

than does pasture. However, grass seems to be the natural feed for animals, and allowing the cow to pick her feed is much easier than harvesting and storing it for stable feeding. Fresh air and sunshine obtained in the open are conducive to health, but if the greatest returns are to be obtained, the pasture must be supplemented during mid-summer and fall. This applies especially to the cow in milk and one which will milk well on into the winter. If the milk flow decreases, due to shortage of feed or unfavorable weather conditions, in the fall, it is difficult to bring it up to normal again. In fact, most dairymen claim that it is impossible to do so. Even dry cows due to freshen during late fall and early winter will give a better account of themselves during the lactation period if supplied with sufficient feed to flesh them before dropping their calves. These facts have been proven time and again, yet supplementary feeding is not generally practiced. Dairymen who allow their cows to drop below normal in milk flow or get out of condition, due to shortage of pasture and lack of care, are losing hard cash. The loss will be heavier than ever this year owing to high price of both feed and milk. A certain amount of the feed consumed goes to sustain the system; that over the maintenance ration goes into production. From the appearance of some herds they are not receiving even a maintenance ration, let alone enough feed to produce milk at a profit. Many feeders evidently fail to realize the relation of feed consumed to production. If feed is scarce this fall and it is not thought advisable to purchase mill feeds, get rid of the cows that are boarders and feed well those which are kept. A small herd of carefully selected, well-fed cows is more profitable than a large herd kept on a maintenance ration. Besides, the labor is reduced, which is an item that must be considered.

Even if winter dairying is the most profitable line, it is impossible to have all the cows freshen in the fall. The best-laid plans are upset by cows failing to breed, and various other causes over which man has little control. Consequently, while the aim in some dairies is to have the cows freshen in the fall, there are some freshening at different times of the year. This tends to give a uniform supply of milk to place on the market the year around, and so prevent a glut in one season and a shortage another. Six weeks' or two months' rest should be given a cow in order that she may gain in flesh before dropping her calf. Dairymen aiming at winter dairying generally breed their cows to freshen any time from October to the New Year. Work is not so rushed in November and December as during seeding and harvest, consequently, there is time to give the cows and calves the attention necessary to have them make the best returns for feed consumed. Cows freshening in the fall usually milk well all winter and continue to give a good flow in the spring, so long as grass is abundant. August and September are generally considered to be the most difficult months to make milk. Flies are bad and pastures are parched. However, by this time the cows to freshen in the fall are dry or nearly so, consequently all the feed goes to build up the animal body and prepare the cow for her winter's work.

Whether a cow is in milk or dry she requires special attention during the fall. If pastures are short they should be supplemented. Green corn, silage, or clover hay are satisfactory roughages, and oats or bran might also be profitably fed. Possibly a few pounds of oil-cake meal or cotton-seed meal would aid in balancing the ration, and under certain circumstances be the most economical feeds to use. The concentrates to feed depend on the nature of the roughage. This year in particular all pasture is short and on many farms the grain supply is below normal, while roots and corn are not on a par with other years. Consequently, dairymen have difficult problems in the feed line to face this fall. In view of the high price of dairy products every effort should be made to handle the herd so as to get the greatest net returns under prevailing conditions. This cannot be done by curtailing the feed or feeding a one-sided ration to good cows.

Cows are sensitive animals, and the milk flow is influenced by changes in temperature. After the first of October it is usually advisable to stable them at night. The ground is more or less damp and cold, and if cows are left out extra feed is required to keep up the body heat. If the feed is not forthcoming then the milk yield suffers. A cow should be in the stable on chilly, drizzly days this time of year, but so long as it is fair weather they are better out even if the pastures are short, but they require feeding in the stable. Not only do the cold and damp lower the vitality of the animal, but tend to cause udder trouble. Teats are more liable to become sore during the fall than at any other time of the year. Garget may be brought on by the udder coming in contact with the cold ground. This trouble not only diminishes the milk flow for the present, but frequently causes loss of a quarter of the udder. The average dairyman might profitably take lessons from those who are making high records with their herds, regarding care and feeding the year round. If special attention aids in making big records, it will assist in improving the milk yield of the average cow.

The change from pasture to stable is probably the most difficult thing to get a cow accustomed to. Climatic conditions of this country are such that animals must be sheltered about seven months of the year. Fresh, succulent grass is Nature's feed for stock, and successful dairymen aim at imitating summer feeding in the winter. Silage comes nearer taking the place of grass than any other feed grown on the farm. Roots are valuable feed to include in the ration, and, of course, there must be a certain amount of dry feed. The system of an animal on pasture all summer, becomes accustomed to digesting green feed, and it is a miracle that the loss

is not heavier than it is when they are placed on dry fodder. So often the change is made suddenly in place of gradually getting the animal accustomed to digesting dry feed. It is possible to change from field to stable conditions without in any way interfering with the health of the animal or decreasing the milk yield. Through September and October the cows become accustomed to a certain amount of dry feed in a well-regulated dairy. A certain amount of concentrates is also fed daily, and, as the grass decreases the silage and roots are fed in increasing quantities, consequently by the time the weather prevents stock going to the fields they have become accustomed to winter conditions and winter feed.

Corn, either as silage or stover, goes a long way in solving the winter-feeding problem. If handled properly corn stover is readily eaten by stock the early part of the winter, but silage is a palatable feed for all seasons of the year. A cow requires all the roughage she will consume, but the amount of concentrates to be fed depends on the yield of milk. One pound of grain to every four pounds of milk is a rule followed by some.

Milk averages about 87.5 per cent. water; 3.6 per cent. fat; 2.5 per cent. casein; .7 per cent. albumen; 5 per cent. sugar, and 7 per cent. ash. These substances must be fed before the cow can produce them in the form of milk. If they are not in the feed, a cow will draw them from her system for a certain length of time. Feed is also necessary to repair waste tissue, supply energy and heat. It is necessary that the ration consist of feeds that will supply protein. Where there is a supply of alfalfa or clover hay and a silo full of corn a dairyman can keep his cows looking fairly well, and at the same time producing a profitable quantity of milk, without feeding too heavily on expensive concentrates. Oats are the most nearly balanced ration in themselves of any of the grains. They are particularly good for milk cows and young stock. Bran is also highly recommended as a protein feed. Oil cake, cotton seed and brewers' grain are also rich in protein, and are used in large quantities by some dairymen. Owing to scarcity of grains many tons of these feeds are being purchased this fall to assist in keeping the cows up to normal in production this coming winter. For best results a variety of feeds is necessary.

The dry cow due to freshen within a few weeks requires attention as well as the cow in milk. Probably the concentrates need not be fed in as large a quantity, but she must be fed well when dry if the greatest returns are to be made during the lactation period.

The boarder cow should never be kept. However, we have reason to believe that many are still to be found in the country, and in many herds they will be the means of reducing the ration that the profitable cow should receive this winter. Never before was the necessity of weeding-out so apparent as it is this year. Individual records of production and feed cost should be kept, and attention centred on the cows making a profit.

THE APIARY.

Preparing for Winter in the Apiary.

Bees do not become torpid in winter like other insects, but they generate heat and consume their stores in so doing. In cold weather the bees form a compact spherical cluster, the interior of which may be as warm as eighty or ninety degrees Fahrenheit. Successful wintering depends principally upon the number of bees in the cluster, the youth of the bees, sufficient and wholesome stores, and protection from cold. When good protection is provided the bees do not need to produce so much heat, consequently less stores are consumed and there is less drain upon the vitality of the bees.

Preparation of bees for winter, therefore, begins by seeing that each colony has a good fertile queen and enough bees to crowd the spaces between seven to ten combs, the more the better, and that these consist principally of young bees that have done but little field work. Weak colonies must be united. To get plenty of bees reared in August and September in regions where but little honey is gathered during these months, the queen should be one that has been reared during the summer. Since such a queen will also usually build up her colony more rapidly and to greater strength in the spring, and will be less inclined to swarm than an old queen, the advantages of requeening colonies that have old queens are great, and it will often pay to buy queens for this purpose if they have not been reared.

Each colony should have thirty to forty-five pounds of wholesale sealed stores if it is to be wintered out-of-doors, the amount depending on the intensity of the cold, and thirty to thirty-five pounds if it is to be wintered in the cellar. The weight of an ordinary 10-frame Langstroth hive made of white pine with walls seven-eighths of an inch thick, with five-eighths inch thick bottom board, combs, bees and pollen, but without cover, is, if dry, usually between thirty and thirty-five pounds, so that in weighing hives for the winter the weight of stores may be liberally estimated by deducting thirty-five pounds from the weight. Any deficiency in weight is made good by feeding as rapidly as possible during the third or fourth week in September (the first week in October in southern Ontario,) with sugar-syrup.

To avoid dysentery it is good practice to give each colony at least ten pounds of syrup. This is stored next to the cluster which occupies the empty parts of the comb from which the last brood emerged, and it

is therefore consumed first, so that the accumulation of the faeces is delayed. At the Central Experimental Farm, Ottawa, where a considerable amount of honey is gathered from wild flowers in August, it has been found that colonies whose stores have been thus supplemented with about ten pounds of syrup, winter better than those whose stores consist of honey only, and this has been found to be the case in many places in Ontario and elsewhere. If honey-dew honey or other stores that quickly produce dysentery are suspected to be present in quantity, the outer combs should be removed and replaced with combs of clover honey saved from the summer, the honey should be extracted from the inner combs and the colony should be fed with sugar syrup.

In many places in British Columbia, southern Ontario and the Annapolis Valley, N. S., the bees may be wintered successfully out-of-doors, provided adequate protection is given, but in regions where the winter is very cold they must be wintered in the cellar. In places where there is a choice between the two methods, out-door wintering is sometimes preferred by absentee beekeepers for out-apiaries because the bees need no attention from the time they are prepared and packed for winter at the end of September until spring has opened. Nevertheless, where the bees are unable to get a good cleansing flight for several weeks their vitality is better conserved in cellars where the optimum conditions of temperature, ventilation and humidity (which as yet are but imperfectly known) are approached than under the severe and fluctuating conditions found outside.

Outdoor Wintering.

On the Pacific coast where the winter is mild and damp, a weather-proof wooden case that slips down over the outside of the hive and projects about three inches above it, with a two-inch covering consisting of sacks or a chaff cushion on top of the frames and a ventilated waterproof roof makes a sufficient and satisfactory extra covering. It is advantageous to have a dead-air space between the case and the hive, and this may be filled with cork granules or other packing that will not attract or hold moisture. The entrance to the hive should be reduced to six or eight inches long by three-eighths of an inch deep.

In colder and drier regions the hive without its roof is placed in an outer case large enough to take two to four inches of good packing such as planer shavings or closely packed dried leaves around the sides (in severe climates the bottom also) of the hive and six to twelve inches on top. The material on top may be placed in bags or a cushion for easy removal. It is an advantage to make such a case large enough to take four hives in two pairs, back to back, because the colonies keep one another warm. The cases made to take four hives have proved very satisfactory in many apiaries in southern Ontario, and with three inches of planer shavings at the sides and underneath and ten inches on top, they have met with fair success at the Central Experimental Farm, Ottawa, in the winters of 1912-13 and 1913-14.

The roof of the wintering case should be covered with waterproof roofing. Above the packing material an air space should be left which should be ventilated by holes in the gables. To prevent the mouths of the hives getting choked with dead bees there should be a space of at least an inch between the floor and the bottom bars of the frames. A suitable size for the outside entrance where the winters are severe is one and one-quarter inches high by eight inches wide, the width being reduced to three-eighths of an inch during the winter by means of a piece of wood revolving on a screw and resting on a projecting nail or block of wood. To prevent the small entrance getting partly closed with ice there should be no projecting ledge under it. To be buried under a moderate depth of loose snow does bees no harm in mid-winter, but snow may advantageously be cleared away from the hives in March.

Bees wintered out-of-doors must be sheltered from wind. Protection from wind is especially important in the colder regions. In such regions if the apiary is not surrounded by evergreens or other satisfactory shelter a close board fence about eight feet high should be erected around the apiary. It is necessary to emphasize the importance of wind protection in the winter, because it is often given insufficient attention.

Bees wintered out-of-doors start breeding earlier than those wintered in the cellar, and they benefit by the better protection provided by the wintering case in the spring.

Cellar Wintering.

The bee cellar should be well ventilated but not drafty, and the temperature should be kept steady at about two to five degrees below that at which the bees would begin to show signs of restlessness. The best temperature in the early part of the winter will usually be around forty-eight degrees F., but as the faeces accumulate a somewhat lower one (forty-two to forty-five degrees F.) with more fresh air will be needed. The air in the bee cellar must not be too dry, but it must not be damp enough for moisture to condense on the floors of the hives, and the cellar should be well drained. The bees must be kept in darkness and should be left undisturbed.

The cellar of the residence is usually satisfactory for wintering bees, or it can be made so, the furnace helping to supply the required temperature and ventilation. A portion of the cellar should be boarded off for the bees. The principal faults are insufficient insulation to keep the temperature within the stated limits, insufficient ventilation and insufficient or ex-