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the winter persistence of prairie grass. It will persist for four to six years in Pennsylvania if properly managed. Forage quality of prairie grass compares well with other cool-season grasses but is more palatable.

Adapted varieties: "Matua" is the only cultivar of prairie grass that is currently sold in the United States. This variety was developed under New Zealand grazing conditions and has been very productive in Pennsylvania. Other prairie grass varieties are being evaluated for persistence and productivity by the USDA-Pasture Laboratory and Penn State; however, none of these varieties is marketed commercially in Pennsylvania at this time.

Grazing management: Prairiegrass is an ideal grass for grazing systems because of its potential for earlier spring grazing and its fall growth can effectively extend the grazing season by as much as two months over traditional cool-season grass species. Fall yields of nearly 3.5 tons/acre are possible. In addition, because seed heads are palatable, it is not necessary to mow them off to maintain animal intake as may be needed with other grasses. Yields of nearly 7 tons/acre have been achieved when harvesting prairie grass for silage.

Prairiegrass should not be cut or grazed below a 3-inch stubble height because regrowth energy reserves and buds for plant regrowth are contained in this portion of the plant.

In established prairiegrass stands, delaying the first spring grazing will reduce recovery rate and lower the yield potential of the next cutting. Under normal weather conditions, about 25 to 30 days of regrowth is sufficient between harvests. This period is a good balance between yield and quality of prairie grass. Generally, during this time, new shoots have developed at the base of the plant and harvesting or grazing will allow more light to reach the shoots and to stimulate their growth. An approximate

50-day growth period in mid-summer will allow the prairie grass seed heads to mature and drop seed during August which, in turn, will thicken the stand the following year.

Prairiegrass persists best when managed so that monthly harvests are made during the fall; spring yield and shoot density increase when multiple harvests are made in the fall. Harvesting only once in the fall (November) has caused 98 percent of the basal shoots (source for growth the following spring) to winter kill. However, when prairie grass was harvested or grazed three times during the fall only 35 percent of the basal shoots were winter killed. Compromise is needed with regard to fall harvesting because late fall grazing reduces slightly prairie grass vigor the following spring and restricts early spring grazing.

Adequate nitrogen fertilization is essential for maximizing prairie grass growth in the fall. Nitrogen applications of 50 lb/acre are recommended after each harvest and in early fall.

For more information about the production and management of prairie grass, refer to Prairie Grass, Penn State Agronomy Facts 39.

Forage brassicas: Brassicas are annual crops which continue to grow during the fall and into the winter. They are highly productive and digestible and contain relatively high levels of crude protein. They can be grazed 80 to 150 days after seeding, depending on the species and weather. In addition, some varieties lend themselves to stockpiling.

Species and varieties: Several brassica species can provide forage for grazing during the fall. These include:

- Kale — The stemless variety "Pre-

mier" has consistently survived winters in central Pennsylvania, whereas other varieties of kale usually have winter-killed in December.

- Rape — Growth of rape slows or ceases at maturity until leaves senesce and die.

Varieties differ in the time this occurs. For instance, "Rangi" rape retains its leaves longer than most varieties, which makes it more suitable for stockpiling and winter grazing than other rape varieties.

- Swede — The variety "Calder" has been cold hardy in central Pennsylvania and thus ideal for stockpiling for late-fall or early-winter grazing. However, in general, all swede varieties are recommended for late-fall grazing.

- Turnip or Turnip Hybrids — Pennsylvania studies have shown that "Forage Star" turnip is more cold tolerant and retains its leaves longer in the fall than other turnip varieties. Turnip can accumulate dry matter in October as fast as field corn does in August. Growing "out of season" (October and November) makes turnip a valuable crop for late fall grazing.

Grazing management: Proper grazing management is important to optimize the true potential of these crops. Strip grazing small areas of brassicas provides the most efficient utilization.

Rape is more easily managed for multiple (generally more than two) grazings than are the other brassica species. Approximately six to ten inches of stubble should remain after the first grazing of rape; this practice promotes rapid regrowth. Regrowth of rape may be grazed at four-week intervals. On the final grazing, the plants should be grazed close to ground level.

When turnips are grazed twice, the first grazing should remove only their tops. Turnip regrowth is initiated at the top of the root, so this part of the plant should not be removed until the second and final grazing. Like rape, regrowth of turnips can be sufficient to graze within four weeks of the first grazing.

Yield and nutritional value: Dry matter digestibility at maturity generally exceeds 90 percent for all plant parts except kale stems. Unlike perennial forage crops, the dry matter diges-

tibility of brassicas does not decrease markedly with increasing plant maturity. This characteristic makes them ideal for stockpiling. However, ruminant diets should not contain more than 75 percent brassica forage because the fiber content is too low for maintenance of proper rumen activity. With their high digestibility and low fiber content, brassicas actually should be considered as "concentrates" rather than "forage" in nutritional planning for livestock.

For more information about brassicas, refer to Use of Brassica Crops to Extend the Grazing Season, Penn State Agronomy Facts 33.

Small grains: The use of winter cereal crops such as wheat, barley, rye, or triticale can provide fall or early winter grazing opportunities. However, certain management practices need to be modified from what is normally done for grain production. When small grains are to be used for grazing, plant them three to four weeks earlier than for grain production. Increase the seeding rate to 3 bushels/acre and apply nitrogen at the rate of 40 pounds/acre at planting time.

If the small grains are being planted only for pasture (with no subsequent grain harvest), there may be some benefit to mixing small grains species. This has been beneficial in the south-east United States, where small grains pastures are quite common. Mixing species of rye, wheat, barley, or triticale can help extend the grazing period and reduce the tendency for a strong peak growth period in the spring.

Grazing management: With adequate fall moisture, grazing should be available from October through December and then again in early spring. One acre of properly fertilized and managed small grains should support one animal unit (1,000 lb animal) on a limited grazing basis.

Stocking rate and time of grazing will be somewhat determined by the intended use of the crop. If you are planning to take a silage or grain harvest, grazing should only be moderate. Heavy grazing can reduce grain yields. Moderate grazing in the fall will not result in significant silage or

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