Using Pasture 150+ Days/Year In North-Central Alberta

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Take Home Messages

- Pasture based dairy production is offering a paradigm shift in dairy that may be needed.
- The need to reduce external risks, as they may cause drastic rises in input costs, could be the main reason for the shift to grazing dairy cows.
- Holistic Resource Management is a perfect guiding tool in a shift to intensive grazing.
- One of the grazing practices that worldwide has the most detrimental impact on pasture production, water cycles, biodiversity and climate change is “overgrazing”!
- Although the shift to grazing will result in lower production per cow, overall performance is attractive due to significantly lower feed costs.
- Optimal pasture production requires minimal capital investment but a significant amount of intensive management.
- Managed Intensive Grazing gives a greater buffer against nutrient deficiencies and excesses and provides overall superior cow health benefits.
- Intensively grazing dairy cows will lead to more fluctuations in milk production on a daily basis compared to confinement systems; therefore there are extra challenges in managing daily production quota.
- Intensive grazing offers an opportunity to enhance Conjugated Linoleic Acid (CLA) content in milk to an extent that can not be matched by special supplementing rations in dry lot feeding systems and there are no extra costs to achieve it.

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▪ Introduction

Dairy production has seen unparalleled productivity and efficiency increases, per unit of labour as well as per cow, over the last 50 years. A paradigm of applying linear efficiency increases has been the modus operandi for research and development. Operations have grown large, management intensive, capital intensive and non-renewable fuel intensive. Relatively low fossil fuel prices have allowed efficiencies of scale to dictate automation and development. It is not just the equipment and operation of dairy farms that requires energy sources but the acquisition of fertilizers and grain concentrate also comes with large amounts of fuel use. In addition, large confinement dairy farms require more transportation of feed and manure to and from fields. Western agriculture requires multiple calories of fuel for every calorie of food that it produces (Manning, 2004 and Heinberg, 2005). On the eve of an era in which fossil fuels will be scarcer and in which a reduction of the environmental footprint, in terms of greenhouse gas emissions is needed, a paradigm shift for dairy production may be needed. Grass-based dairy production has the potential to significantly lower the use of fossil fuel. Even in times of low fossil fuel prices, better cow health, savings in feed concentrate and equipment operating expenses are easily offsetting the somewhat lower production per cow.

▪ Holistic Resource Management

In order to make the shift to pasture based dairy production successfully, the practice of Holistic Resource Management (HRM) will be very beneficial (Savory, 1988). HRM will prevent mistakes in general but it specifically prevents mistakes that have long range implications.

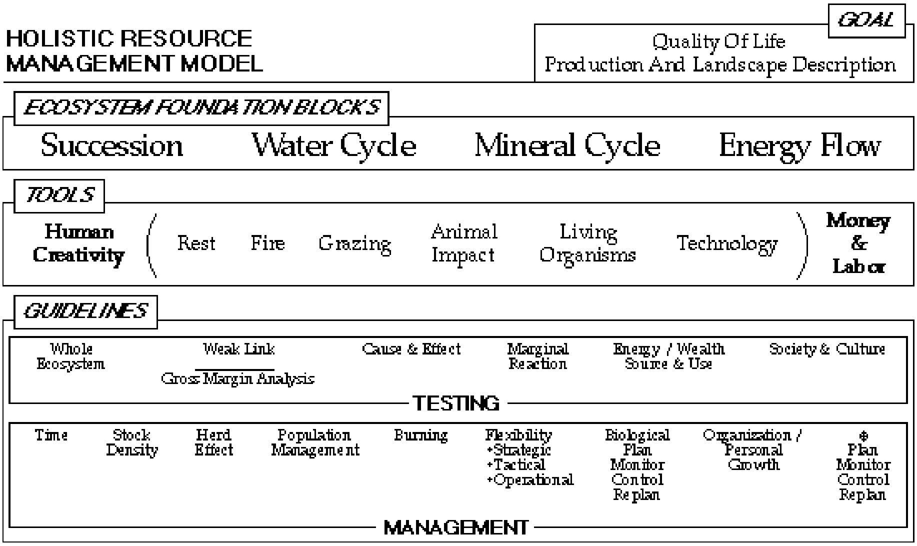

Figure 1: Holistic Resource Management Model (source: Savory 1988)

Before a plan can be implemented, several steps need to be taken in order to screen the plan to fit personal, family or perhaps community goals. Gauging the impact the plan has on the various ecosystem foundation blocks is the next large exercise. Succession is the process of how different animal impacts change the presence and complexity of plant species that make up the pasture or range. Intensive grazing, while respecting proper rest periods between grazings, enhances soil fertility and causes a shock penetration several times per year of growing and decaying root systems that allows for increased water infiltration over time. This subsurface ground water forms a buffer to carry the pasture through drought. This practice reduces surface runoff and enhances ground water buffer which, in turn, becomes a force against desertification. Intensive grazing enhances the cycling of nutrients and therefore grass productivity. Healthy root systems bring up nutrients from deeper soil layers. With respect to energy flow, the ideal is grazing an animal that produces a marketable product with negligible amounts of fossil fuel required. Grazing a dairy cow of which the milk is shipped immediately, basically achieves the perfect energy flow, as residual energy, in the form of manure, immediately feeds the next growth. In Figure 1, the tools and guidelines in the middle bars are used to access the impact of the plan. The lower bar provides management steps and practices that help in adjusting, altering, postponing or perhaps terminating the original plan.

■ Grass Productivity

In a study done by the Dutch agricultural extension service in the seventies, the effects of various management factors on net income of dairy farms were measured. Of the factors examined - herd health, feeding, breeding, housing, milk production per cow and/or per farm and pasture productivity - pasture productivity had the single greatest impact on income.

It is important to understand the dynamics of grass productivity on its own merit, as well as how it relates to various forms of animal impact through grazing. Everything we do to pasture influences succession, the mineral cycle, the water cycle and the total amount of solar energy we can direct harvest with cows in one sward as well as over time. In all environments, not just the most fragile ones, there is one grazing practice that has the most detrimental impact on pasture production, the water cycle, biodiversity and climate change and that is “overgrazing”!

Overgrazing is not what most people think it is, many animals grazing plants short or grazing it down close to the ground. The term for that is severe grazing. Exposing grazed pasture to re-grazing without a rest period is overgrazing, even when there are few animals around.

French scientist, Andre Voisin (Voisin, 1988) wrote the book “Grass Productivity”, in the early fifties, in which he analyzed the basic fundamentals of pasture, its species of grass and legumes, their productivity in relationship to animal impact and performance and management of both. Extensive practical research was done in the sixties and seventies by Dutch government research stations and farms about pasture productivity and dairy production. University of Missouri researchers, P.R Peterson and Jim Gerrish (Peterson and Gerrish, 2008) have done extensive work on nutrient cycling and grazing. All the above mentioned research can provide great tools to obtain the maximum benefits of grazing dairy cows in Alberta.

■ The Pasture Growth Curve And The Window Of Harvest For High Performing Animals

We recognize three phases in pasture growth.

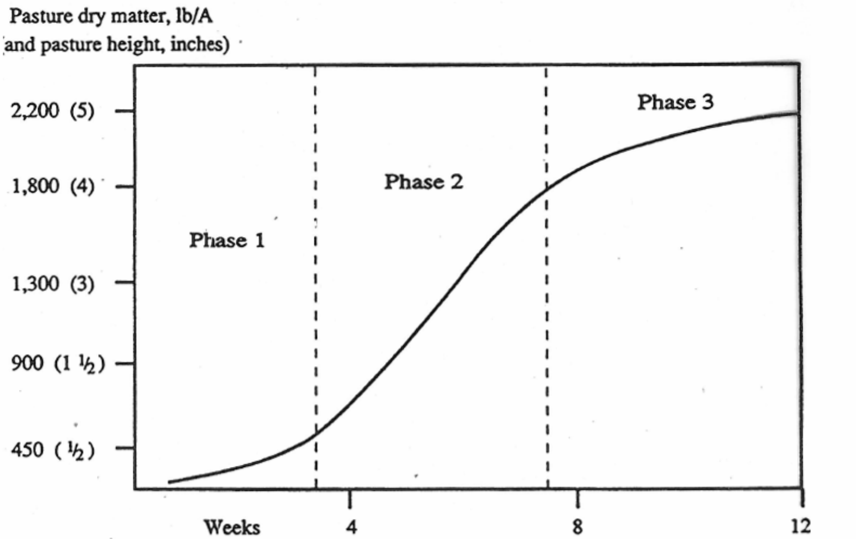

Figure 2: Rate of pasture regrowth after grazing (source: Grey Wooded Forage Association, 1993. See also New Zealand Ministry of Agriculture and Fisheries, 1983)

Phase one is the period after the grass is mechanically harvested or grazed. In this period, root energy reserves are initially used for re-growth until enough green leaves re-establish to replenish root reserves through photosynthesis.

Grazing in phase one is overgrazing. Phases one and two are the periods when the grass is highly palatable, fiber levels are low and digestible energy levels are high (high levels of sugar and starch). Phase two is the period in which grazing high performance animals is most successful. It is the optimum window of harvest. Later on in phase two, under ideal growing conditions, yields of dry matter per acre increase rapidly and the stage of diminished pasture dry matter intake sets in caused by the rapid increase in fiber content of the plants. Early on in phase three dry matter yield is increasing, but digestible energy density goes down. Sugar and starch make way for increasingly lignified fiber. Dry matter intake goes down drastically as time goes on (Figure 3).

Grazing brings more fluctuation in daily milk production and could bring extra challenges in managing daily production quotas.

▪ Soil Fertility And Its Influence On The Growth Curve

Fertile soils and good growth conditions are needed to make phase 2 as long as possible. Pastures under stress, from lack of moisture or lack of one or more nutrients, are quickly moving from phase 2 into phase 3 of the growth curve, making grazing them less desirable. The availability of nitrogen in particular is important to maximize the length of phase 2. Avoiding the use of chemical fertilizer only works if legumes are making up 20-30% of the canopy cover.

Compared to dry lot feeding, where feed analyses are used to balance rations for optimal milk production, grazing dairy cows is more complicated as adequate pasture analyses are lacking. The composition of pasture samples changes daily, so by the time lab results are received, cows are eating different grass already. Experience is the tool to assess fiber, energy and protein levels. In the best days of grazing one can match the milk production of ideal dry lot feeding. In a period with consecutive days of cloudy, rainy and otherwise good growing weather, plant growth might be good, but sugar and starch content of the forage is reduced, resulting in lower milk yields. Lower dry matter intake on rainy days may also be a factor resulting in reduced production. Lower feed cost however, even in these less than ideal conditions, makes grazing dairy cows very attractive.

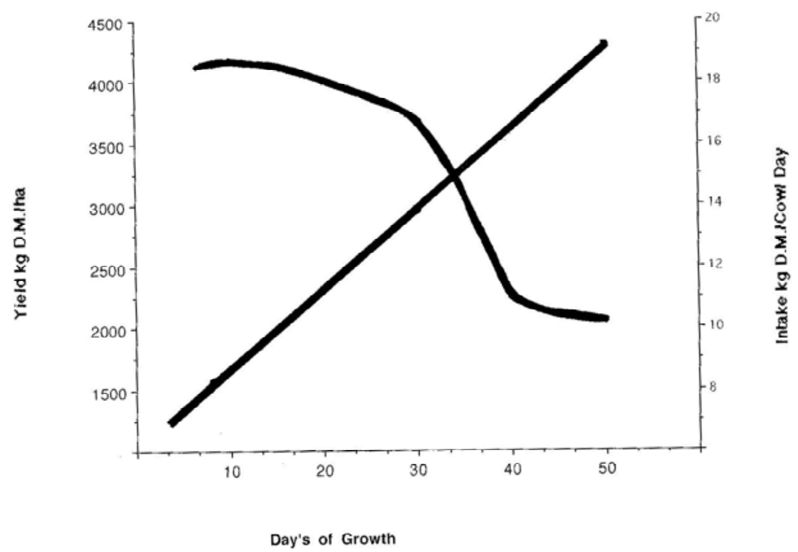

Figure 3: Dry matter yield and intake per cow vs. days of pasture growth (source: Grey Wooded Forage Association, 1993). Curved line = dry matter intake; straight line = dry matter yield.

Phase two is the ideal time for grazing as the low fiber content and the high digestible energy and protein content allow the cows to eat up to 25 kgs of dry matter per day, enough for about 25 kgs of milk production without concentrate. Mechanically harvesting phase 2 is too costly, as the yield per acre takes too many machinery hours for the total amount of feed harvested.

Note: It is important to first lower the amount of concentrate fed before turning cows onto highly palatable phase two pasture because fiber levels in the total diet will be too low and a wreck with left displaced abomasums and hoof ulcers can result!

Although the fiber content of phase two pasture is low, backing off on concentrate fed to start with while providing unlimited grazing will allow the cow to eat a lot more dry matter and will provide the total required amount of fiber.

▪ Palatability Of Pasture

It is important to aim for maximum palatability of pasture as dry matter intake is affected by it. Certain species of legumes and grasses are more palatable than others. When grazing within 4 weeks of a previous grazing, manure is not decomposed and high intake is only possible if more pasture area is made available per day and more pasture residue is tolerated. Under good growing conditions it takes 5-6 weeks for manure residue from a phase 2 grazing to be dissolved and be odour free. Mechanically harvesting a cut after one or two grazings enhances the palatability of the next grazing.

▪ The Solar Powered Combine

Grazing quality pasture with fiber content between 20 and 30% results in increased dry matter intake providing enough nutrition for about 25 kg milk per cow/day. In a dry lot feeding situation where high quality roughage is provided, that same cow would need at least 4 kg of concentrate to produce that amount of milk. Pasture provides energy concentration equivalent to grain from spring to fall. Therefore the dairy cow, metaphorically, becomes a solar powered combine, harvesting throughout the growing season and beyond.

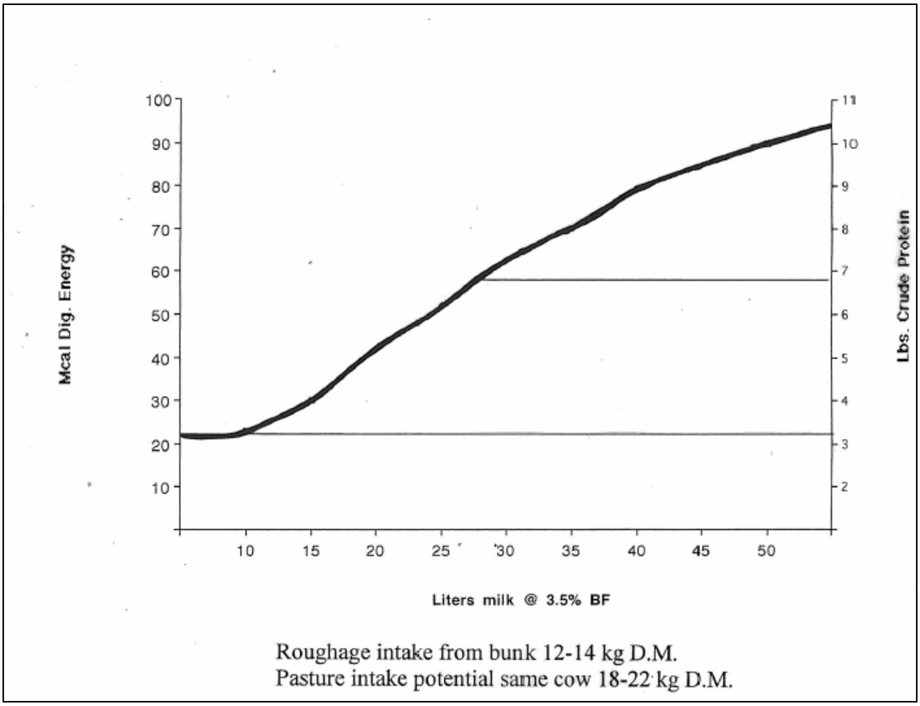

Figure 4: Cow energy and protein requirements to corresponding milk production (source: The Netherlands Department of Agriculture, 1983)

Figure 4 shows the nutrient intake needed for milk production. As the dry lot milk cow takes in enough nutrients from roughage for 10-15 kg of milk/day (area below the lower horizontal line in Figure 4), the pasture fed cow takes in enough nutrients from pasture alone for up to about 25 kg of milk per day (area below the upper horizontal line in Figure 4). The nutrients for milk production above the upper horizontal line need to be provided by concentrate for the grazing cow as well as for the cow in dry lot feeding.

▪ Planning For Availability Of Phase Two Pasture

Early spring growth, until June 20 in central Alberta, provides plenty of harvestable pasture for high performing animals. One of the trickiest jobs as a pasture manager in Alberta is planning the availability of phase two pasture from June 20 to July 15. That is the period in which the first cut is well into phase three and in which previous grazed fields have a tendency to go into seed setting, limiting the availability of leafy material. Grazing faster (by allowing more residue) is a way of getting high dry matter intake and thus high performance of the cows. From July 15 on, pasture that is re-grown from first cut mechanically harvested fields provides the ideal phase two material. Mechanically harvesting the pastures, left with more residue from the June 20 to July 15 period, in early August, leaves enough time for an ideal phase two to be established before dormancy sets in, in September.

Phase 2 material established before the plants go dormant can be harvested in the fall or winter, absence of snow permitting. Even stockpiling some of that phase two for next spring's supplemental grazing is possible in Alberta with its dry winters. Any pasture that has progressed into phase 3 needs to be set aside for mechanical harvesting or grazing with dry cows or yearlings. It is wise to be critical of any mechanical harvest after the tenth of August, as that potentially limits the availability of fall pasture.

▪ Grass And Legume Species

An ideal pasture has at least five species of grass and legumes in it, as multiple species better bridge the extreme conditions that one particular species suffers from while others survive easily. Climate, micro climate, annual rainfall differences, elevation or latitude, and different soils affect which grass or legume species will thrive in one area and not do so well in another. To limit or eliminate the use of nitrogen fertilizer a canopy cover of 20-30% legumes is necessary for harvesting good quality and high yielding phase 2 material. More legume cover may lead to bloat problems.

Species that do well in west central Alberta pastures are orchard grass, broom grass, blue grass, and tall fescue as grasses and red clover and alsike clover (three year stand), Dutch white clover, Cura white clover, alfalfa, birds foot trefoil, hairy vetch and milk vetch as legumes.

▪ Human Health Benefits From Consumption Of Pasture Derived Milk

Milk derived from pastured cows that are fed no more than 5-8 lbs of concentrate, contains Conjugated Linoleic Acid at levels that are up to 350% higher than from milk derived from cows in confinement systems. Higher levels of CLA in the human diet offer a wide range of health benefits (Robinson, 2000, 2002)

▪ Conclusion

Pasture based dairy production is a very viable alternative to confinement dairy production, for at least 150 days a year, in central Alberta. Managing a pasture based dairy is more challenging and requires a whole new set of skills. It also requires a different mindset, as the security of roughage analyses and a balancing concentrate ration make way for a journey on the waves of uncertainty about daily changing nutrient composition and palatability of pasture. The opportunity that grazing brings in terms of lower capital cost, lower fossil fuel use, improved animal health and overall improved quality of life for operators will make the shift for many producers a welcome one.

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