CHOOSING PLANT INTRODUCTIONS: NEEDS OF GRAZIERS

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ABSTRACT

Forage plants introduced to Hawai'i have come from both temperate and tropical areas of the world. Although introduced species have changed the face of the landscape, they have often failed to provide long-term benefits to the livestock industry. Proper management of rangelands can result in increased livestock productivity and reduce the need for further introductions of forage plants.

Almost from the start of the cattle grazing industry, graziers in Hawai'i have been introducing new forage plants. Native Hawaiian grasses evolved without grazing pressure, so when subjected to ruminants and overgrazing, they soon made room for introduced species better adapted to grazing. Today it is difficult to find indigenous and endemic grasses in a sward or grassland. Alien plants have been introduced both intentionally and unintentionally, most flourishing for a number of years then decreasing and giving way to less palatable, and in a few cases hardier, plants.

As the early grazing industry needed improved varieties, it initially drew upon proven forage plants that were available from temperate areas. In general, these plants did not do well at lower elevations but improved the forage in the cooler regions of Hawai'i. It would be difficult to imagine what Mauna Kea would look like without sweet vernalgrass (*Anthoxanthum odoratum*), or what Ka'ū would be like without meadow ricegrass (*Ehrharta stipoides*) or kikuyu grass (*Pennisetum clandestinum*). They have become part of the landscape along with many other introduced plants.

In more recent times some of the forage plant introductions have come from tropical areas and are thus well adapted to the conditions in the lower and drier areas in Hawai'i. Some of the best examples of these highly adapted grasses are buffelgrass (*Cenchrus ciliaris*) in dry areas, and green panic (*Panicum maximum* var. *trichylum*) and Guinea grass (*Panicum maximum* var. *maximum*) in slightly wetter areas.

Many legumes have also found a new home in Hawai'i in the warmer areas. Koa haole *(Leucaena leucocephala)*, greenleaf desmodium (*Desmodium* sp.) and glycine (*Glycine wightii*) are examples of newer introductions. As a young boy G.C. recalls the bleak arid makai (seaward) areas in Ka'ū before koa haole and Guinea grass were introduced. However, Christmas berry (*Schinus terebinthifolius*) and common guava (*Psidium guajava*) had not spread as they have now.

THE NEED FOR PLANT INTRODUCTIONS

The present selection of forage plants is adequate for current grazing needs. However, the door should be kept open, with reasonable quarantine requirements, for new introductions. If a new introduction produces more forage than another plant, it usually requires more moisture, fertility or energy than a less productive plant. Some areas may still exist where a highly adapted introduction may prove superior in soil protection and forage by being perfectly adapted to the environment.

As desirable as it would be to have a new wonder forage available, we already have many available forage plants that will yield many times the present production through better grazing management. Any new introduction will require the same careful grazing management.

RANGE MANAGEMENT AND MISMANAGEMENT

"Overgrazing" is a term that needs to be better understood. When forage is grazed for more than a short period, the individual plant may be cropped more than once without a rest period to recover or recuperate. This is overgrazing. If this situation continues indefinitely, the desirable forage will be eaten off as it grows, reducing plant reserves and eventually killing the plant.

The more palatable the plant to livestock, the faster it will be eliminated from the sward with overgrazing. Overgrazing, then, allows the desirable palatable plant to be replaced by one less palatable. As time goes by, woody plants invade the sward, and plant succession proceeds into brushland, which in turn has a greater moisture requirement. If moisture is the limiting factor, the grasses and legumes will give way to brush. If moisture is not lacking, succession will continue into woodland. Change is very rapid in the tropics, where the seasons of the year are not well defined.

Humans have spent much time and money over the years to improve forage and ranges but have been failing miserably. Repeated investments have been made in new forage plants and land clearing, only to have swards degenerate to less desirable plants. Many crawling grasses (with stolons or rhizomes) are popular in Hawai'i today, as they can withstand longer periods of overgrazing before they give way to less palatable plants. Kikuyu grass is an excellent example of this; but with overgrazing such grasses also will regress. We have seen areas go from grassland to brush, and tree and

forest areas to savanna and grass, in our short lifetimes on Hawai'i Island. Rocky, dry areas may become very productive grasslands, and the perennial grasses may give way to annuals (or in wet areas to rank, unpalatable grasses). Examples of dramatic change are the spread of fountain grass (*Pennisetum setaceum*) on the western side of Hawai'i Island, and bush beardgrass (*Schizachyrium condensatum*) and broomsedge (*Andropogon virginicus*) on the eastern side. It is obvious that introductions of new species without adequate study and proper grazing management waste time and money; they can also be detrimental to the grazing industry. With adequate grazing management, new introductions become less important, as there are many plants already available from which to choose.

The intent of the grazier is to obtain food and fiber from an area with suitable forage. Pasture management, as with other businesses, is expected to be profitable. Land managers must establish goals for the landscape and expectations of profit, and then determine whether they are economically feasible. Environmental and human influences on successful pasture management can be viewed at several levels (Fig. 1).

RECYCLING AND GRAZING MANAGEMENT

Each plant and animal is adapted to a particular environment. Any change, even the slightest, will have an impact on all the rest of the environment. Nature controls recycling of nutrients in an area through selection of adapted plant and animal life. The goals of the grazier are achieved by taking advantage of and managing the process of recycling. Under a grazing program to maximize returns (profit), forage is utilized at its peak of nutrition as much as possible. At the same time, plant succession can be largely controlled by increasing or decreasing grazing pressure. Grazing pressure in any livestock management system is controlled by stock density (area and numbers), plus time of exposure. The rest period between grazing periods will favor certain plants if the interval is short, and others, if longer. Control of grazing can include many paddocks to prevent overgrazing (time control) yet maximize the animal impact through foraging, hoof action, and excrement on the soil. The New Zealand system of "flogging," which involves high densities of livestock in an area for a short time, is an extreme example of intensive livestock management used in Hawai'i. Use of different species of livestock to enhance productivity and plant control have rarely been attempted in Hawai'i because of logistical difficulties.

The use of browsing animals will control woody plants and will recycle minerals and energy that have been locked up in ungrazed grass or brush for a long time. Recycling can also be promoted with machinery, chemicals, or fire, but at a greater expense and less profit. The more rapid recycling of minerals and energy in an area, the better the quality of forage that results. Plants of higher nutritional value will increase in the sward as recycling increases. However, supplemental minerals must eventually be provided grazing stock to replace soil minerals removed over years of

grazing. All the supplements are not assimilated by the animals, and much is passed on to the ecosystem in the excrement.

In summary, through proper range management, livestock production can be more effective, thus eliminating the need to introduce new plants to Hawai'i. In extreme conditions, use of fire, chemical, and mechanical controls may be necessary to enhance management of grazing animals.

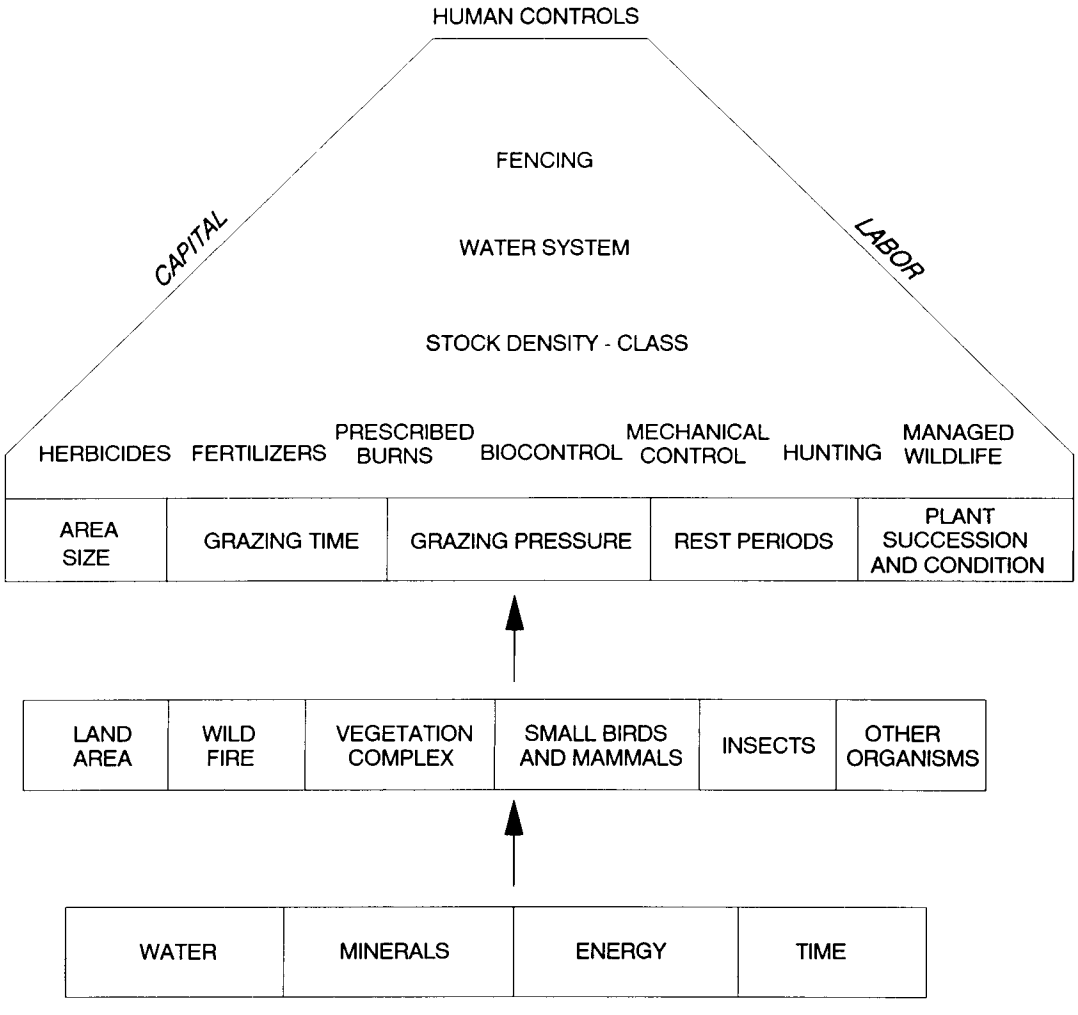

Figure 1. Interrelationships of environmental variables controlled and uncontrolled by humans in a grazing system.