and T85 ground samples were, placed in nylon in situ bags, and ruminally incubated for 0, 6, 12, 24, 36, 48, and 72 h. The average in situ digestion for the times sampled(Table) was similar for digestion of DM (DMD), ADF (DADF), and NDF (DNDF), but digestion of CP (DCP) was higher for C than T85. Incubation time affected all variables (P < 0.01), and after data was centered (28.28 h), digestion rate/h increased linearly for DDM (+0.48 %/h), and decreased linearly at the same rate for DADF and DNDF (0.12 %/h). For DCP digestion, hay and time interacted (P < 0.01), and rate of digestion increased linearly for C (+0.100%/h), R (+0.098%/h) and T85(+0.137%/h). Steers had higher DMI and gains on C than R or T85 hays, but chemical composition and overall average digestion of the hays was similar. Results differ from studies in which cattle gains and digestibility were consistently higher for T85 than C hays and pasture forages.

Table 1.

Item	C	R	T85	SE	*P* <
Final BW, kg	268.3	254.3	255.3	1.74	0.05
ADG, kg	0.90	0.58	0.55	0.04	0.01
Hay DMI, kg	5.43	4.04	4.11	0.08	0.16
Total DMI, kg	8.37	7.01	12.05	0.10	0.20
DDM, %	42.7	37.3	38.2	2.02	0.17
DCP, %	16.5	16.2	15.8	0.19	0.02
DADF, %	39.7	40.3	41.4	0.60	0.18
DNDF, %	83.0	83.1	83.2	0.67	0.90

Key Words: Bermudagrass hay, In situ, Steer

Goat Species:Potential of Goats as Biological Agents to Produce Meat, Control Vegetation and Restore Land

56 Meat goat industry, an emerging animal-agriculture enterprise in the U.S. S. Solaiman*, *Tuskegee University*, *Tuskegee, AL*.

Goats are the most popular farm animals in the world, and goat meat and milk are the most consumed of all animal products. Goats are popular with small land holders because of their efficient conversion of feed into edible and high quality meat, milk and hide. Goats are also used as holistic tools for land vegetation management and fire fuel load control. With proper grazing management, goats can eliminate noxious weeds, restore native grasses and prevent fires through fuel load reduction. In the U.S., meat goat production has been gaining popularity in recent years particularly because of a growing population of ethnic and faith-based groups who consume goat meat. The national estimates, based on import data only, indicate that the U.S. is more than 500,000 head deficient in meeting current demands for goat meat. However, when the demand for goat meat is estimated based on increasing ethnic populations and faith-based consumers in the U.S., it far exceeds this number. Australia has been experiencing enormous growth in export of its goat meat, from about 2000 metric tones in 1999 to more than 8000 metric tones in 2004, and this has pressured Australian exporters to market their bush or feral goats to fulfill their existing contracts. This increase in demand of goat meat is also supported by the more than 19% increase in number of goat farms with over a 12% increase in the goat population from 1997-2002 in the U.S.; more-over, the number of farms selling goats increased by over 45%, and goat sales were up by more than 55%. Goat industry is in its infancy and is just like beef industry that was turned around when European breeds were imported to the U.S. For the industry to grow, Meat Goat Quality Assurance programs using Hazard Analysis Critical Control Points (HACCP) principals for pre- and post-harvest meat goats similar to those for beef, pork, and poultry must be developed to assure quality and uniformity of product. Meat goat industry is a new and emerging industry and it is an opportunity for U.S. animal agriculture to present another quality product to consumers.

Key Words: Emerging industry, Goat meat, U.S.

57 Nutritional quality assessment of browse for goats . W. Pittroff*, *University of California*, *Davis*.

Goats are classified as an intermediate ruminant feeding type, i.e. selecting a major proportion of their diet as browse. In recent years, the nutritional properties of browse for goats have received increased attention, for two reasons: (1) goats are recognized as an important element of the livelihoods of rural poor in developing countries, and (2) goats are emerging as the potentially most effective biocontrol agent for removal of fire fuel and invasive species biomass. In both cases, the major constraint to the more effective use of goats is the near total lack of knowledge about the specific nutritional and anti-nutritional properties of browse species. A cost effective solution to this problem is an in vitro method capable of providing solid data on ME concentration of browse species. The Hohenheim Gas Production Test, coupled with crude protein analysis, has proven to meet this requirement. A thorough discussion of the method and its application for the development of nutritional tables for the use of goats in fire fuel management in California is presented. This approach has the potential to serve as the method of choice for determination of nutritional quality of forage and browse species of low economic significance in cases where research budgets do not allow to perform exhaustive in vivo experiments. We further demonstrate the use of this method to assess the effects of nutritional and non-nutritional supplementation, and as a bioassay for tannins. Correlations between in vivo data on consumption and digestibility of tannin-rich browse with and without PEG supplementation clearly illustrate this capability. Further, the capability to infer rumen fermentation properties from the non-linear analysis of gas production profiles is emerging as a powerful tool to describe ruminant feedstuffs in a more differentiated manner, for example in regards to their potential impact on emission levels from livestock production.

Key Words: Gas test, Goats, Nutritional quality

58 Vegetation control using goats. S. Hart*, *Langston University*, *Langston, OK*.

Goats can be a valuable biological agent for brush and weed control, converting these unwanted plant materials into an income stream with minimal adverse impact on the environment. It is well established that goats can control a number of species of weeds and brush, however, there is a lack of knowledge on many specific plant species. The objective of brush or weed control is to overgraze (defoliate repeatedly before the plant can restore its carbohydrate reserves) the target species. Achieving this objective requires that the goat consume the target species. Predicting the species of plants that goats will consume is

complicated by the fact that goat dietary preferences are affected by previous animal experience, availability of alternative species, season of the year and the soil/environment that the plant is growing in. Therefore, information on goat dietary preferences may not apply to a specific case due to the aforementioned factors. Also, since plant preference is affected by season of year or stage of plant growth, the time of grazing can be important. However, if goats consume the target species, it is only a matter of time until the species is controlled because weeds and brush are not very tolerant of defoliation and require long rest periods to restore root carbohydrates. If goats do not consume the target species, animals which do consume the species may be brought in to train naive animals. Recent research shows that cattle may be trained to eat certain weeds and it may be possible to use similar techniques to train goats to consume the target species. We have observed goats consuming novel species when forage became limiting, but goats have also been observed to starve rather than eat some species. Goats may be more interested in a plant the second year they are exposed to it and research indicates progeny may consume more of a target species than their dams if availability is high when they are young. We have observed breed differences in the ability to graze. Goats consume many brushy and weedy species, but it takes good management to utilize this attribute effectively and profitably for weed and brush control.

Key Words: Behavior, Goats, Vegetation management

59 Utilization of goats for rejuvenation, reclamation and land cleaning. A. Peischel*, *Tennessee State University*, *Nashville*.

The goat is an extremely agile, gregarious and opportunistic creature. It is the ability of management, through innovation and creativity, to successfully use those characteristics for the enhancement of lands. The management goal encompasses use of all ecosystems, biological and environmental, with success centering on flexibility of management plans and the ability to re-plan. To accomplish this, biodiversity must be maintained, the physiology of plants and soil understood along with the ability of man to make environmental, economical and socially sound decisions. Goats, under control are being used to enhance land productivity and encourage vegetative biodiversity. Energy is universal and can be used, stored, concentrated or spread with the primary source being the sun. To use the natural energy flow efficiently, it is vital to control: the time of grazing/browsing, the area to be grazed/browsed, the season of grazing/browsing, the plant specie to be grazed/browsed and the goat(s) that are being used for land management. The use of goats in vegetative management takes on many diverse avenues. They can be used for: noxious weed abatement, rejuvenation of abandoned and eroded lands, edging back of woody and forb species, fire breaking and fuel load reduction, poisonous/toxic plant eradication and enhance timber producing forests through silvopasture and agroforestry techniques eliminating competition of unwanted species. Goats can stabilize stream banks and riparian areas, clean along irrigation ditches, minimize old fence lines, clear farm ponds and create flyways for ducks and geese along with landscaping around homes and land cleaning in citrus orchards, nut farms and vineyards. The management criterion is to never underestimate the nutritional value of plants and vegetative re-growth; encourage a change of regression plant communities into succession plant communities. Biodiversity provides year round selection for goats, avoiding problems such as those associated with monocultures. Goats provide mankind with meat/milk/fibre/skins; products to enhance our lives. The goat is truly an opportunity for man to manage.

Key Words: Goats, Land restoration, Vegetation management

Graduate Student Paper Competition: Northeastern ASAS/ADSA Graduate Competition

60 Milk production of dairy cows fed diets constant or varied in phosphorus content during lactation. J. Elizondo*[1], D. Beegle[1], J. Fergusson[2], and Z. Wu[1], [1]*Pennsylvania State University*, *University Park*, [2]*University of Pennsylvania*, *Kennett Square*.

The current NRC (2001) suggests that diets fed to dairy cows contain high concentrations of P during early lactation and low concentrations of P in late lactation based on milk production. Milk production response to diets containing constant or varied P concentrations during lactation was determined. Thirty multiparous Holsteins were blocked by mature equivalent milk yield and calving date, and assigned to one of three dietary treatments for complete lactation. For the first treatment, the diet was formulated to contain 0.36% P for the entire lactation (constant P, 0.36-0.36-0.36). Treatment 2 included 0.36% dietary P for 30 wk followed by 0.29% P during the last 14 wk (P changed once, 0.36-0.36-0.29). The third treatment consisted of 0.43% P for the first 10 wk, 0.36% P for the second 10 wk, and 0.29% P for the last 14 wk (P changed twice, 0.43-0.36-0.29). Milk yield and milk component production did not differ among treatments. Keeping dietary P concentration constant or varying the concentration once or twice during lactation did not affect milk production.

Acknowledgement: Sincere appreciation to Pennsylvania Department of Agriculture for funding (Award ME443245).

Table 1.

Item	0.36–0.36–0.36	0.36–0.36–0.29	0.43–0.36–0.29	SEM	Constant vs. varied P[1]	P changed once vs. twice[1]
Milk, kg/d	33.3	33.3	36.0	2.2	0.63	0.39
Fat, %	4.24	4.00	4.04	0.21	0.40	0.88
Fat, kg/d	1.454	1.390	1.491	0.086	0.91	0.41
Protein, %	3.08	3.12	3.08	0.05	0.85	0.56
Protein, kg/d	1.074	1.068	1.145	0.063	0.68	0.39
3.5% FCM, kg/d	38.8	37.6	40.5	2.2	0.94	0.35

[1]*P* values for contrasts.

Key Words: Phosphorus requirement , Dairy cows, Milk production