directions for the care of milk and the manufacture of butter on the farm. During all of these years instruction—mainly by means of lectures—has been given in the subject to the students in Agriculture.

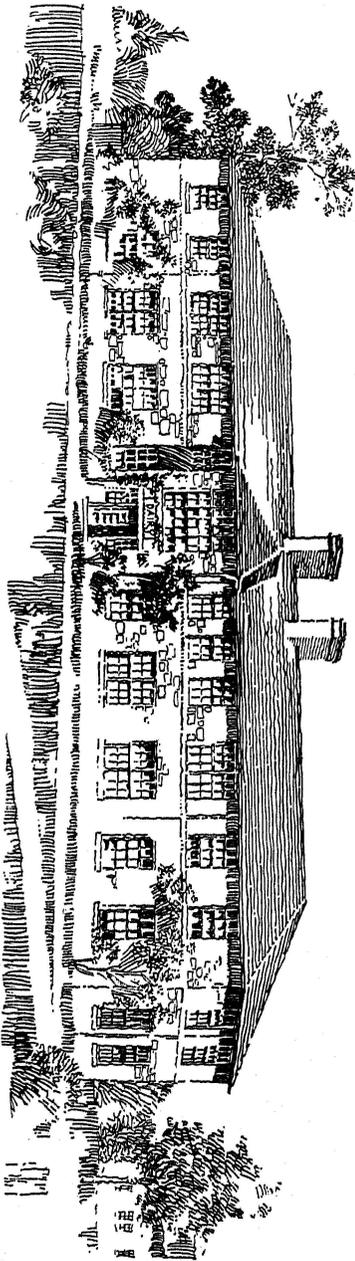
In the winter of 1895-6 a Course in Dairying was offered—a special instructor employed and arrangements made for practical work in the manufacture of butter and cheese, the testing of milk, etc. Practically a new equipment was procured for this purpose. This Course has been continued each year since, and minor feeding experiments, comparisons of methods of creaming, churning, etc., tests of new machinery, and tests of the productiveness of cows, have been conducted.

NEW DAIRY BUILDING.

In 1899 the Fortieth General Assembly passed an appropriation of \$30,000 for a Dairy, Live Stock Judging and Veterinary Building, which however was vetoed by the Governor along with a number of appropriations for buildings for other State Institutions on account of lack of revenue.

In 1901 the Forty-first Assembly passed, almost unanimously, a similar bill carrying an appropriation of \$40,000, which was approved by the Governor and became a law.

After a most careful study of the matter, including a personal inspection of the leading College dairy buildings of the country, the plans shown in the accompanying cuts were decided upon as combining ample space, convenient arrangement,



FRONT ELEVATION OF NEW DAIRY BUILDING.

and low cost of construction. The building is of native lime stone, green Bangor slate roof, practically fire proof, two stories and a basement. It will be equipped throughout with new machinery and apparatus of the latest patterns, and will offer as good facilities for instruction and research in dairying as can be found in America.

CHAIR OF DAIRY HUSBANDRY ESTABLISHED.

The Forty-first General Assembly further recognized the importance to the State of developing the dairy industry, by enacting a law establishing a Chair of Dairy Husbandry in the College of Agriculture as follows:

Be it enacted by the General Assembly of the State of Missouri as follows:

Section 1. In order to aid in the development of the dairy industry of this State, there is hereby established in the College of Agriculture and Mechanic Arts of the University of the State of Missouri, a chair of Dairy Husbandry.

Section 2. The Board of Curators of the University shall, as soon as possible after the taking effect of this act, fill this chair by the appointment of a well recognized expert in all matters pertaining to dairying and Dairy Husbandry.

Section 3. The duties of the Professor of Dairy Husbandry provided for in the foregoing sections, shall be to give instructions in the practical details of the selection, breeding, feeding and management of dairy herds, of the production of milk at the least cost, of the manufacture of butter, the different kinds of cheese, and the marketing of the same, to the farmers of the State by means of public lectures and practical demonstrations throughout the State, through the farmers'

institutes, the public press and the issuing of reports and bulletins on these subjects, also to give instructions in all these subjects and in creamery management to the students in the Agricultural College of the University. It shall be the further duty of the Professor of Dairy Husbandry to make such experiments in the breeding and feeding of dairy cattle, in the handling of milk, and in the manufacture of butter and cheese, at the Experiment Station, as may be demanded by the dairy interests of the State, and that the Board of Curators may direct.

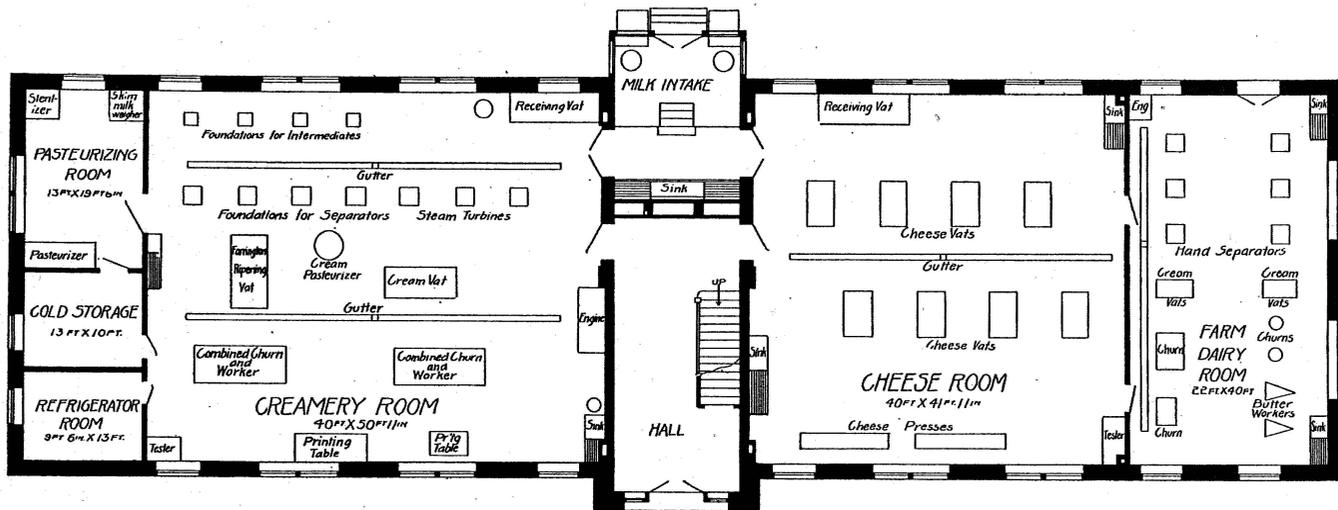
Section 4. In order to carry into effect this act, and to defray the expenses of salary, travel, and publications, there is hereby appropriated out of any moneys in the general revenue fund not otherwise appropriated, the sum of five thousand dollars (\$5,000).

Approved April 17, 1901.

In June, 1901, Mr. C. H. Eckles, B. Agr., M. S., of the Iowa Agricultural College was selected for the Chair. Professor Eckles entered upon the duties of his office in August of the same year.

Carrying into effect the provisions of this act, a special course in dairying was offered by the College last winter, and a course in this subject is required of all students completing the Collegiate Course in Agriculture. These courses will be much extended and improved this year when the new building and equipment will be available. There is no longer any reason for a citizen of Missouri going to another State to acquire a knowledge of any part of this subject, as our own College now offers as good facilities as can be found in this country.

Professor Eckles has visited fifty-one counties, and delivered seventy-three lectures on different phases of Dairy Hus-



FIRST FLOOR PLAN
 OF
 DAIRY BUILDING
 UNIVERSITY OF MISSOURI
 ∴ 1902 ∴

bandry to perhaps 7,000 people since his induction into office. He has visited eighteen creameries and cheese factories to assist the managers and butter makers with any advice and suggestions concerning the practical details of their work.

This bulletin is one of a series that will be issued on different phases of the subject, in order to comply with that part of Section 3 requiring that bulletins, etc., shall be issued.

It is very gratifying to be able to report that the Dairy industry is growing more rapidly in the State now than ever before, and that if the present rate of increase is maintained it will be but a matter of a few years until Missouri will be recognized as one of the leading dairy States of the Union. It is fortunate indeed that the College and Station have the active and friendly co-operation and sympathy of the leading dairymen, friends of the industry of the State, and especially of the State Dairy Association and its officers to whose efforts so much of the recent development of dairying in the State is due.

H. J. WATERS, Director.

Dairy Husbandry.

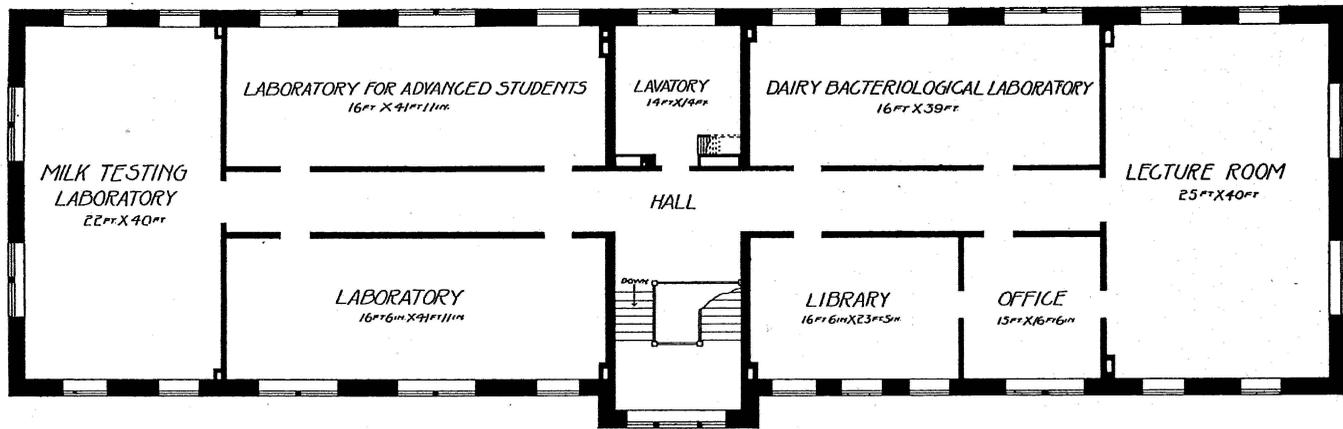
C. H. ECKLES.

MISSOURI AS A DAIRY STATE.

Missouri is not generally considered even by her own citizens to be a great dairy state. The production of meats and corn has been so large that the dairy industry has been overshadowed. The fact has not been generally realized, however, that the annual value of the dairy products of the State at present is only exceeded by the meat products, and by corn and hay.

The following table shows the yield and value of the leading crops of Missouri for 1899 and the value of the butter and milk used in the State for the same year. The crop statistics are taken from the report of the United States Department of Agriculture. The production of butter is taken from the recent census and the value placed at the average price generally used, twenty cents per pound. The value of milk is found by assuming the per capita consumption in Missouri to be the average of the United States as shown by the census report:

Corn, 162,915,064 bushels, value.....	\$48,874,519
Hay, 3,094,304 tons, value	19,339,962
Oats, 20,299,350 bushels, value.....	4,871,844
Wheat, 11,398,702 bushels, value.....	7,067,195
Potatoes, 8,757,496 bushels, value	3,502,998
Butter, 47,322,962 pounds, value	9,464,593
Milk	8,387,995
Total Dairy Products.	17,852,588



SECOND FLOOR PLAN
 OF
 DAIRY BUILDING
 UNIVERSITY OF MISSOURI
 :: 1902 ::

The total valuation is exclusive of cheese for which the figures are not yet available.

While these figures show that dairying is already an important industry in Missouri, it should occupy a much more prominent position and rank with the corn crop and meat products as one of the great industries of the State.

ADAPTABILITY OF MISSOURI TO DAIRYING.

When we contemplate the great development of dairying in other States, we are apt to conclude that these States possess some great and special advantages not found in Missouri. A study of the actual conditions, however, shows this idea has no foundation, and that in reality the reverse is nearer the truth. Compared with the great dairy States of Illinois, Iowa, Minnesota and Wisconsin, Missouri stands well from every point of view. A milder climate, which requires less expense in shelter and winter feed; a longer pasturing season by at least six weeks per year; the soil readily producing all the crops of these States, and some to better advantage—especially those needed to make a balanced ration, such as clover, cowpeas, etc.; the greater part of the State having splendid blue grass pastures, producing clover in abundance; alfalfa, one of the best milk producing forage crops, growing well in some parts of the State; and the cowpea of about equal value, growing in all parts. In some sections of the State a large amount of cheap rough land is found, well suited for pastures but not for grain raising, which could be utilized to good advantage for dairying, and the present returns be greatly increased.

THE MARKET FOR DAIRY PRODUCTS.

Missouri has markets for dairy products unsurpassed by any State in the Mississippi Valley, and superior to most of them. The markets of the East are as near to her as to the States which are now largely supplying those markets, and the shipping facilities are quite as good. In addition to this, and of more importance, Missouri has within her borders remarkably good local markets, and as a rule good local markets are the best in the world. A large city population makes a good market for dairy products, and this Missouri has in a marked degree compared with neighboring States. The following table taken from the census of 1900 shows this comparison:

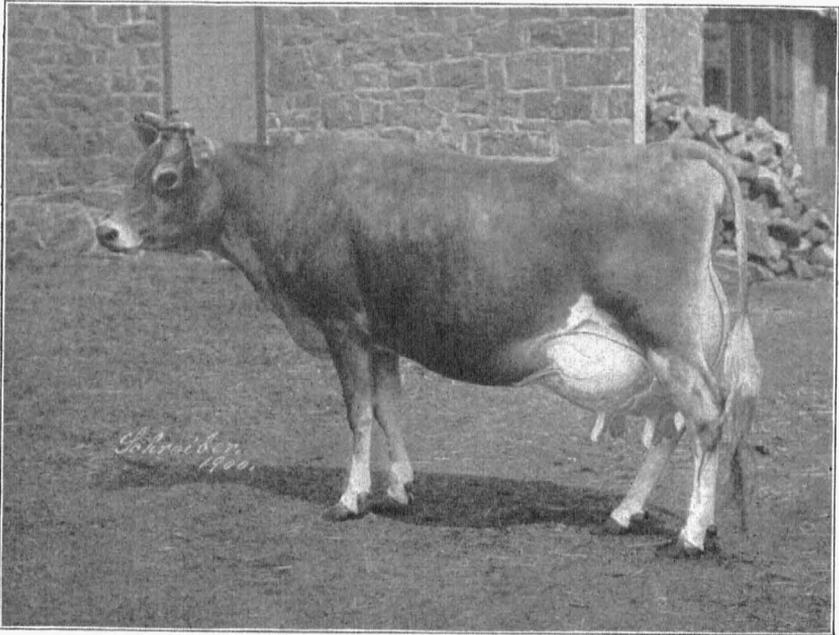
	Total Population.	Population in cities over 15,000.	Per ct. of total popu- lation in cities over 15,000.
Missouri	3,106,665	906,490	28.8
Michigan	2,420,982	567,850	23.4
Iowa	2,231,853	282,355	12.6
Wisconsin	2,069,042	512,319	25.2
Minnesota	1,751,394	438,466	25.
Kansas	1,470,495	146,117	9.9
Nebraska	1,066,300	168,735	15.8

It will be observed that of the seven States compared, Missouri has nearly twice the city population of the next highest as well as a good lead in per cent of city population, having 28.8 per cent as compared with 12.6 per cent for Iowa, and 9.9 per cent in the case of Kansas. Yet both Iowa and Kansas boast of a larger dairy development.

INCREASE IN VALUE OF FARM LANDS MAKES DAIRYING A
NECESSITY.

The recent increase in the value of our best farm lands is revolutionizing our systems of farming. Many are asking

themselves if they can afford to keep a cow on land worth forty, fifty or sixty dollars per acre for the sole purpose of raising a calf worth \$15 or \$20 in the fall. The more carefully the proposition is considered, the more certain is the decision that with ordinary grade cows, under the conditions



GOLDEN LAD'S SOLID GOLD,

A Prize Winning Missouri Jersey. Bought by Dr. Still, Kirksville, for \$1,000.

given, the profit is small if not entirely lacking. The fact is, the conditions have materially changed in recent years, and while formerly the keeping of such cows for raising calves alone was a very profitable business, now only those having the most favorable conditions can afford to do so. The man who

keeps cows from this time on must have those capable of producing very valuable calves, or get some return from them besides the calf, if he expects to get a fair return on his investment and for his labor and feed.

RAISING THE CALF ON BUTTER FAT.

The general farmer will be forced to get the most possible from his cows, and to do this he will have to stop feeding his calves on milk containing four or five pounds of butter fat per hundred pounds, worth twenty to twenty-five cents per pound when properly made into butter. This butter fat which has such a high value as a human food can be replaced with other substances such as corn meal or flaxseed jelly worth one cent per pound or less, and which the calf can use for the same purpose as it uses the butter fat. In substituting this cheap feed for the valuable butter, the farmer will receive from \$15 to \$50 per cow per year for his work.

WHAT THE AVERAGE MISSOURI CREAMERY PATRON RECEIVES.

It is a well known fact that the average Missouri cow is not noted for dairy qualities, on account of her development in the direction of beef production. Reports made by about thirty creameries to the Secretary of the State Board of Agriculture show the average amount paid per year for the milk of these average cows is \$29.32. It should be kept in mind that a considerable amount of milk is also used at home by these farmers, and of course they get no credit for this at the creamery. The reports made by nearly 1,000 creameries in Iowa show the average cow earns about the same sum there. This does not seem to be a very large income, and may be more than doubled under good management. The recent census shows 1,089,584 cows owned in Missouri. Of this number not over

20 per cent at present supply dairy products for market. This leaves at least 800,000 cows, the milk of which if utilized at this average price would give an increased return of over \$20,000,000 per year. That is to say that in addition to raising a good calf on the skim milk from the cow, the butter fat sold to a creamery or manufactured into butter on the farm would represent an annual value of \$20,000,000. This means that by investing some additional feed and labor in the cows we now keep, the annual returns from them would be more than doubled. It is to be understood that the above sum represents only the sale value at the creamery, of the butter fat produced by these cows, over and above that required by the families of the farmers, and that with proper care and intelligence just as many and quite as valuable calves may be raised on the skim milk as are now produced on the whole milk.

Thousands of farmers in this and other States have proved beyond a doubt that this can be done, and if the skim-milk calf is not as good as any, it is not because it has been fed skim milk, but because it was not fed in the proper manner. If the owner does not wish to raise the calf, he can get very good return from the skim milk by feeding it to growing pigs. It is a mistake to think that milk from a separator is of no value. It contains nearly all of the muscle making substances originally found in the milk, and these are what a growing pig needs, especially when fed largely on corn. Fifteen cents per hundred pounds is a conservative estimate of the value of skim milk for feeding pigs when grains are an average price, and usually twenty cents per hundred can be realized from it in this way. The average Missouri farmer who is selling milk to a creamery, gets about the following return per cow each year:

Received for milk (skim milk returned).....	\$30.00
Calf raised on skim milk.....	\$15 to 20.00
	<hr/>
Total	45 to 50.00

The calf from the same kind of a cow brings about \$20 to \$25 when raised by its mother. The man who sells his milk gets from \$20 to \$30 per cow for doing the extra work required.

BETTER RETURNS FROM ORDINARY COWS.

There is no reason for keeping a herd of average cows very long on any farm. Care in selection, breeding and feeding will soon raise the returns far above the average figures just quoted. The grade cows common in this State, if well fed and cared for, will yield at least 250 pounds of butter per year instead of 130 or 140 as at present. This much of an improvement can be made by simply better feed and care. We have numerous examples that prove this assertion.

The Kansas Agricultural College recently bought a herd of thirty ordinary grade cows, not selected as especially good dairy cows, and these produced an average per cow of 277 pounds of butter per year. These cows had no feed or treatment which any farmer could not have given them profitably. A herd of eighteen Shorthorns recently in charge of the writer, gave an average return of 279 pounds of butter per year for four years, which was sold at twenty cents per pound, or \$55.80 per cow for the butter alone. A herd of common grade cows well cared for and fed in an intelligent manner, will give about the following returns:

Milk sold at creamery (skim milk returned)....	\$40 to \$50
Value of calf raised on skim milk	15 to 20
	<hr/>
	\$55 to \$70

INCOME RECEIVED FROM CREAMERY BY SOME MISSOURI.
DAIRYMEN.

That these figures are not overdrawn is shown by reports received at this office from men who are actually securing these results. The following are the amounts received in the year 1901 by some of the patrons of the Palmyra, Missouri, Creamery for butter alone, the skim milk being returned.

	No. Cows.	Total Return.	Average per Cow.
J. B. Leggett	6	\$367.43	\$61.23
E. L. Buckwalter	10	401.48	40.14
A. O. Redd	7	362.15	51.76
A. Bross	7	260.02	37.14
Joe Meyers	6	258.77	43.13
J. K. Rohrer	14	587.28	41.94
J. Nafzigler	10	444.39	44.43
Miss Mazie Stewart.....			45.56

INCOME FROM WELL SELECTED HERDS OF THE DAIRY BREEDS.

The largest income from Dairying is realized when a well selected herd of one of the dairy breeds is used. Such a herd under good conditions can be made to yield an average of 300 pounds or more of butter per year. The amount of money received from the product will of course vary according to circumstances of location, markets, etc. When the milk is sold to a factory the income should be about as follows:

Milk sold at creamery (skim milk returned) ..	\$50 to \$60.00
Value of skim milk	10.00
Value of calf for veal or to be raised for dairy	4.00
	\$64 to \$74.00

Reports have been received from a number of dairymen in the State who are getting this large an income from their cows and several report considerably larger yearly receipts.

Settles & Settles, Palmyra, Missouri, during 1901 from twenty registered Jerseys produced cream and calves to the value of \$1,488, an average of \$74.40 per cow.



JERSEY HERD OF SETTLES & SETTLES,

Palmyra, Missouri.

Income \$74.40 per Cow for 1901.

H. C. Goodrich of Calhoun, Missouri, reports butter sales of 11,438 pounds, bringing \$2,401.90 from thirty-three Jersey cows, or an average of \$72.70 per cow.

H. T. Burris of Clinton, Missouri, from sixteen Jerseys sold butter and cheese to the value of \$1,081, being an average of \$67.50 per head.

E. B. Cooper, Trenton, Missouri, sold from twenty registered Jerseys, butter and cream to the amount of \$1,200, or \$60 per cow.

George Koontz, Carthage, Missouri, from nineteen registered Jerseys sold in the year 1901, 7,589 pounds of butter, an average of 399 pounds per cow. This butter brought a total income of \$1,925.52 or \$101.34 per cow. The value of the skim milk and the calves, would make a considerable addition to this sum.

George Saffarrans, Palmyra, Missouri, with nineteen registered Jerseys sold cream to the amount of \$62.75 per cow, and calves and pigs raised on skim milk to amount of \$15 per cow, a total of 77.75 per cow besides eight heifers kept in the herd.

This list could be greatly extended from recent reports received at this office from the leading dairymen of the State, but these will be sufficient to show what may be done with proper care and good business management. It will be noted that in most of the cases just cited the value of the skim milk and the value of the calf for veal, or to be raised if a heifer for dairy purposes is not included. These are the returns for butter alone. When these items are figured in, it will be clear that these dairymen are getting splendid returns from their cows. In most of these cases the dairymen made and marketed his own butter, which of course involves more work than when a factory is patronized, but with a correspondingly higher return.

The college herd of twenty Jerseys has given a total

income per year of about \$90 per cow. The product sold being butter, skim milk and buttermilk.

A herd of ten Jerseys recently in charge of the writer, produced a yearly average of 340 pounds of butter per cow for four years, and twelve Holsteins in the same time produced 323 pounds each. This butter was sold at an average price of twenty cents per pound, or \$68 per cow for the Jerseys, and \$64.60 for the Holsteins. If it had been sold at the average price reported by the Missouri dairymen, 23 cents, the income would have been correspondingly larger.

SELLING MILK FOR CITY CONSUMPTION.

The presence of a city population of about one million in Missouri, makes the milk shipping business of great importance. This will grow in volume constantly and for those favorably located will prove the most satisfactory market for their milk. The prices received for milk for this trade is generally higher than the creamery or cheese factory pays, as no skim milk or whey is returned. From reports received by the Secretary of the Board of Agriculture, he estimated that the average return per cow when the milk is shipped to the city is about as follows:

4,100 pounds milk.....	\$51.25
Calf one week one.....	2.50
	<hr/>
	\$53.75

A number of reports received by this office recently tend to confirm this estimate. The average yield of milk shown by these reports could be easily increased to 6,000 and with well selected and well fed cows of the dairy type the amount could be still further increased, and the return brought up

to \$75 or more per cow. Reports have been received from several who are realizing this latter figure or more.

RETAIL MILK TRADE.

This business varies so greatly under different conditions that it is almost impossible to compare it with other lines of dairying. When intelligently carried on probably no kind of dairying offers equal returns. Reports from a number of retail milk dealers show the average price secured per gallon in 1901 to be twenty cents, and the yearly income per cow from \$100 to \$125. The expenses of conducting a business of this kind of course are comparatively high.

THE INCOME OF THE CHEESE FACTORY PATRON.

We have not received sufficient reports to make a fair estimate on the amount received per cow for milk furnished to cheese factories in this State. The farmer should receive somewhat more for the milk than when furnished to creameries, and we find this to be the case. The whey is of less feeding value than the skim milk, and calf raising can not be carried on so successfully as when skim milk is used. To carry on this line of business to best advantage, the cows should be of a breed especially adapted for dairying, as the sale of milk must be the chief source of income. The average price paid for milk at the cheese factories varied last year as a rule between 70 and 90 cents per hundred pounds. For a good dairy cow giving from 6,000 to 9,000 pounds of milk per year, the return would be from \$45 to \$55 for the milk, to which the value of the whey and calf should be added. When cheese is made by the dairyman and sold locally at retail, the income will exceed this amount considerably.

THE COST OF RAISING A CALF WHEN NURSED BY ITS MOTHER.

The fact that probably over half a million cows are kept in the State, almost entirely for the purpose of raising calves, adds interest to this proposition. We shall not attempt to make an estimate as to what it costs Missouri farmers, but will refer to one made by J. D. Gillette* of Elkhart, Illinois, a man of international reputation in his time as a breeder and feeder of beef cattle. These figures were first published twenty years ago, when land was considerably cheaper than now. It is well to keep in mind also that the writer was interested entirely in raising and feeding beef animals, and not in dairying. This is Mr. Gillette's estimate:

Cost of Steer Twelve Months Old.

Value of calf at birth.....	\$ 3 00
Keep of cow 12 months.....	12 25
Risk of failure to breed.....	1 75
Insurance on cow	1 00
Interest on \$50 value of cow at eight per cent.....	4 00
Risk of death of calf.....	1 00
Keep of calf until 12 months old.....	6 00
	<hr/>
Total cost	\$29.00
Value of calf 700 pounds at five cents	\$35.00

There may be some question in regard to the fairness of charging up the value of the calf at birth as part of the cost of raising. The value placed on the cow is also rather high for our present conditions but the other items are conservative. The amount estimated for the keep of the cow a year \$12.25 is not large enough, and Missouri farmers would not

*W. A. Henry's "Feeds & Feeding," page 389.

contract to keep a herd of cows in good condition for a term of years at this rate per head. The \$1 allowed for insurance would be equal to an expected loss per year of one \$40 cow in a herd of forty by disease or accident. The estimate of \$1.75 per year for failure to breed seems rather high. Allowing \$20 as the loss in keeping a cow a year without breeding, this would be equal to one in twelve failing to breed. Allowing the same \$20 as loss for keeping a cow a year when the calf is lost, the estimate of \$1 would equal the loss of one calf in twenty each year, which is not excessive. Under the conditions of this State the calf may not cost quite the amount estimated by Mr. Gillette, and on the other hand the selling price will seldom reach the figure given by him. It is evident the profit is small on our high priced lands when the calf is of the average quality. This much can be said in favor of this system of farming. It is economical of labor, it preserves the fertility of the farm, and enables the farmer to dispose of a large amount of rough forage to good advantage. The cow kept for milking purposes gives the same advantages with the exception of labor and gives returns about twice as large.

DAIRYING AS A MEANS OF KEEPING UP THE FERTILITY OF THE
FARM.

One of the most important questions which sooner or later concerns every farming community is that of keeping up the richness of the soil. When a rich fertile soil, such as covers a large part of the Valley of the Mississippi and Missouri Rivers, is brought into cultivation, it produces crops so abundantly that no thought is given to the keeping up of that fertility. Sometimes it is hard to believe that such a

soil can ever be worn out. A country like this always becomes a great grain raising region and so continues as long as it is found profitable.

It takes nature thousands of years to build up this soil which the farmer often wears out in half a life time or less.



SHADYBROOK GERBEN,

A Missouri Holstein. Owned by M. E. Moore, Cameron. Official Record 23 pounds 4 ounces of Butter in 7 Days. Winner of numerous prizes in butter tests and in the show ring at many State Fairs.

Another condition is at work at the same time. While the grain crops after a time become smaller, the land as a rule gradually becomes more valuable, due to other reasons. While the income should increase per acre, it gradually decreases.

This is exactly the condition of thousands of the farms of these valleys to-day. Their owners are living under different conditions now from twenty or thirty years ago, while their methods of farming have not been changed to correspond. Many farms have lost much of their original richness, and the owners are now confronted with a serious problem. The writer has heard many Missouri farmers state that one of the things of most vital interest to them is how to restore the fertility of their farms. Most of them now know what has brought their farms into this condition. All farmers are aware that selling grain is selling the valuable part of their farms. Another evidence that the farms of Missouri are not what they once were in point of fertility, is the fact that commercial fertilizers are coming into use in some parts of the State, and were bought to the amount of about \$100,000 last year by Missouri farmers.

When the fertility of the farm is reduced to a point where it is necessary to buy fertilizers to put upon the land, the farmer will realize that the plant food has a market value the same as other marketable products. If he will endeavor to discover where these valuable materials have gone which his soil once had, he will find that frequently crops were sold from the farm for a little more and sometimes even less than he now pays for the elements of fertility they took away. The following table shows the market value of the plant food or fertilizing material in some of the crops commonly sold off the farm:

Market value of fertilizing materials.

1 bushel of wheat.....	\$.26
1 bushel of corn16
1 bushel of oats12
1 ton of timothy	3.86
1 ton of clover hay.....	9.04
1 ton of cowpea hay.....	8.03
1 ton of oat straw.....	3.32
1 ton of wheat straw.....	2.46
1 ton of bran.....	12.94
1 ton of cottonseed meal.....	24.94

These figures mean that if a man, after selling a bushel of wheat, would buy enough commercial fertilizer to restore to the farm the fertility he sold in the wheat, he would have to expend 26 cents, and for other crops, the amounts indicated in the table. A glance at the above figures is sufficient to show the drain on the farm from selling these products.

While there are several ways in which the worn out lands may be restored, everybody knows that the first principle is to feed on the farm as nearly as possible all of the crops raised and to return the manure to the soil. Live stock of all kinds are well adapted for this purpose, but the dairy cow is especially adapted. When the grains are all fed on the farm and the manure properly applied, nearly all of the plant food removed by them is returned to the soil. Then as a rule more or less feed will be brought onto a dairy farm, which represents so much gain in fertility, although this is not necessary in Missouri in most years. A ton of cottonseed meal, for instance, which is one of the cheapest dairy feeds this winter, brings onto the farm nearly as much value as a fertilizer as it costs as a feed. When fed to cows, such material serves its purpose as a feed, and from 75 to 90 per cent of its value as a fer-

tilizer is left in the manure pile to be applied to the soil. Bran enriches the farm as much in one ton as would nearly \$13,00 worth of commercial fertilizers bought in the market. Another reason why the selling of dairy products does not injure the farm, is that the product sold takes almost nothing that is valuable as a plant food from the farm. A ton of butter for example will bring at twenty cents per pound, \$400, and takes from the farm only about fifty cents worth of plant food. A ton of cheese, worth about \$200, takes from the farm only about \$13 worth of fertility. If the average farmer kept from ten to twenty cows for milking purposes, he would not raise less crops but more; his farm could be made to gain in richness instead of losing. The seeding to clover and grass of worn lands and those subject to washing, when cultivated, would in a few years do much to increase their richness. At the same time, the returns from the land would be much more than if used for grain raising.

There is no reason to believe that commercial fertilizers would be necessary in fifty years on most of our farms, if the proper methods of farming are followed. It is clear that the boy born in this year or fifty years hence has as much right to a chance to earn a good living from the soil as the present generation. I believe the man who dies and leaves his land worn out from continued grain raising, has been doing his children a great wrong. The soil is one of the provisions of nature necessary for the support of mankind. Has the owner any more right to despoil it than he has to pollute the water or contaminate the air which some one else must use?

UNCERTAINTY OF GRAIN FARMING.

One of the worst features of depending upon the selling of grain for an income, is its uncertainty. Such farming not

only robs the soil of its fertility but gives at best an uncertain income. One year the crops may be abundant but the market low; another year may bring small crops with the usual high price which gives little comfort to the man having nothing to sell. In selling grains, the farmer is selling raw material which some more enterprising man in the east or in Europe will manufacture into pork, beef or milk and in so doing he will usually secure most of the profits and enrich his soil at the same time. On the other hand one of the advantages of the dairy business is that the income is certain and comes every month in the year. The market price of dairy products varies less than that of the grains, as the amount of dairy products made does not vary from year to year to the degree that the supply of grains does. By looking over the market reports for the past few years, it will be found that dairy products have varied in price within comparatively narrow limits. A man may engage in the dairy business, if properly located, with every assurance that he can obtain a good constant income every month in the year. Even under the extraordinarily high prices of feeds this season (1901-1902) the owner of a really good dairy cow has been able to make a profit. When times are hard this advantage of the dairy business is most noticeable. During the late period of business depression it was the general observation of those in a position to study conditions in many different localities, such as traveling salesmen, that the dairy sections felt the hard times far less than others and were at times almost the only communities where these salesmen could find customers for their wares.

THE LABOR PROBLEM.

One of the most common objections raised to dairying is that the work must be done every day and that the hired man

does not like to milk. Successful dairying does undoubtedly require constant attention and more or less work every day, but in this respect it is by no means unique. To make a success in almost any line requires the same constant attention. The store clerk or proprietor, the railroad man, the successful doctor, or newspaper man, finds it necessary to give the closest attention to business and to labor constantly. Dairying under intelligent up-to-date conditions need not be drudgery in any sense. It is no harder to milk cows than to follow the plow or do other farm work. If the farmer or his hired hand quit their field work so the milking and other chores be finished by the time the regular field men finish their work, the objections to milking will disappear. Very few men will object seriously to milking under these conditions; in fact many will prefer to do it, being a change from field work. A man can hardly be blamed for thinking dairying drudgery when he is expected to get out in the morning in time to milk and be ready for field work by the time his neighbors are who have no such work, do a day's work in the field and the same chores afterwards. The work with the cow should be made a part of the regular day's work and not so much extra, and the returns will fully justify the expense in time.

THE DAIRY COW ON HIGH PRICED LANDS.

The statement has been made at times that Missouri farm lands are too high priced to be used for keeping cows. This is fundamentally wrong, as the dairy cow is at home always on high priced lands, and will give returns in keeping with their value better than almost any other animal.

It is a well known fact that many of the most valuable agricultural lands in the world are used almost exclusively

for keeping cows. On the Island of Jersey the cow is kept on land which rents from \$30 to \$50 per acre per year. Much of the most valuable land of every European country is used to support the cow. The same is true of our Eastern States where agriculture may almost be said to be based on dairying. The cow can not only be kept with profit on land so high priced that the beef steer is no longer known, but the cow also makes high priced lands. It is said the dairy industry is largely responsible for the remarkably high prices reached by farm lands in the Elgin district, while in the Dakotas, farms within reach of a creamery are considered much more valuable than those not so located. If Missouri had 1,000 creameries and cheese factories in active operation, as some of the adjoining States have, her lands would at once rise in value to a still higher level.

THE FARM SEPARATOR SYSTEM.

When sufficient milk is produced within a radius of a few miles, a creamery, cheese factory, or skimming station can be operated successfully and are very satisfactory systems for handling milk. However, in many communities at the present time only a few are interested and wish to sell milk, consequently a factory cannot be maintained now in every community.

Fortunately within the last year or two a new system has been rapidly coming into use, which gives a person so located access to the same markets and with the same advantages as those within reach of a factory. By this system the farmer buys a hand separator, skims his milk at home at once after milking, and instead of hauling the milk to a creamery, takes the cream to the creamery or to the station and ships it to the

nearest creamery. The railroads as a rule are making very favorable rates so that cream may be shipped with advantage 100 miles or even more. It is found to be no more trouble to separate the cream and ship it than to take the milk to the factory, and those already following this plan are very well pleased with the results. Almost every farmer in Northern and Western Missouri is within reach of as good a market as anybody has, so the statement frequently heard among farmers that they have no market for milk, is without foundation. It seems to the writer that within a few years the hand separator will be considered as necessary a farm machine as the mower or harvester.

SECTIONS ESPECIALLY ADAPTED FOR CHEESEMAKING.

While nearly all parts of the State are adapted for cheese-making, some are especially well adapted. In communities some distance from a railroad, cheese-making is well adapted, as it can be hauled out easily and without damage even during warm weather. Many of these localities, which do not find it profitable to raise the grains for market, could add largely to their income by establishing a cheese factory. Some parts of the State have also very good pastures but do not raise corn extensively enough to fatten stock to any large extent. Such sections will find the cheese factory especially suited to their conditions, and by raising good cows of some of the dairy breeds, could make a profitable industry and make use of the large amounts of pasture and forage not now used to the best advantage.

THE FACTORY AND THE PRIVATE DAIRYMAN.

The purpose of this bulletin, and the object of the work begun under the act of the last Legislature is not especially

the establishment of factories for making butter or cheese. A factory built in a section where it will not be supported by the people, is an injury to the community and to the development of the dairy industry. A factory should never be built until support is assured and a sufficient supply of milk guaranteed. For a large part of the State the skimming station and hand separator will continue to be the best system for some time to come. Private dairying, meaning by this the making of first class butter and cheese on the farm by modern methods, or the sale of milk for the city trade, will continue to be profitable enterprises if carried on with intelligence and skill. The largest returns per cow to-day are made by some of those following these latter lines, but the requirements in the way of care and skill are far more severe than when a factory is made the center of the business. A person intending to make butter or cheese on the farm to the best advantage will have to learn the most modern methods of manufacturing and marketing these products as well as to know how to handle cows to the best advantage. One of the best things about the factory system is the burden it takes from the women on the farm. The care of the milk and the making of the butter with the facilities generally found on the farm, is very unsatisfactory as well as quite burdensome to those doing the work. Butter can be made on the farm equal to that made in any factory, but on account of lack of facilities and skill, the quality as a rule is very irregular and inferior. At some seasons such butter brings less than one-half and seldom more than two-thirds of what it would bring if made by an experienced man in a creamery or a well equipped dairy.