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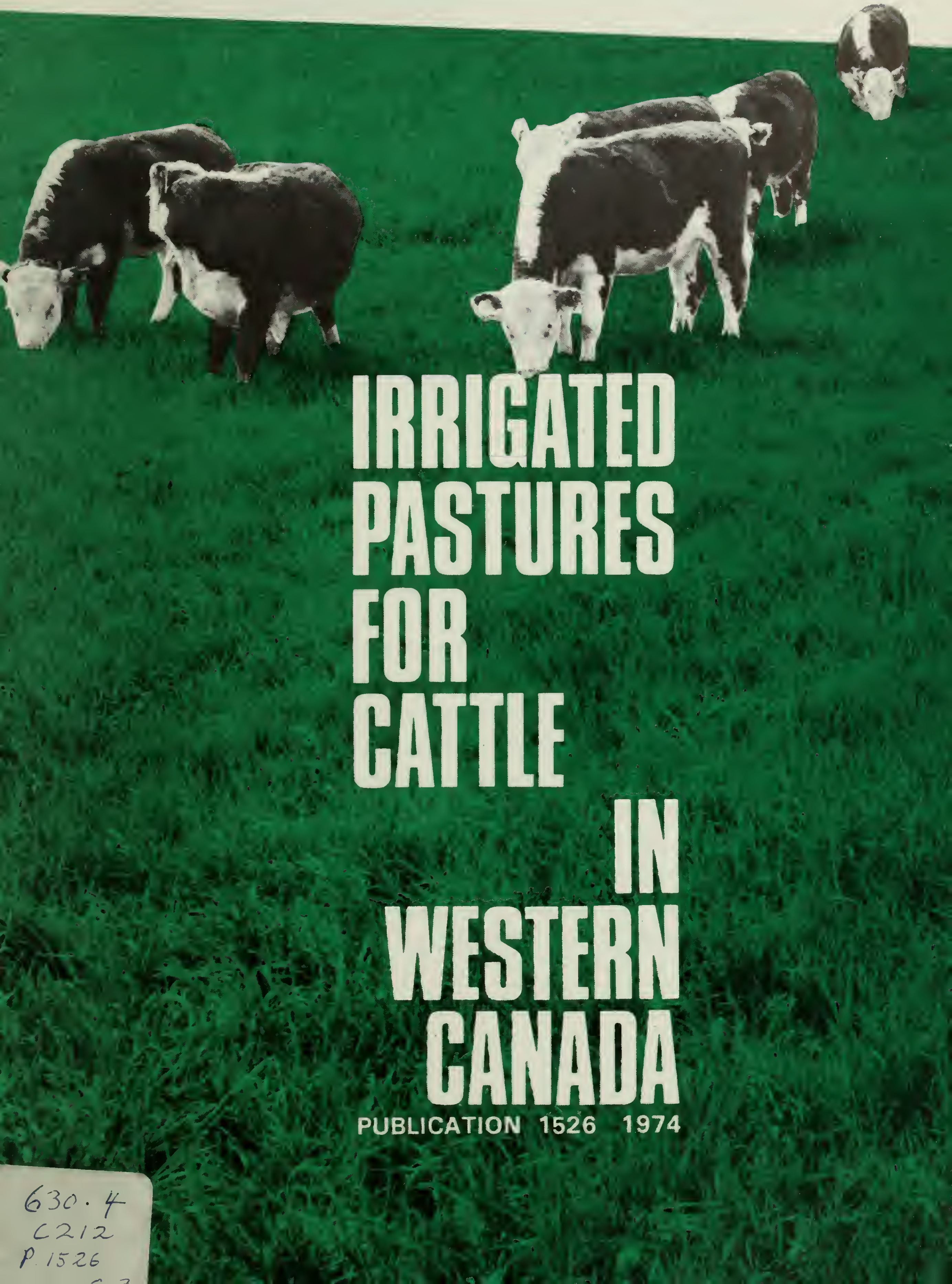

IRRIGATED PASTURES FOR CATTLE IN WESTERN CANADA

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MAIN STEPS IN PRODUCING GOOD IRRIGATED PASTURE:

- Sow good seed of adapted varieties
- Seed at a shallow depth on well-prepared land
- Control weeds from seeding time on
- Choose a grazing system that suits your class of stock
- Harvest the spring surplus as hay or silage
- Remove seed heads by mowing
- Irrigate lightly and often
- Fertilize regularly
- Do not allow your stock to overgraze a pasture
- Control insect pests of livestock

IRRIGATED PASTURES FOR CATTLE IN WESTERN CANADA

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In Western Canada about 125,000 acres (50,000 ha) of grazing land are irrigated, but the production on this land varies widely from one location to another. Only part of this area fits the concept of irrigated pasture described in this publication. Irrigated pasture means much more than just supplying extra water to grassland; it also means growing grasses and legumes that are adapted to moist, fertile soil, and practicing good management techniques in order to make the most efficient use of the forage. An irrigated pasture is a crop that is harvested mainly by livestock, and is marketed as an animal product.

The production and maintenance of good irrigated pasture is expensive. No one can afford to waste forage. A high degree of skill and careful management are needed to match the forage supply to the needs of the animals throughout the grazing season.

Choose the type of pasture and management that are most suitable for the class of livestock using it. The best kind of pasture for cows with their calves and for feeder cattle is not necessarily the same as for horses and sheep. The season of use for irrigated pasture is about 4 months, which is shorter than that for dryland pasture. Carrying capacity and production are highly variable, and depend mostly on management. This publication describes the most successful methods of livestock production on irrigated pastures.

GENERAL PRINCIPLES

Irrigated pasture, if properly managed, provides an adequate diet for grazing animals. Dairy cows and yearling cattle for slaughter need a high intake of good-quality feed. They should always have access to plenty of fresh forage to keep their feed intake at a maximum (Fig. 1). If they do not have it, their production or rate of growth will decline. However, dry or mother cows tend to overeat if more feed is available than they need, and consequently the carrying capacity of the pasture will be lower than it should be. Therefore, you should restrict their feed intake by growing a less palatable forage than the one the cows are accustomed to, by offering it in a less digestible state, or by pasturing the cows mostly on aftermath left by the yearlings. The main management problem is the irregular growth of forage during the season (Fig. 2). The growth of forage starts slowly in late April, reaches a peak in June, becomes very slow in July, increases somewhat in August, and is almost finished by mid-September. Grazing animals, however, have a constant or an increasing need for feed throughout the whole season. Pasture management is concerned largely with balancing the feed supply with the need for it. The returns on your investment in the pasture are highly dependent on how efficiently the surplus from early summer is used.

Fig. 1. To make rapid gains feeder cattle should always have access to plenty of grass so that their feed intake is kept at a maximum.

The carrying capacity of the pasture varies with management but it is somewhat predictable. The amount of forage eaten by cattle on good pasture is 2–3% of their body weight each day. A 1,000-lb (450-kg) cow eats 20–25 lb (9–11 kg) of forage each day and a 600-lb (270-kg) steer about 16 lb (7 kg). An average pasture produces 6,000 lb of forage per acre (6 716 kg/ha) during the growing season, so theoretically the carrying capacity is between 240 and 300 cow-days per acre (593–741 cow-days/ha). The lower figure (240 cow-days) means that 1 acre of pasture can maintain two cows for 120 days (two cows for 296 days or four cows for 148 days/ha). In practice, the calculated carrying capacity of the pasture is never reached, because the feed is never completely used. A lot of waste occurs, particularly during the period of rapid growth in June, from animals tramping down the forage and rejecting mature herbage. Experience has shown that good, well-managed pasture can carry three yearling cattle per acre (7.4/ha) for 110–120 days, and they will each gain about 225 lb (100 kg) during the season. A somewhat modified pasture can carry three cows with their calves on each 2 acres for 120–130 days (four cows and calves per ha for 120–130 days). Without good management the carrying capacity of the pasture is less. It is important to remember that the grazing season is short, and other feed sources are needed. After September, grass grows slowly, and when the summer production of grass is used up, new

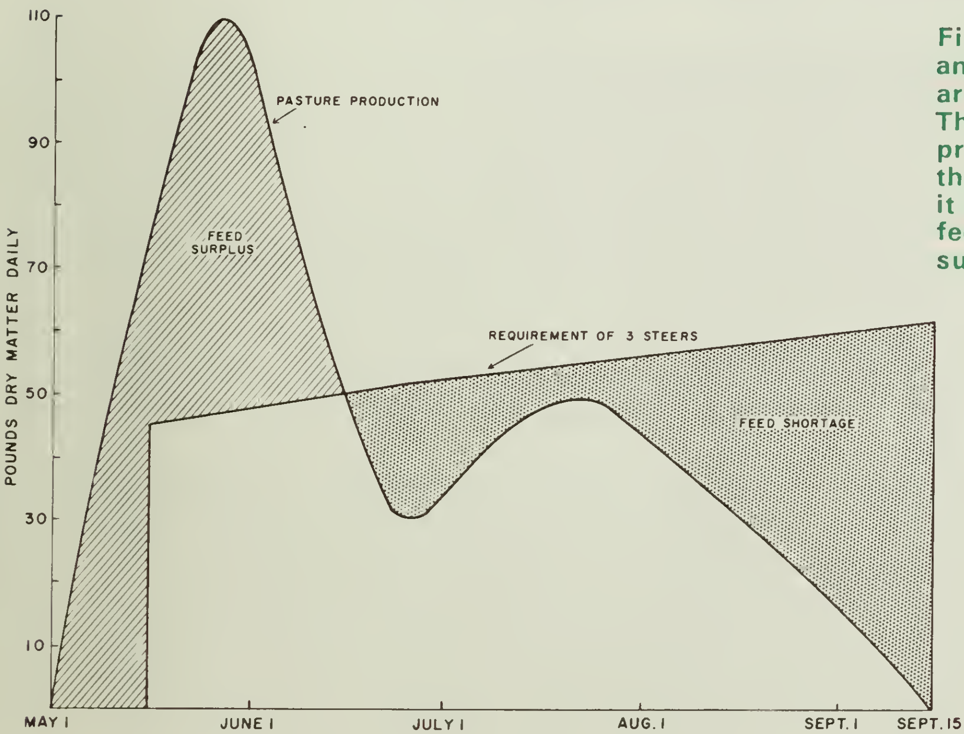

Fig. 2. Forage growth and animal requirements are not always in balance. The best solution to this problem is to harvest the early surplus and store it as hay or silage for feeding later in the summer.

growth is not fast enough to keep the animals gaining. Grazing in late fall may injure the plants and lead to winter-killing (Fig. 3).

Fig. 3. Close grazing in the fall may lead to winter-kill in forage crops.

ESTABLISHING THE STAND

May is the best month for seeding, but, if fall is more convenient, it can be done just after mid-August. On areas that are often wet, delay the seeding until after the ground is frozen in late fall.

Sow the seed about ½ in. (12 mm) deep in a firm seedbed. Place the seed directly into clean stubble or well-packed cultivated land. Pack the soil firm enough so that footprints barely show.

You can use a companion crop of grain to protect the soil from wind erosion, and to receive a cash return in the year of seeding. Seed the grain at half the usually recommended rate, then seed the pasture at right angles to the grain. If you do not use a companion crop, a pasture seeded in the spring should provide some grazing by mid-August. If you use a companion crop, do not expect to graze the pasture before June of the following year. Irrigate for the pasture crop, not the grain crop.

Seed with a grain drill in rows 6–9 in. (15–25 cm) apart, and pack behind the drill with press wheels on the drill or by pulling a packer. Use the grain box to seed most grasses, though you may have to shut it off almost completely for Kentucky bluegrass, reed canarygrass, and the legumes except sainfoin. For orchardgrass and mixtures of grasses that have larger seeds, try a drill setting of about ½ bu of wheat/ac (34 kg/ha), and adjust it if necessary. Try to adjust the drill so that the seed flows continuously without leaving any gaps. The seeding rates are high, and in fact could be cut in half if you prepare a fine, firm, moist seedbed. Heavier rates provide pasture sooner than lighter rates, and if the pasture can be used earlier the extra grazing more than makes up for the cost of the extra seed. It may be helpful to have someone ride the drill to watch for plugged seed cups and to free them by poking with a stiff wire.

For sowing crops that have small seeds, use a grass seeding attachment. Otherwise, the seed can be diluted by mixing it with some inert matter such as cracked wheat or bran, or it can be broadcast and harrowed. Never fill the seedbox more than half full.

FORAGE SPECIES AND MIXTURES

Grasses are the main species in most pastures, but legumes such as clover, alfalfa, and sainfoin are also useful. Legumes have the advantage of being able to use nitrogen from the air, and therefore they do not need fertilizer nitrogen, which is an important money-saving feature. However, most legumes are difficult to manage, and we are not able to capitalize on them to the fullest extent.

In this publication pastures of simple mixtures or single species are recommended. This is a change from earlier "shotgun" recommendations that sometimes included six or more species. In complex mixtures, usually one or two species dominate, and the money spent on seed of the other species is wasted. It is much better to select one or two species that are suited to your soil and climate, and to manage them according to their needs.

The recommended species, but not the varieties, are given in the following list. New varieties are constantly being introduced, and recommendations for their use are published annually by provincial governments. Always use good seed of the best variety. The investment in an irrigated pasture operation is too big to risk using anything but the best seed available.

RECOMMENDED PASTURES

FOR FEEDER CATTLE:

where winters are mild as in the area around Lethbridge
— orchardgrass at 15 lb/ac (17 kg/ha)

where winters are more severe than at Lethbridge
— a mixture of Kentucky bluegrass at 10 lb/ac (11 kg/ha) and pubescent wheatgrass at 5 lb/ac (6 kg/ha)

wet land
— reed canarygrass at 10 lb/ac (11 kg/ha)

short-term pasture (2–3 years)
— pubescent wheatgrass at 15 lb/ac (17 kg/ha), or
— sainfoin at 40 lb/ac (45 kg/ha)

FOR COWS WITH THEIR CALVES AND DRY STOCK:

— a mixture of Kentucky bluegrass at 10 lb/ac (11 kg/ha) and pubescent wheatgrass at 5 lb/ac (6 kg/ha)

FOR OTHER SPECIFIC CONDITIONS:

saline soils
— a mixture of tall wheatgrass at 10 lb/ac (11 kg/ha) and tall fescue at 6 lb/ac (7 kg/ha)

limited irrigation water
— a mixture of bromegrass at 10 lb/ac (11 kg/ha) and creeping red fescue at 5 lb/ac (6 kg/ha)

Do not expect full production from these mixtures for special conditions.

To any of the recommendations in the preceding list add the seed of a suitable legume in the following list at 2 lb/ac (2 kg/ha). High production of grass requires heavy fertilization with nitrogen, which soon makes the legume disappear. Nevertheless, the money spent on the legume seed will be repaid. Alfalfa or clover in a pasture increases the chances of bloat in cattle. This problem is described in the section, "Animal Management" on page 13.

OTHER RECOMMENDED FORAGE CROPS

LEGUMES:

Alfalfa is an excellent feed that produces well for a short time. It will almost disappear from the pasture after 3 years of grazing. It can cause bloat in cattle.
Alsike clover is widely adapted. It is often used on wet soils, where other legumes will not grow. It can cause bloat.
Birdsfoot trefoil is a good feed. It does not cause bloat. It begins

growth late in spring, and its regrowth after grazing is slow. At Lethbridge, stands of trefoil have partly died out and become weedy after only 1 year of grazing. It appears to have some tolerance for wet and saline soils.

Ladino clover withstands heavy grazing on good land. It can cause bloat in cattle, particularly if it constitutes more than half of the herbage.

Sainfoin is an excellent feed (Fig. 4). It does not cause bloat. Pure stands may be very productive for 2 or 3 years. Do not use it in a mixture because it requires different management than grasses do.

ANNUALS:

Italian ryegrass is a winter annual and, in some areas, a short-lived perennial. It can be safely regarded only as an annual in Western Canada. If seeded in April, it is ready for grazing by mid-June and produces almost as much forage as a perennial grass. It provides high-quality pasture well into the fall.

Cereal crops seeded early at 50% more than the normal rate provide good emergency pasture. Fall rye can be grazed throughout the season, but spring cereals provide good pasture only until mid-July.

Fig. 4. Sainfoin is well liked by cattle but it requires special management for good production.

PASTURE MANAGEMENT

ROTATIONAL GRAZING

For high-producing animals such as feeder cattle or dairy cows fence the pasture so that each field can be grazed in rotation. Your objectives should be to maintain continuous maximum feed intake of highly digestible feed, and to make it possible to harvest and store the June surplus while it is still in a nutritious state. At least four separate fields are needed. The length of stay in each field varies as the season progresses. With a four-field rotation and a constant stocking rate, one field might provide grazing for 10 days in June, and 2 days in September. In June, one field can be cut and stored as hay or silage instead of being grazed. Under a rotational grazing system you do not produce more forage than under continuous grazing, but highly productive animals will use the forage more efficiently. To keep the forage intake high, move the animals to the next pasture just as soon as the grass is grazed down or matures. The grazing season on orchardgrass pastures usually lasts from mid-May to mid-September. During this period yearling steers gained an average of 2 lb (0.9 kg) per head daily at Lethbridge.

For cow–calf and dry-stock operations, continuous grazing is acceptable when you use Kentucky bluegrass rather than orchardgrass. Mature forage is often present under a continuous grazing system, but it is usually adequate for the cow. The calf is usually well nourished by nursing and selective grazing. Where the stocking rate is moderate, 0.75–1 acre (0.3–0.4 ha) per cow, the grazing season can last from mid-May to mid-October.

WEED CONTROL

Weeds may be numerous soon after seeding. Control them with the use of herbicides. Consult your provincial agricultural extension officer for advice on the use of chemicals.

Very often weeds are only a symptom of poor growing conditions or inadequate management and are not really the main problem. Weeds seldom get started in a vigorous pasture. Poor irrigation, inadequate fertilization, and prolonged close grazing are the most common causes of increased weediness.

The most common weeds in irrigated pastures are foxtail barley, Canada thistle, and dandelion. Foxtail barley is usually found on poorly drained, saline soils. Frequent mowing helps to check its growth but is not a permanent measure. Foxtail barley will not be a problem if you can rid the soil of excess water and salt, and apply fertilizer to promote vigorous growth of the pasture grasses.

If you cannot improve the soil, use a seed mixture that is adapted to the specific conditions in your pasture (see mixtures for other specific conditions in the section, "Recommended Pastures" on page 8).

Where Canada thistle is a problem, it was usually already in the field when the pasture was seeded, although it also invades poor pastures. The best control of Canada thistle is a combination of mowing and spraying with a herbicide. Consult your provincial authority on the choice of herbicide and the treatment. You may have to repeat the treatment.

Dandelions are not common in vigorous orchardgrass pastures, but they invade most other pastures. They are particularly abundant in heavily grazed bluegrass pastures. They are useful as feed, but because they are not very productive, they are undesirable. Dandelions can be controlled by using a herbicide and by maintaining a vigorous stand of grass.

MOWING

Mow the pasture once each season to remove seed heads (Fig. 5). On rotation pastures, mow the third field after the first grazing, and also the fourth field if it is not cut for hay or silage. Mow the first two fields after the second grazing. Sainfoin pasture should not be mowed after grazing. Though the forage is badly trampled, good regrowth will occur if the residue is left undisturbed.

Fig. 5. When a large number of seed heads have formed, mow the pasture after it has been grazed.

IRRIGATING

Pastures need about 24 in. (60 cm) of water during the growing season. If the rainfall is 10 in. (25 cm) you need to apply 14 in. (35 cm) of water. The most important point about irrigating a pasture is that water must be applied often and in small amounts. Apply 2–3 in. (5–8 cm) at a time, five to seven times during the growing season. Choose an irrigation system that is suitable for your land. Irrigate the pasture immediately after it has been grazed, and again, if needed, before the next round of grazing begins. Water applied by surface flooding (in a border-dike system) moves slowly through a dense stand of grass, especially if the slope of the land is gradual (Fig. 6). A center pivot system is an effective way to irrigate a pasture. Under continuous grazing, animals tend to move ahead of the advancing sprinklers. Under rotational grazing, special provision can be made to allow the system to move through the fences. Gates have been designed that open and close as the wheels of the system pass through. As the system passes through a pasture where animals are confined, decrease the amount of water applied to prevent damage to the plants caused by animals tramping on the wet and softened ground.

Fig. 6. Flooding with a border-dike system is the cheapest method of irrigating if the land has a gradual, uniform slope.

Timing of irrigation is very important. The roots of pasture plants are concentrated in the top 6 in. (15 cm) of soil. If this part of the soil becomes dry, regrowth is too slow to meet the needs of the animals.

FERTILIZING

Apply nitrogen to grass pastures each year. The amount needed depends on the soil conditions, but usually 150–200 lb/ac (170–225 kg/ha) of elemental nitrogen is needed for maximum grass yields. Apply the fertilizer at 50 lb/ac (56 kg/ha) in early April, and the beginning of June, July, and August. In theory, nitrogen fertilizer is not needed on pastures that are half legume, because legumes can use the nitrogen they take from the atmosphere and make it available to the grasses growing with them. However, in practice, pastures that are a mixture of grass and legume produce only about 70% as much forage as grasses heavily fertilized with nitrogen, and their production varies widely from year to year. Where 200 lb/ac (224 kg/ha) of nitrogen is applied annually, grasses soon crowd the legume out of the mixture, and the continued application of nitrogen fertilizer becomes essential. Where legumes such as alfalfa, sainfoin, or birdsfoot trefoil are grown alone, no extra nitrogen is needed to produce high forage yields.

Phosphorus fertilizer is needed on many pastures. A soil test is the best way to determine a deficiency. If phosphorus is needed, broadcast it on the surface of the soil in spring.

SUPPLEMENTARY PASTURE

Figure 2 shows that forage growth and animal requirements are not always in balance. At a stocking rate of three yearlings per acre, there is a feed surplus early in the season, and a shortage midway through the season. From July on, supplementary pasture can be used, and hay lands or annual pasture can be grazed. Italian ryegrass, described earlier, is a useful grass for supplementary pasture.

ANIMAL MANAGEMENT

WATER AND MINERALS

Supply plenty of fresh, clean water to all livestock on pasture. Where rotational grazing is used, provide a lane from each field to give the animals access to water. Or, the water supply may be in the center of the pasture where the rotation fields meet.

Livestock also need minerals. A mineral supplement should contain 15–20% of both phosphorus and calcium, and it should be mixed half and half with cobalt-iodized salt. If the fields where the animals are grazing are large, locate the water and minerals so that the animals are encouraged to move over the entire area available to them.

SHELTER

Animals need shelter from the sun during hot weather. Steers may gain up to ½ lb (0.2 kg) more each day when they have shelter. If no trees are available, a simple inexpensive structure may be used, as long as it is large enough to accommodate all the animals and to allow air to circulate freely.

INSECT CONTROL

Cattle bothered by flies, mosquitoes, and other insects suffer considerably and their production is reduced. For example, uncontrolled horn flies may reduce gains of yearling steers by 25%. See Canada Department of Agriculture Publication 1309 and Alberta Department of Agriculture Publication 651 for recommendations on controlling insects.

SUPPLEMENTAL FEEDING

High-producing animals may not be able to get enough feed from grazing to supply all their needs, even on good pasture. Cows producing over 30 lb (13 kg) of milk daily should be fed grain. The usual rate is 1 lb (0.5 kg) of grain to 4–5 lb (2 kg) of milk. Steers fed barley on pasture have gained 0.5–1 lb (0.2–0.5 kg) a day more than on grass alone. Steers fed grain can be sold as fat cattle off pasture or can go into the feedlot for a short finishing period.

Yearling steers self-fed barley on pasture gained about 3 lb (1.4 kg) per head and ate 12–15 lb (5–7 kg) of barley per day. Because they tend to waste grass when plenty of barley is available, it is best to limit the amount of grain when grass is plentiful. Usually the greatest benefit is derived from feeding grain after the middle of July. Higher gains have been obtained from feeding barley than from oats or wheat. The cost per pound of gain is higher when grain is fed, but more animals can be carried. On a full feed of grain, animals eat very little grass, and the pasture is like a feedlot. The decision to feed grain depends on the difference between the added cost of the grain and the extra market value of the product.

MECHANICAL GRAZING

During a 4-year experiment rotational grazing was compared with cutting forage daily and feeding it in a feedlot. In 108 days the feedlot animals gained 14 lb (6 kg) per head more than the animals on pasture and used 15% less feed per pound of gain. Ten percent less forage was harvested from the mechanically grazed field than from the grazed one, largely because the machines could not cut close to ditches, fences, and other obstructions. Various problems occurred because of having to cut forage daily in all kinds of weather.

You can have the advantages of mechanical grazing without the daily problems by cutting the forage at suitable times, ensiling it, and feeding it from storage. In this way a year-round supply of feed of known quality can be maintained. Another advantage of a feedlot system over a pasturing system is that animals are under close observation at all times and supplementary feed can easily be supplied when it is needed. However, the disadvantages include higher cost, a greater waste-disposal problem, and sometimes more labor.

BLOAT

Alfalfa and clover are legumes that may cause bloat in cattle and sheep. Deaths due to bloat are thought to be about 2% where legumes comprise less than half of the forage mixture. Many livestock producers feel that the value of the legume outweighs the risk for animals of ordinary value, but not for animals of high value. However, if you have only a small herd, the possibility of a devastating loss has to be considered. Sainfoin and birdsfoot trefoil are legumes that are not known to cause bloat.

You can control the growth of legumes by regulating the grazing height. Continuous close grazing favors white clover; light grazing suppresses it. For alfalfa the opposite is true: close grazing quickly eliminates it from the pasture. A high rate of nitrogen fertilizer encourages the growth of grass, which in turn crowds the legume out of the pasture.

Bloating is caused by gas that is blocked in the rumen. The gas causes the rumen to swell, especially on the left flank of the animal. As the gas pressure increases the animal gasps for breath and becomes greatly distressed. In acute cases the animal may die in a short time unless the gas pressure can be relieved quickly.

To relieve bloat, first try using a stomach tube. If this does not give relief, a trocar and cannula inserted 6–8 in. (15–20 cm) in front of the hip bone and about 3 in. (8 cm) below the loin area may be effective. In an emergency, an incision into the rumen may be the only effective treatment.

A commercial product called Poloxalene, which can be mixed with a grain ration, has been found to be reasonably effective in controlling bloat caused by alfalfa. The treatment is practical for animals that get daily supplementary feed, but less effective where the product is added to a salt block. Drenches with defoaming agents may also help. Other drenches such as turpentine, coal-tar derivatives, and household detergents are sometimes used as treatments, but all drenches should be used with caution.

Before animals are turned out on alfalfa or clover pasture, make sure they have been well fed with other feed. It may also help to have dry feed available in the pasture. Chronic bloaters should be slaughtered.

SOME FACTS ABOUT IRRIGATED PASTURES

- A good irrigated pasture produces 7,000 lb of dry forage per acre (7,800 kg/ha) from mid-May to mid-September; an average pasture produces 5,000–6,000 lb per acre (5,600–6,700 kg/ha).
- In 119 days the amount of forage dry matter eaten by hand-fed yearling steers was equivalent to 2.4% of their body weight.
- On grazed pastures 15–35% of the forage produced is wasted. Waste is minimized when the June surplus is harvested and stored as hay or silage.
- On reasonably well managed pasture, yearling steers gain about 1 lb (0.5 kg) for every 10 lb (4.5 kg) of forage produced.
- Gains of yearling steers were reduced 25% when horn flies were not controlled on pasture.
- On good orchardgrass pasture, the average carrying capacity has been three yearling cattle per acre for 110–120 days, each animal gaining 220–240 lb (100–108 kg). Besides, it has usually been possible to harvest one-half ton of hay.
- An acre of good grass and legume used for hay and pasture can feed a cow-calf unit (4.5 tons of dry matter) for a year (1 ha can feed 2.5 cow-calf units per year). The weaned calf needs additional feed.
- The effect on yield of irrigated grass pasture of a 50-lb (23-kg) application of nitrogen fertilizer was almost gone after 40 days. This differs from results obtained from dryland pasture, where the effect lasts longer.
- Cattle graze about 8 hours each day. If the forage is in short supply, the cattle eat less and therefore produce less.

METRIC EQUIVALENTS

LENGTH

inch	= 2.54 cm	millimetre	= 0.039 in.
foot	= 0.3048 m	centimetre	= 0.394 in.
yard	= 0.914 m	decimetre	= 3.937 in.
mile	= 1.609 km	metre	= 3.28 ft
		kilometre	= 0.621 mile

AREA

square inch	= 6.452 cm^2	cm^2	= 0.155 sq in.
square foot	= 0.093 m^2	m^2	= 1.196 sq yd
square yard	= 0.836 m^2	km^2	= 0.386 sq mile
square mile	= 2.59 km^2	ha	= 2.471 ac
acre	= 0.405 ha		

VOLUME (DRY)

cubic inch	= 16.387 cm^3	cm^3	= 0.061 cu in.
cubic foot	= 0.028 m^3	m^3	= 31.338 cu ft
cubic yard	= 0.765 m^3	hectolitre	= 2.8 bu
bushel	= 36.368 litres	m^3	= 1.308 cu yd
board foot	= 0.0024 m^3		

VOLUME (LIQUID)

fluid ounce (Imp)	= 28.412 ml	litre	= 35.2 fluid oz
pint	= 0.568 litre	hectolitre	= 22 gal
gallon	= 4.546 litres		

WEIGHT

ounce	= 28.349 g	gram	= 0.035 oz avdp
pound	= 453.592 g	kilogram	= 2.205 lb avdp
hundredweight (Imp)	= 45.359 kg	tonne	= 1.102 short ton
ton	= 0.907 tonne		

PROPORTION

1 gal/acre	= 11.232 litres/ha	1 litre/ha	= 14.24 fluid oz/acre
1 lb/acre	= 1.120 kg/ha	1 kg/ha	= 14.5 oz avdp/acre
1 lb/sq in.	= 0.0702 kg/cm^2	1 kg/cm^2	= 14.227 lb/sq in.
1 bu/acre	= 0.898 hl/ha	1 hl/ha	= 1.112 bu/acre

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