

be in place. If your special summer food for stock is grass, several varieties are advisable, if you can get them to grow; but if you put particular stress on soiling, using a variety of fodders, don't be so particular about the pasture. Many of our best farmers soil to such an extent that they put twice as many cows on the pasture as it would naturally support.

Mr. Graham says "the grain certainly impoverished the soil more than the pasture." We can hardly expect that he has found this out by experience, and he should be careful not to theorize so long as he accuses others of the same fault. Let us examine his statement. As we don't know how much milk his cows give, or the increase in live weight of his steers, we will go by general averages, which will prove nothing if the debits and credits show little difference, but if there is a wide margin, the question will be settled.

It will be fair enough to consider his whole stock as milch cows, as they take as little substance out of the soil as steers. One season his pasturing was equal to one animal for 4,370 days, and 30 lbs. of milk per day will be a good average yield, making a total of  $4370 \times 30 = 131,100$  lbs. of milk. Milk contains an average of  $\frac{3}{4}$  percent of albuminoids, which contain 16 percent of nitrogen, so that  $131,100 \times .033 \times .16 = 786.6$ , which represents the total nitrogen taken from the soil. Milk contains an average of .68 percent ash constituents, so that  $131,100 \times .0068 = 891.48$ , which represents the total mineral matter taken from the soil; but as this is valued in our fertilizer markets only for the percentages of phosphoric acid and potash which it contains, it would be just to make the calculations accordingly. Average milk contains .40 percent of phosphate of lime, the latter yielding 46 of phosphoric acid, so that  $131,100 \times .0040 \times .46 = 241.22$ , which is total pounds of phosphoric acid removed from the soil. Milk averages .18 percent of muriate of potash (chloride of potassium), so that there will be removed from the soil  $131,100 \times .0018 = 236$  lbs. of this fertilizer.

Now let us compare these results with the exhaustion of fertility produced by the barley crop. The same year he obtained 680 bushels of barley from 25 acres, equal to 544 bushels from 20 acres (the size of his permanent pasture field). This also yielded \$28 worth of straw, which, according to his valuation, is equivalent to 34 bushels of barley, making a total of 578 bushels;  $578 \times 48 = 27,744$  pounds. Barley contains 10 percent of albuminoids, which contain 16 percent of nitrogen, so that there will be removed from the soil  $27,744 \times .10 \times .16 = 443.9$  lbs. of nitrogen, against 786.6 lbs. taken from the soil by the milk. Barley averages 2.2 percent of ash, there being therefore taken from the soil  $27,744 \times .022 = 610.37$  lbs. of ash, against 891.48 lbs. removed by the milk. This ash contains .72 percent of phosphoric acid, the amount of this constituent removed therefore being  $27,744 \times .0072 = 199.75$  lbs., against 241.22 lbs. removed by the milk. Of potash, the ash contains .48 percent, so that barley removes  $27,744 \times .0048 = 133.17$  lbs., against 236 lbs. of muriate of potash taken from the soil by the milk. The difference between the potash and the muriate is not so great that it is necessary to draw a distinction.

These figures prove that milk is much more

exhaustive on the soil than barley, and this factor in the calculation is of immense practical importance. There are two other factors which make permanent pastures still more unprofitable; (1) the droppings of the cows are not so effective from a fertilizing standpoint as the same fertilizing ingredients if they had been left in the soil instead of being converted into manure, principally for the reason that the droppings are not evenly spread over the surface of the soil, and (2) more fertility, in many instances, is drawn from the atmosphere by cultivated crops. These figures disprove the great advantages claimed for permanent pastures, and the sequel is clear that temporary pastures must produce heavy losses, basing the calculation on Mr. Graham's figures. We should like to know if Prof. Arnold took these figures into his calculation when he said that the profits of good arable land were six to eight times greater than those derived from permanent pastures.

#### PRIZE ESSAY.

#### Can Mixed Farming be so Changed that more than the Ordinary Amount of Work may be Profitably Done During the Winter Months?

BY JAMES SHANNON, WOLVERTON, ONT.

Under the old regime of mixed farming, as it has been, and is, understood to consist of raising to sell a few horses and cows, sheep, pigs, poultry, beef, cheese, butter, fruits, roots, corn, rye, oats, barley, wheat, beans, etc., etc., little can be done toward equalizing the work between summer and winter, more than to get things into a state of readiness during the winter months for the campaign when spring arrives.

Of course such work as threshing and hauling grain to market may be postponed until freezing weather. A certain amount of manure may be handled also, and many other things done which would come under the list of preparations for spring. As the state of the times is no longer what they were, when it seemed necessary for every farmer to raise a little of everything, in the hope that something would succeed, I wish to confine my observations to the present and prospective order of agricultural affairs. Modern inventions and facilities for transportation have created keen competition the world over, which, in all probability, will be heightened in the future, so that the cost of production will be the all important factor in the matter of profits. Let us bear in mind also that farming is no longer to be based upon luck, but upon science.

Taking this view of the matter, it is readily seen that the character of mixed farming must be greatly changed or reduced in the number of productions—these to be selected with the utmost care to personal capabilities, and the natural advantages in each case.

In order, then, to reduce the cost of production to the minimum, and also to equalize the work more nearly throughout the year, as well as to build up the soil, the true policy to adopt is to keep more and better stock of whatever species is best adapted to the lay of the land. This will require a larger area to be kept under grass and clover. It will at the same time reduce the amount of tillage and team work to be done, and render more profitable that which is done, on account of the growing fertility of

the soil, which is the sure result. This should be the constant aim of farmers, to increase the productiveness of the land they till, as it is their bank from which dividends may be expected in future years. I am aware that many will shout out objections to any sentiment in the direction of the advocacy of specialties in farming. But the tendency of the times is most unmistakably in this direction. My own theory and practice in this matter is to reduce the lines of production to the lowest point conformable to the requirements of rotation.

However, after all that can be done towards making profitable winter employment on the farm, in our climate, this season will always remain one of comparative leisure to the farmer. This leisure may be turned to profitable account in storing the mind with facts and ideas, and improved ways of doing things, to be applied when time is more precious.

The knowing how and when to do all kinds of farm work without hesitation or doubt, is also another matter of great importance in the question of the cost of our productions and the saving of time. As the mind cannot retain the many good things that may be read during the year, it is necessary to classify and arrange, so that we may have a good stock of shelf knowledge at our disposal, and at a moment's notice. This may be pleasantly and profitably done during the leisure of winter.

#### Canadian and Colonial Exhibition.

Now that this great exhibition is closed, leading journalists in Britain and the Colonies are beginning to speculate as to the effects on Imperial and Colonial agriculture and commerce, not to mention the political prospects. The Imperial Federation League is becoming a powerful organization, and has already made its influence felt in British politics; but our politicians are fighting shy of the question. The agricultural and commercial aspects should be of the first consideration, and the establishment of satisfactory trade relations is an issue of extreme practical importance to our farmers. The adoption of the decimal system of coinage and of weights and measures by Britain and the Colonies would be the first step in the right direction. That the great exhibition has already developed sympathetic relations needs no further proof, and the way is now clear for the exchange of the products of the soil and the factory. The trade should have natural growth, and nothing would mar the harmony and prospects more than placing it into the hands of the politicians. The Canadian Gazette, published in England, which takes a deep interest in Imperial and Colonial affairs, and has critically investigated the nature of the displays, makes the following allusion to the exhibition:

Canadians cannot, indeed, too often remember that while individual enterprise is essential to substantial progress, it is as members of a united country that they will best make their mark in all relations with the outside world. For emphasizing this point, Canada is much indebted to the exhibition just brought to a close. It is, of course, early as yet to speak of the full commercial results of the exhibition. The earliest intention of the Canadian authorities was to give the contribution from the Dominion a distinctly practical character, and those who have followed our articles from week to week will not hesitate to affirm that this intention has been fully carried out. In whatever department one looks, the same extension