

file 87-11

SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION PROGRAM  
AND AGRICULTURE IN CONCERT WITH THE ENVIRONMENT

Format For Preparation of Annual/Final Reports

1. ANNUAL/FINAL REPORT: (Select one) 2. DATE OF REPORT: 19 December, 1992

3. PROJECT TITLE: Ruminant Animal Production using Tyfon forage Brassica

4. PROJECT STATUS: (for annual reports only)

Please check one of the following. The project is:

- New: receiving SARE or ACE funding for the first time.
- Continuation: no major change in direction or objectives.
- Renewal: project whose SARE or ACE funding was interrupted one or more funding cycles.
- Redirection: major revision of an earlier SARE or ACE project.
- Change Funding Source: from SARE to ACE or from ACE to SARE.

5. PROJECT COORDINATOR: (Name, affiliation, address, and telephone number of person responsible for writing this report)

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6. MAJOR PARTICIPANTS:\*  
no change

7. COOPERATORS:\*  
Ms. Mary Burr, unable to participate

8. GRANT NUMBER:

9. FUNDING PERIOD:\*

10. FUNDING TO DATE:\*

Organization	SARE or ACE Funding	Non-Federal Match Funds	Other Federal Match Funds
List all organizations			

11. ABSTRACTS:\* (Current overview of the project; up to one page)

12. OBJECTIVES:\*

\* List here only new information since your previous report or the project proposal. Write "no change" otherwise.

**13. PROJECT RESULTS:**

A. Findings: Be as concise as possible without diminishing the usefulness of the report. List findings and accomplishments for each objective in lay language, with brief comments as to why the results are significant scientifically or practically, or both. For studies that have reached the findings stages, please submit papers or articles released or published. For studies at earlier stages, describe the status of the work and indicate when major accomplishments are expected to be forthcoming. The final report should integrate and interpret the results of the entire project.

B. Case studies of model farms, on-farm demonstrations or integrated natural systems should be clearly described, including features such as soil types, acreage, topography, labor, machinery, weather, climate, irrigation, cropping history, proximity to markets, management practices used for soil fertility, weed and other pest control, and other attributes in sufficient detail to permit the reader to understand these locations and situations where this case study/landscape ecology might be applicable.

C. Economic Analysis: Summarize any results regarding financial costs, returns, and risks of adopting sustainable farming practices and systems. Describe the enterprise budgets, crop-rotation budgets, and whole-farm analysis already completed, those now being prepared, and those anticipated in the future. Indicate whether these data are presented in a format compatible with the Planetor/Budgetor budget generator and whole-farm planning system developed at the University of Minnesota, and give the location or source of these findings.

D. Dissemination of Findings: Describe plans (actions) for dissemination of findings, such as papers published in scientific journals, popular press, extension publications, bulletins or other written results; papers presented at meetings; conferences, workshops, field tours, videos/slidetape series, computer software, etc.

E. Producer Involvement (contacts/outreach) during the period of the report.

Number of farmers/ranchers in attendance at:

\_\_\_ Workshops    \_\_\_ Conferences    \_\_\_ Field Days  
 \_\_\_ Other events (specify) \_\_\_\_\_

**14. POTENTIAL CONTRIBUTIONS AND PRACTICAL APPLICATIONS:**

A. If findings of this study are widely adopted, what would be the potential production, social, economic and/or environmental impacts (eg. effects on pesticide loadings, soil erosion, water quality).

B. Identify any new hypotheses or alternative paradigms resulting from the project that have enriched the scientific basis of sustainable agriculture.

**15. AREAS NEEDING ADDITIONAL STUDY:** Identify any needs for new basic (fundamental) or applied (problem-solving) research.

### 13. PROJECT RESULTS:

#### A. Findings::

Effects of hay supplementation on feed intake and apparent digestibility of tyfon diets for lambs:

Five Dorset-cross wether lambs, approximately 5 months old, with an average initial weight of 32.8 kg were shorn and housed in individual metabolism crates during the experiment. The animals were given a 14 day period for diet adjustment before data collection. Dietary treatments (on a dry matter basis) were: 1) 100 % hay; 2) 75 % hay: 25 % tyfon; 3) 50 % hay: 50 % tyfon; 4) 25 % hay: 75 % tyfon; and 5) 100 % tyfon. Water and loose trace mineralized salt were available to lambs at all times. Hay was second cutting mixed-mostly grass hay that had been chopped. Tyfon was seeded 7 July 1989 and leaves and stems were harvested daily from 8 September to 22 December 1989, which corresponded to 63-168 days after planting. On 21 November, a foot of snow completely covered tyfon in the field. Snow cover and subfreezing temperatures continued through the rest of the experiment.

Jugular blood samples were collected at the end of each diet period and analyzed immediately after collection for packed cell volume, red blood cell count, hemoglobin concentration, and Heinz bodies. Blood was also analyzed for the thyroid hormones thyroxine and triiodothyronine. Feed, orts, and feces samples were analyzed for dry matter, ash, calcium, phosphorus, magnesium, crude protein, nitrate nitrogen, neutral detergent fiber, acid detergent fiber, and permanganate lignin.

This experiment did not demonstrate that hay supplementation increased total forage intake on tyfon-based diets. The relatively low quality of the hay used may have been a major factor in this because lambs preferred not to eat it. Lambs on 100 % tyfon diets were able to consume adequate amounts of dry matter to support expected growth rates despite the high water content of the brassica forage. Lambs that consumed diets containing more than 25 % tyfon did not require an external water source due to the high water intake from feed. Lambs did not develop anemia, impaired thyroid gland function, or diarrhea as a result of consuming high levels of tyfon. However, apparent digestibility values indicated that tyfon in the diet negatively affected the digestibility of fiber in a manner reminiscent of a concentrate. With feedlot diets, excessive consumption of concentrates can lead to problems with rumen acidosis and animals going off-feed because of rumen dysfunction. Therefore the primary beneficial effect of hay supplementation to brassica pastures may be its provision of extra fiber to stabilize rumen fermentation. Although that fermentation of that fiber itself is depressed, its presence may slow down rumen turnover time or allow better utilization of dietary protein or soluble carbohydrates.

Evaluation of milk from dairy cows consuming tyfon forage

Seven holstein dairy cows averaging 165 days in milk and producing an average of

62 lb of 3.5% fat milk daily were used during the four week trial. Each cow was housed in a tie stall where daily individual intake could be monitored. Cows were fed a total mixed ration *ad libitum* (Table 1). The forage portion of the ration was a 50:50 mix (on a dry matter basis) of corn silage and grass (small amount of legume) silage. The ration was a 60:40 forage to concentrate mix on a dry matter basis. Tyfon was collected fresh each day by cutting off the plant at approximately 5 inches above the soil surface. No roots or weeds were fed to the cattle. The composition of the tyfon is found in Table 1. The cows were allowed to adjust to the tyfon-based diet prior to data collection.

Milk was collected from the cows offered an *ad libitum* consumption of fresh tyfon for an hour period starting at either three, six, nine, or twelve hours prior to milking. At the end of the hour all tyfon not consumed was removed from the feed bunk. As a control, milk was collected from cows being fed the same basal ration without tyfon. The three and six hour time points and the nine and twelve hour time points were collected on separate days. Each cow's milk was collected separately from a weigh jar with a subsample taken for fat analyses. Milk was batch pasteurized prior to the evaluation.

Two sensory tests were conducted to determine the effect of feeding *Brassica* on the flavor of cow's milk. The first test included samples of the three and six hour milkings as compared to a control. Nine and twelve hour milkings were compared to a control during the second evaluation. Five two-liter batches of each sample were autoclaved at 110°C for 30 seconds, the milk comingled, poured into plastic gallon jugs and pasteurized at 4°C for 24 hours. The following day samples were presented at room temperature in a randomized complete block design with four replications. The panelists were instructed to compare the flavor of the coded samples to a labeled standard which was also included as one of the coded samples. A three point rating scale with scores of +1 "better than", 0 "equal to", and -1 "poorer than", was used to evaluate the flavor. The flavor means for the sensory scores of the milk are shown in Tables 2 and 3. No significant flavor differences were found in the milk samples from cows fed tyfon (*Brassica*) when compared to a control sample.

Table 1. Average Composition of total mixed ration and tyfon over the four week of trial.

Component	Basal Total Mixed Ration	Tyfon	Basal Tyfon
Dry Matter, %	38.2	8.3	31.5
Crude Protein, %	16.3	19.0	17.25
Acid Detergent Fiber, %	24.4	25.0	23.3
Net Energy, Mcal/lb	0.70	0.67	0.71
Calcium, %	0.71	1.79	0.81
Phosphorus, %	0.40	0.65	0.25
Magnesium, %	0.24	0.29	0.42

Table 2. Flavor evaluation of milk from cows fed Brassica. Three and six hour milkings were compared to the control.

Treatment	Flavor mean <sup>1,2</sup>
Control	-0.08
3 hour brassica	-0.14 ns <sup>3</sup>
6 hour brassica	-0.14 ns
LSD (0.05)	0.21

<sup>1</sup> Mean of 16 judges, 4 replications

Table 3. Flavor evaluation of milk from cows fed Brassica. Nine and twelve hour milkings were compared to the control.

Treatment	Flavor mean <sup>1,2</sup>
Control	0.04
9 hour brassica	0.13 ns <sup>3</sup>
12 hour brassica	0.02 ns
LSD (0.05)	0.22

<sup>1</sup> Mean of 14 judges, 4 replications

<sup>2</sup> 1 = "Better than the standard", 0 = "Equal to the standard", -1 = "Poorer than the standard"

<sup>3</sup> not significantly different from the control at  $P < 0.05$ .

#### Finishing lambs on *Brassica*/perennial ryegrass.

A grazing trial was conducted during the 1989 and 1990 grazing seasons at the University of Maine Smith Farm in Stillwater, Maine to compare lamb production on a grass/legume pasture supplemented with Tyfon/perennial ryegrass to lamb production on a grass/legume pasture. Treatments consisted of:

- 1) An existing grass/legume pasture was rotationally managed for the entire grazing season. Lambs were turned onto pasture on 26 May in 1989 and on 21 May 1990 and continued to graze for 140 and 150 days, respectively. Grazing was stopped when all forage had been consumed.
- 2) A late spring seeding of Tyfon/perennial ryegrass (cv. 'Bastion') with multiple grazings. The lambs began grazing the rotational managed grass/legume pasture on 26 May 1989 and 21 May 1990. The lambs grazed the grass/legume pasture for the next 81 days in 1989 and 95 days in 1990. After an adjustment period, lambs were then moved into the Tyfon/perennial ryegrass pasture on 15 August (62 days after planting) in 1989 and 24 August (63 days after planting) in 1990 and continue to graze 34 days and 40 days, respectively. These lambs were then returned to grass/legume pasture and rotationally grazed for 24 days in 1989 and 36 days in 1990. Lambs grazed the regrowth of the late spring seeded Tyfon/perennial ryegrass. In 1989 ewes grazed the Tyfon/perennial ryegrass for 21 days between 12 October and 2 November while rams were fed hay on a grass yard, then the rams grazed the Tyfon/perennial ryegrass regrowth for 18 days between 2 November and 20 November while ewes were fed hay on a grass yard. In 1990 ewes and wethers grazed the Tyfon/ryegrass regrowth for 25 days between 8 November and 3 December. Lambs grazed on this regrowth until all the forage had been grazed or snowfall limited the ability to graze.
- 3) A late summer seeding of Tyfon/perennial ryegrass with a single fall grazing. Lambs started the grazing season on 26 May 1989 and 21 May 1990. These lambs grazed on the rotationally managed grass/legume pasture for 139 days in 1989 and 143 days in 1990. In 1989 ewes grazed the Tyfon/perennial ryegrass (62 days after planting) for 21 days between 12 October and 2 November while rams were fed hay on a grass yard, then rams grazed the Tyfon/perennial ryegrass between 2 November and 20 November while ewes fed on hay of the grass yard. In 1990 ewes and wethers grazed the Tyfon/perennial ryegrass (60 days after planting) regrowth for 36 days between 11 October and 16 November. Grazing was terminated when forage was completely consumed or snowfall limited the ability to graze.

The grass/legume pasture consisted mainly of Timothy, white clover and alfalfa. Minor amounts of other broadleaf and grass species were present. All treatments were strip grazed by sheep. A back fence was used to prevent grazing of regrowth. Supplemental trace minerals and salt in a block form was provided when lambs were grazing. Fresh water was available daily. Tyfon/perennial ryegrass plots were uniformly fertilized with 112 kg ha<sup>-1</sup> of nitrogen, 34 kg ha<sup>-1</sup> of phosphorus and 65 kg ha<sup>-1</sup> of potassium and seeded at the rate of 3.9 kg ha<sup>-1</sup> and 16.8 kg ha<sup>-1</sup>, respectively. A cultipacker seeder was used to plant the Tyfon in both years. A cyclone seeder was used to plant the perennial ryegrass in 1989; the perennial ryegrass was seeded with the Tyfon in the cultipacker in 1990. The late spring seedings of Tyfon/perennial ryegrass were seeded on 14 June 1989 and 22 June 1990. The late summer seeding of Tyfon/perennial ryegrass was seeded on 11 August 1989 and 10 August 1990.

In 1989 and 1990, the average daily gain (ADG) for the three treatments were not significantly different for the grazing periods when all the lambs were grazing the grass/legume pasture. The ADG values for lambs grazing the initial growth of the early

seeded tyfon/perennial ryegrass pasture was not different from the ADG values of the lambs on the grass/legume pasture (0.17 kg/day vs. 0.16 kg/day, respectively). In 1989, the ADG values for the lambs grazing the regrowth (of the early seeded tyfon) were different from the lambs on the traditional pasture for only the first 21 days during the 39 day grazing period. The lambs grazing the initial herbage of the late summer seeded pasture gained significantly more than the lambs consuming hay (0.21 kg/day versus -0.01 kg/day, respectively). In 1990, the ADG for the lambs consuming hay (from the traditional pasture) was not calculated. The ADG values for the lambs grazing the tyfon/p. ryegrass regrowth was 0.18 kg/day which was statistically different from zero. The lambs grazing the initial herbage of the late summer seeded tyfon pasture were gaining 0.36 kg/day, which was statistically different from zero.

In 1989, the number of grazing days was 140 for the control lambs grazing on grass/legume pasture and 180 for both the single and double grazing of Tyfon/perennial ryegrass. An early season snowstorm on 21 November ceased grazing on the tyfon pastures. In 1990, the number of grazing days was 178 for the control lambs grazing on grass/legume pasture, 186 for lambs on a single grazing or Tyfon/perennial ryegrass and 203 days for the lambs on a double grazing of Tyfon/perennial ryegrass. The additional grazing days would result in an reduction of costs for the purchase of feed, purchase/harvest of hay, barn maintenance, and manure handling. The additional costs of tyfon and perennial ryegrass seed and fertilizer may or may not offset the additional savings. It would depend if the livestock producer bills the costs to the tyfon pasture or to the renovation of the pasture the following year.

#### D. Dissemination of Findings:

Findings from these projects have been disseminated to Extension and Soil Conservation Service personnel. Findings have also been disseminated through field days (two), a paper presentation, guest talks at various farmer meetings. Three scientific papers are in preparation. Two of the objectives were part of two graduate student theses.

#### E. Producer Involvement:

Number of farmers in attendance at:	
Field days	200
Organizational meetings	50

### 14. POTENTIAL CONTRIBUTIONS AND PRACTICAL APPLICATIONS:

A. The findings demonstrate that adequate lamb growth can be maintained on tyfon

pastures in the fall after the traditional grass/legume pasture has become dormant. The additional cost of establishing a tyfon pasture could be offset with the reduction in cost of purchased feeds, cost of purchasing or mechanically harvesting hay that would be consumed prior to snowfall, cost of barn maintenance, and the cost of manure handling. It has been reported that animals housed indoors are less healthy than those left outdoors.

Sheep farmers and some beef farmers are very keen on using tyfon pastures to extend their grazing season. In the past dairy farmers have been reluctant to use the lush fall herbage of tyfon in fear of tainted milk. However, our findings suggest that there is no difference between the flavor of milk from cows consuming tyfon and milk from cows consuming a traditional silage/grain diet.

B. The digestion trial results provide further evidence that the nutritive composition and fermentative characteristics of tyfon classify it as a high moisture concentrate rather than a forage. Therefore, the tyfon pastures will have to be managed differently than a traditional pasture.

#### 15. AREAS NEEDING ADDITIONAL STUDY:

More information is needed regarding the grazing management of tyfon because of its characteristics as a concentrate. Because the consumption of tyfon does not taint the milk, there is a need to investigate milk production from cows on a tyfon diet. Unfortunately, our feeding trial results did not provide a complete economic analysis of the use of tyfon pastures during the summer and fall months.

#### PUBLISHED ABSTRACTS:

Cassida, K.A., B.A. Barton, M.H. Wiedenhoef, R.L. Hough, and A.C. Thompson, Jr.  
1992. Effects of hay supplementation on feed intake and apparent digestibility of tyfon diets for lambs. *J. Anim. Sci.* 70 (Suppl. 1):304 (abstr.).

#### JOURNAL ARTICLES IN PREPARATION:

Cassida, K.A., B.A. Barton, M.H. Wiedenhoef, R.L. Hough, and K. Guillard. Effects of hay supplementation on feed intake and apparent digestibility of tyfon diets for lambs. *J. Anim. Sci.* (to be submitted 1 February, 1993).

Barton, B.A. and M.H. Wiedenhoef. The influence of Brassica forage on milk flavor. *J. Sust. Agric.* (to be submitted 1 February, 1993).



Jones, C.R., M.H. Wiedenhoft, and B.A. Barton. Forage Brassica (cv. 'Tyfon') management strategies for lamb production. J. Prod. Agric. (to be submitted 1 May, 1993).

#### FIELD DAYS:

Sustainable Agriculture Program Field Day, 8 August, 1989 and 2 August, 1990

#### GRADUATE THESES:

Cassida, K.A. 1992. Forage Brassicas in sheep production systems in the Northeastern U.S.A. Dissertation.

Jones, C.R. 1993. Management strategies for lamb production using Brassica/perennial ryegrass pastures. Thesis.

### 13. PROJECT RESULTS:

#### A. Findings:

No-till establishment without herbicides and N requirements in these seedings:

In only one of four site-years was no-till establishment of tyfon successful without herbicides. At the Storrs location, unusually heavy precipitation in late July-early August in 1989 and 1990 prevented proper grazing management of sheep for vegetation control prior to no-till seeding; the experimental fields were water logged and would not support mob-stock grazing. When weather conditions cleared, the seeding date was past that for optimum tyfon growth (as determined by previous research). Tyfon was successfully established only after herbicide (glyphosate) application. Because of this, emphasis at the Storrs location was directed toward animal performance experiments.

Results of no-till seeding without herbicides in 1989 were rated as good at the Sugar Hill location. Excellent germination and seedling populations of tyfon were obtained. Grazing of tyfon seedlings by Canada geese, however, limited information on the replicated N rate experiment at this site in 1989. It was possible that the small white plot markers attracted the geese; geese grazing was mainly restricted to within the experimental area enclosed by plot markers (20 x 187 feet) out of an entire 5 acre field. Useful data collected from this portion of the project indicated that immobilization of nitrogen from the unkilld, grazed sod appeared to limit nitrogen availability to tyfon under these conditions. Consequently, tyfon responded most favorably to 75 lbs N per acre when applied broadcast. Immobilization of N by the living sod probably limited tyfon response in those plots that did not receive supplemental N fertilizer. A nitrate soil test (similar to the "June Nitrate Test" for corn) taken two-weeks after tyfon seeding (early-August) indicated that soil nitrate-N concentrations of 20 ppm or greater resulted in best tyfon growth under these seeding methods. Conditioning of ewes flushed on tyfon grown under these establishment procedures was rated high by the cooperating farm manager. Tyfon completely failed to establish in 1990 at Sugar Hill because existing vegetation was not grazed properly prior to seeding.

Although this portion of the project was fraught with problems, establishing tyfon via no-tillage without herbicides can be accomplished. Precise grazing management prior to and immediately after seeding, however, is absolutely essential. The only successful establishment using this method was obtained when the vegetation was mob-grazed down to one-quarter inch or less, tyfon seeded, then heavy grazing allowed to continue in the seeded areas until tyfon seedlings were visible. The cooperating farm was reluctant to graze following these guidelines in the second year due to concerns with loss of animal conditioning. Apparently mob-grazed animals lost some condition under these circumstances in 1989.

Thyroid hormone metabolism of ewe lambs grazed on tyfon:

Weight gains and thyroid hormone activity of lambs grazing tyfon were measured and compared to lambs raised with a more traditional feedlot regime. Ewe lambs were grazed on tyfon for 39 and 56 days in the autumn of 1989 and 1990, respectively. Biweekly weights and blood serum samples were obtained from both tyfon-fed and feedlot animals. Blood serum samples were analyzed for concentrations of triiodothyronine ( $T_3$ ). Results indicated that tyfon-fed lambs initially lost weight but showed weight increases after approximately 14 d on feed. In both years no net weight gains were observed for tyfon-fed animals; final average weights were lower than weights recorded at the start of the experiment. Steady weight gains were recorded for the feedlot animals. Final weight gains were greater for the feedlot animals than for weights gains from the tyfon-fed lambs in both years. Concentrations of  $T_3$  were significantly greater for the tyfon-fed lambs at 17 and 28 d of grazing as compared to concentrations of  $T_3$  from the feedlot-fed animals in 1989 and 1990, respectively. The overall response curves in both 1989 and 1990 showed a drop in  $T_3$  concentrations in the tyfon-fed lambs after approximately 28 days on feed. This may indicate that a slight negative effect on thyroid hormone activity may have been initiated at this

time. Concentrations of T<sub>3</sub> in the tyfon-fed lambs, however, were never lower than T<sub>3</sub> concentrations obtained from the feedlot-fed lambs. The results suggest that no impaired thyroid hormone activity would occur in lambs grazing tyfon for at least 56 days.

Brassica digestion rate estimations using in vitro techniques:

It has been documented that brassicas are low-fiber, highly-digestible forages. There is limited information, however, on the rate of digestion in animals consuming this type of forage. Determination of rates of digestion would help producers design adequate feeding rations to maximize feed efficiency based on rate of digestion and rate of passage of particular feeds.

Samples from summer- and autumn-grown tyfon, rape, kale, turnip and swede were incubated in rumen fluid for varying times up to 72 hours. Digestibility of the herbage at each time period for each brassica was then determined. Early-cut orchardgrass hay was digested in the same manner and used for comparative purposes. Results indicated that all brassicas had higher digestibility values at every time period as compared to orchardgrass. The autumn-grown brassicas reached a higher digestion at 24 hours than the summer-grown species. Over both growing periods, digestion for the brassicas reached a maximum at 36 hours. Average maximum digestion values for summer- and autumn-grown brassicas were 88.6 and 84.7%, respectively. In comparison, early-cut orchardgrass hay digestibility reached only 68.7% at the same time period. Overall, the results indicate that digestion of brassica herbage is rapid and higher compared to commonly used grass forages. This suggests that brassicas should be treated as concentrate feeds rather than as forages.

#### D. Dissemination of Findings:

Findings from the project have been disseminated through popular press articles (four), a symposium held at the Storrs location, a field day at the Sugar Hill location, and two papers presented at scientific conferences. In addition, at least two scientific papers are in preparation.

#### E. Producer Involvement:

Number of farmers in attendance at:

Symposium	100
Field Tour	75
Conferences	10

#### POTENTIAL CONTRIBUTIONS AND PRACTICAL APPLICATIONS:

A. As a sustainable practice, the establishment of tyfon via no-tillage without herbicides has some merits: no herbicides are used, there is a low potential for soil erosion, there is an extension of the grazing season which reduces the need for off-farm purchased feeds, and the nitrogen requirements of tyfon may be predicted using a soil nitrate test. Reducing the needs for herbicides will decrease the potential for groundwater contamination from pesticides. Decreasing the reliance on purchased feeds will help to reduce operation feeding costs. Predicting the nitrogen needs of the crop will help to reduce over fertilization with nitrogen-containing fertilizers, thus reducing nitrate losses out of the system. Drawbacks of the systems as a sustainable practice include: precise grazing management essential, moderately high rates of nitrogen fertilizer probably will be required for optimal tyfon yields, and lastly, access to a no-till drill will be required.

The results from the tyfon grazing trial suggest that little or no negative effects on thyroid hormone activity would be observed in lambs grazing tyfon for at least 56 days. Weight gains, however, were less than those obtained from a traditional feedlot feeding regime. From a sustainable perspective, tyfon could be utilized as an on-farm resource which extends the grazing season. Consequently, the potential exists for reducing the need for purchased feeds which in turn

could help to reduce operating costs. Weight gains, however, were less than desirable for finishing lambs. As a maintenance feed, tyfon could be used advantageously.

The findings of the digestion rate study help to explain the results of previous animal grazing trials that we have conducted with brassicas. In those previous studies, animals receiving a total brassica diet quickly displayed diarrhea symptoms and loss of weight. Because of the rapid digestion of these forages, rate of passage is probably rapid, resulting in lower feed-use efficiency. The addition of coarse hay to the diet has helped to reduce the rate of passage and improve feed-use efficiency. The optimum brassica:hay ratio has been determined in another portion of this overall project.

#### 15. AREAS NEEDING ADDITIONAL STUDY:

More information is needed pertaining to grazing management before and following no-till seeding. Optimum grazing height of the sward and grazing frequency of sod regrowth need to be more clearly defined before no-till establishment of tyfon without herbicides can be recommended as an alternative practice.

More testing is needed to further refine and adopt the soil nitrate test to tyfon N requirements in these situations.

Additional grazing studies are needed to determine long-term feeding (greater than 56 days) effects of tyfon on thyroid hormone activity, reproductive functions, and overall conditioning.

#### PUBLISHED ARTICLES AND PRESENTATIONS RELATED TO PROJECT:

##### POPULAR PRESS ARTICLES:

Hybrid Plant may change farming future. Brenda Sullivan Tolland County Times, p. 23. March 1, 1990.

Kura clover and Tyfon. Forage crops for the future? Bud Gavit, New England Farmer, May 1990 pp. 10-13.

Southern New England Sheep Symposium Considers No-till establishment of Brassicas. New England Country Folks. Section A, p. 4. November 5, 1990.

Natural Market Lamb. The Future Looks Sweet at Sugar Hill Farm. Shirley Ferris. American Agriculturist. pp. 22-33. September 1991.

##### CONFERENCE ABSTRACTS AND PRESENTATIONS:

Specht, S.M., K. Guillard, R.L. Hough, and D.W. Allinson. 1990. Extent of forage brassica digestion with varying IVDMD incubation times. American Society of Animal Science Abstracts. J. Anim. Sci. 68 (supplement 1):589.

Management and sheep performance of no-till established tyfon without herbicides. Seventh Annual Symposium on Ecological Agriculture. Cornell University, Ithaca, NY. 10 March, 1990.

Extending the grazing season into December and beyond. Southern New England Sheep Symposium. University of Connecticut, Storrs, CT. 27 October, 1990.

##### FIELD DAY:

Sugar Hill Farm. No-till establishment of tyfon. Saturday, Oct. 21, 1989.

**MIMEO:**

Guillard, K., L.A. Malkus, and D. Albert. No-till establishment of brassicas without herbicides at Sugar Hill Farm, Colebrook, CT. University of Connecticut, Department of Plant Science mimeo distributed to farmers at the Sugar Hill Field Day.

**SCIENTIFIC ARTICLES IN PREPARATION:**

Guillard, K., S.M. Specht, R.L. Hough, D.W. Allinson, and L.A. Malkus. In Vitro Digestion rates of Brassicas. To be submitted to Anim Sci?

Thyroid hormone stuff-joint data from UConn and UMaine. I'm not taking the lead on this one so I don't know what the title will be or to where it is tentatively to be submitted..