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of fat, 3.5 pounds of protein, 4.5 pounds of sugar, and about a pound of ash or mineral matter. Each day, therefore, this cow gives off from her body, in the form of milk, about 85 or 90 pounds of water and 10 or 15 pounds of actual solid matter which must reach her in the form of feed before it can be transformed into the constituents of milk. To determine how these solids can be secured in the milk pail in largest quantity and most profitably is the real task of the feeder. Then, too, there is the dry cow to consider. She is presumably mature and does not need much feed to build up the framework of the body, and she may be already receiving enough to grow the young calf she is carrying, in a satisfactory manner. She is giving no milk and so needs no extra daily supply of feed to supply milk solids. She does, however, need extra feed with which to make some gain in flesh because it is well known that cows calving in good condition are likely to last out better and maintain milk yields for a longer period. Thus the feeder must be prepared to feed for increased weight, as well as milk, reproduction and maintenance

Different kinds of feeding materials, such as protein or nitrogenous matter, carbohydrates, fat and ash or mineral matter, can be combined in the form of various grains, hays or concentrates to produce rations that will be satisfactory for any of the purposes mentioned above. These materials are, in fact, the excuse for using the different kinds of feeds that are used, some being more liberally supplied with protein than others, although deficient perhaps in carbohydrates, fat or ash. Thus when we feed rolled oats and cottonseed meal, or bran and chopped oats, or clover and silage, or any two or more kinds of feed to the same cow we are really combining the protein, carbohydrates and other feeding materials so as to make a ration that will, in our judgment, be most economical. We do not feed all oil cake because this feed does not contain all the desirable feed materials in the necessary proportions.

Rations must, therefore, for the reasons given above, be balanced. But most feeders do this balancing more or less unconsciously or from long experience. They know, for instance, that the dairy cow is a specialist in making use of large amounts of roughages, and that her various stomachs and her cud are given her for this particular purpose. They here they there would particular purpose. They know, too, that these rough-ages, such as silage, roots and hay, while desirable for feeding in large bulk, contain much more carbohydrates in proportion to protein than do concentrated feeds such as oats, bran, oil cake or gluten feed. Years of experience have shown them that the two kinds of feed must be adjusted to the proper proportions for different purposes. Thus, the balancing comes as a result of experience in most cases, and rightly so, but it is possible to get a proper balance without experience, provided one knows the chemical analysis of the various feeds. It can be worked out on paper in a scientific way, and very often practiced feeders would find it to their advantage to do this occasionally.

But merely to say that 100 pounds of oats contains 12.4 pounds of protein whereas, 100 pounds of rye contains only 11.8 pounds of protein is not sufficient because even so, the rye is more digestible than the oats and 100 pounds contains 9.9 pounds of digestible protein, whereas there are only 9.7 pounds of digestible protein in 100 pounds of oats. Even then the story is not told because the cows may not like the rye and they may like the oats very much. Here we are dealing with palatability, the factor in feeding that, among human beings, makes some people prefer limburger cheese to olives. The dairyman may have cows that can use large quantities of feeds very economically, but if he feeds them musty hay or other feeds that they do not like, they will not eat nearly as much as

THE FARMER'S ADVOCATE

HORTICULTURE.

The Northern Ontario Plant Breeding Station.

Situated on the Industrial Farm, near Fort William, Ontario, is a Plant Breeding Station which stands as a horticultural light to the settlers living beyond the tried and known districts of Old Ontario. Here in the heart of New Ontario there is being developed a variety of fruits, vegetables, ornamental trees, shrubs, etc., that will be to the settler what the Northern Spy and



Greenhouse and Plant Breeding Station.



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North reveals there is little on record to guide one in the task of finding or producing suitable varieties for the vast territory from Ottawa north and west to the eastern boundaries of Manitoba. It was of the future we were thinking when we visited Mr. Leslie in his field laboratory, when we discussed with him the known possibilities of New Ontario, and when we listened to the interesting story of how the hardy native plants are being crossed with something a little more tender but of better quality in the hope of creating new varieties more suitable to the climate and the palate of the consumer.

New Ontario has a future, and he who creates or discovers something that will make that future more pleasant and prosperous for the settler will have accomplished something well worth while. The tree fruits and berries hardy in that part of Ontario do not on the whole, compare in variety or lusciousness, with what may be found farther south. The Plant Specialist's task is to improve the horticulture of that part of the Province by breeding more palatable yet hardy strains, introducing new varieties and by being constantly on the lookout for the variations of promise wrought by a change in fertility of the soil or in cultural methods. NATIVE TREE FRUITS AND BERRIES OF IMPORTANCE.

New Ontario is not destitute of fruit or berries by any means. There is already growing wild the founda-tion for a good horticulture that will meet the needs of the settler and farmer. Nature's greatest horticul-tural gift to Northern Ontario is the Canada plum (Prunus nigra). This fruit grows in abundance and in very marked variety. Some are little larger than good navy beans, and some are fully one and a half inches long. The variety of flavor and of color is proportionately nearly as great as that of size. The red cherry is found attaining a diameter of nearly one-half inch. It has excellent flavor and its sprightly, somewhat acid nature makes it a very desirable source of jelly-making. The color of this fruit ranges from of jelly-making. The color of this fluit langes from yellow to deep red and almost black. The choke cherry varies in size and in "chokiness," and is worthy of culture for a period until its possibilities are unfolded. The Saskatoon-berry is found in three different species and is worthy of study under cultivation. In the wild state we found it very plentiful and a valuable asset to the district. The high-bush cranberry affords material for the making of tasty jellies, and a garden is enriched by containing a few bushes. Of the small fruits, the currants, gooseberries, red raspberries and blackberries are all of sufficient promise to warrant experimentation, and they along with selected wild strawberry may well lend blood for the developing of new varieties especially adapted for New Ontario culture. OLD ONTARIO VARIETIES SUITABLE FOR THE NORTH.

The writer was interested in knowing just how far one would be safe in introducing the varieties commonly found in Old Ontario. In regard to this, Mr. Leslie gave us the following information: "There is a wide range of conditions in the north,

"There is a wide range of conditions in the north, and although many varieties of commercially-recognized apples do well around Sault Ste. Marie, the number of varieties which merit wide planting in the North are few. In Rainy River District, the Duchess, Charlamoff, Antonovka, Wealthy and Hibernal are being grown with considerable success. In Thunder Bay District the Transcendent crabs do splendidly, and Hibernal, Duchess and Antonovka are sufficiently adapted to be recommended for planting in the home garden. In Kenora District crab apples bear well. With plums, it is well to limit general planting to the wild forms and to varieties developed therefrom, such as Cheney, Aitkin, Assiniboine, Winnipeg, Major, etc., Sand cherries thrive. Most of the small fruits are worthy of a trial, but the tender varieties such as Cuthbert, Raspherry and most varieties of blackberries offered

they can make use of.

Next we have the question of succulency to consider, and this is something that a ration scientifically balanced from figures only, might go astray on. None of us would care to make a whole meal on dry soda biscuits, even though we could get a drink occasionally. When we eat potatoes we usually like gravy or butter or some creamed vegetables to go with them. Similarly cows like green corn much better than dry fodder, and everyone knows how much they appreciate corn silage and roots. Succulent feeds such as this add palatability to the ration, besides exerting a laxative effect and stimulating digestion.

Cows in milk need about four times as much water as when they are dry and farrow, according to some experiments that have been conducted. At the Geneva experiment station, New York, it was found that for every pound of milk produced, cows need about 4.6 pounds of water, either in feed or drink, and Henry and Morrison say that in general, dairy cows should get about 100 pounds of water each per day. This is sufficient to emphasize the need for plenty of water, and it should be needless to add further that the water should be pure and fresh. It should not be ice cold in winter, but the cooler it is in summer the better under ordinary conditions.

The cost of a ration is also a very practical consideration, and as most dairymen need to supplement the home-grown feeds with some purchased concentrates to secure additional protein, this consideration is very important. Feeds at present are extremely high, and the feeder who is marketing his milk at a stated price must contrive, by judicious buying and intelligent feeding, to produce milk at enough less than the selling price to leave a reasonable margin, or lose money. This last factor, the price and choice of purchased feeds is by no means the least important for, by injudicious selection, much of the gain from intelligent feeding may be lost. Transcendent Crab Tree in Bloom. Photographed near Fort William last spring.

Nursery at the Plant Breeding Station.

other standard varieties of fruits and vegetables are to the farmer in the long-settled counties of this Province. The possibilities of the Hinterland are being unwrapped and the hardy fruits of other lands, where the climate is similar to that of New Ontario, are being introduced and made to feel at home. A representative of "The Farmer's Advocate" visited the Thunder Bay District during the summer, and while at Fort William spent several profitable, as well as interesting, hours with the Plant Specialist, W. R. Leslie, who is in charge of the Plant Breeding Station. Just as the settler clears away bush and timber and breaks new land so must the investigator of the North work in an uncharted field, for beyond what the native vegetation of the of a trial, but the tender varieties such as Cuthbert, Raspberry and most varieties of blackberries offered by the trade need winter protection and hence are no to be generally recommended." How it is DONE.

The primary work undertaken was and is to learn what fruits, vegetables and ornamentals, now available in the trade, will thrive in Northern Ontario. The next step has been to comb the wilds for the horticultural specimens of promise, propagating these with the object of taking advantage of any variation pointing to improvement and using the best of these indigenous plants with the best-adapted domestic strains in breeding up a hardy pomology and satisfactory horticulture for the vast regions of the northern and western parts of the Province. More than that, the hardiest varieties of fruits obtainable are introduced and crossed on native stock to get an excess of hardiness. The hardiest sorts are crossed on others somewhat less hardy, but of superior qualities otherwise, with the object of getting a compromise in the two desirable featureshardiness and quality. The seeds of the best obtainable hardy apples, plums, cherries and wild fruits are planted generously so as to develop a list of varieties indigenous to the country. Horticultural and experiment stations in the Northern States are drawn on freely, and thus a stock of their best material is secured and for which seedlings and selected native fruits of promise are given in return. Trees of the apple, pear and plum are being tested out with different systems of culture which embraces varying amounts of wind protection, different spacings, associating them with forest trees, protection from sun scald by interplanting with bush fruits and planting closely in rows running north and south. The Dominion Horticulturist is assisting the work very generously, and is supplying hardy materials introduced from Russia and Asia, and also the best hardy material which has been produced at Ottawa by cross-breeding. "Excess of food tends to variation," and it is expected that some of the native