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Rotation Grazing Demonstrations With Beef Cows on HEL - Adams County Conservation Reserve Program (CRP) Project

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Abstract
Two grazing systems were demonstrated on Conservation Reserve Program (CRP) land in southwestern Iowa near Corning in the summers of 1991, 1992, 1993, 1994, and 1995. This report summarizes the 1995 data and compares them to results from the four previous years. The systems, a 13-paddock intensive-rotational grazing system and a 4-paddock more traditional rotation, both established in 1991, are aimed at showing economically sustainable grass alternatives for steeply sloping (9-14% slope), highly erodible land (HEL) once the 10-year CRP ends. In a 147-day grazing season in 1995, nursing crossbred calves with no creep gained 2.36 pounds and 2.38 pounds per day on the 13- and 4-paddock systems, respectively. The rotations were stocked at 1.65 acres per cow-calf pair on the 13-paddock system and 1.72 acres per pair on the 4-paddock system. This produced 210.2 pounds of calf gain per acre on the 13-paddock system and 203.2 pounds of calf gain per acre on the 4- paddock system.. Similar calves gained 2.37 pounds and 2.50 pounds per day for 155 days, yielding a total gain per acre of 222.7 pounds on the 13-paddock system and 224.9 pounds on the 4-paddock system in 1994. Results for 1992 remain the highest from both systems in the five years of grazing, with calf gain per head per day at 2.45 for 155 days netting 241.9 pounds per acre on the 13- paddock system and calf gain per head per day at 2.38 for 154 days on the 4-paddock system yielding 263.6 pounds per acre. Cows maintained both their weight and condition scores in both systems again in 1995. A third system, the 18-paddock intensive-rotational grazing system, was stocked with stocker steers in 1995, and the results are reported in a second article in the 1996 ISU Beef Research Report entitled "Intensive- Rotational Grazing Steers on Highly Erodible Land at the Adams County CRP Project." Concerning grazing management, paddocks were grazed four, five, or six times in the 13-paddock intensive- rotational grazing system during the 147-day grazing season of 1995. This number of times grazed per paddock was nearly equal to times grazed per paddock in 1994. However, several paddocks were subdivided temporarily to equalize paddock size and increase grazing uniformity. This increased the total number of cattle moves in the 13-paddock system from 78 in 1994 to 109 in 1995. The average length of stay on each paddock or subdivision of a paddock per grazing time was 1 to 2.2 days. This was less than in any of the other four grazing years in this project. The principle of not grazing more than half the standing forage during any one grazing period was closely followed in 1995. All paddocks in the 13-paddock system were also rested approximately the recommended 30 days between each grazing cycle in 1995.

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Summary

Two grazing systems were demonstrated on Conservation Reserve Program (CRP) land in southwestern Iowa near Corning in the summers of 1991, 1992, 1993, 1994, and 1995. This report summarizes the 1995 data and compares them to results from the four previous years. The systems, a 13-paddock intensive-rotational grazing system and a 4-paddock more traditional rotation, both established in 1991, are aimed at showing economically sustainable grass alternatives for steeply sloping (9-14% slope), highly erodible land (HEL) once the 10-year CRP ends.

In a 147-day grazing season in 1995, nursing crossbred calves with no creep gained 2.36 pounds and 2.38 pounds per day on the 13- and 4-paddock systems, respectively. The rotations were stocked at 1.65 acres per cow-calf pair on the 13-paddock system and 1.72 acres per pair on the 4-paddock system. This produced 210.2 pounds of calf gain per acre on the 13-paddock system and 203.2 pounds of calf gain per acre on the 4-paddock system.. Similar calves gained 2.37 pounds and 2.50 pounds per day for 155 days, yielding a total gain per acre of 222.7 pounds on the 13-paddock system and 224.9 pounds on the 4-paddock system in 1994. Results for 1992 remain the highest from both systems in the five years of grazing, with calf gain per head per day at 2.45 for 155 days netting 241.9 pounds per acre on the 13-paddock system and calf gain per head per day at 2.38 for 154 days on the 4-paddock system yielding 263.6 pounds per acre. Cows maintained both their weight and condition scores in both systems again in 1995.

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Introduction

The purpose of the Adams County CRP project Grazing Demonstration is to show the production potential of highly erodible land (HEL) under well-managed livestock grazing systems. This demonstration is a part of The Adams County CRP Research and Demonstration Project established to determine the economic feasibility of grazing systems as a means of profitable grassland farming when the Conservation Reserve Program (CRP) ends. The project is an interagency cooperative effort sponsored by the Southern Iowa Forage and Livestock Committee and with special permission from the United States Department of Agriculture Farm Service Agency (FSA) to use CRP land for research and demonstration.

This report summarizes five seasons of grazing cow-calf pairs on HEL land under two well managed grazing rotations.

Materials and Methods

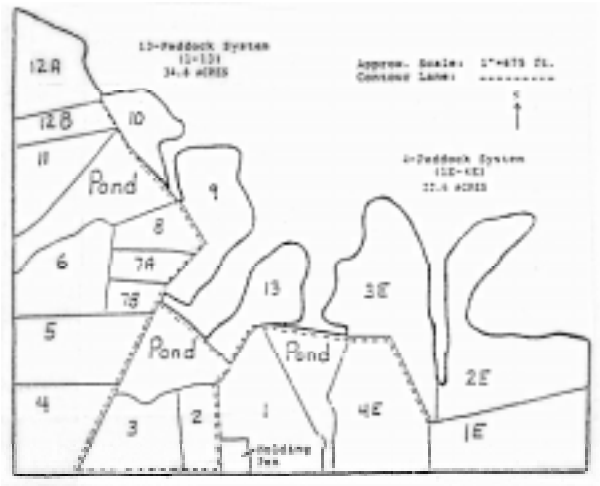
The Adams County CRP Research and Demonstration Project is located in Section 23 of Quincy Township in Adams County, Iowa. The predominant soil type of the 57 acres used for the grazing project is Adair-Shelby Complex, 9% to 14% slope and severely eroded. This area was

selected as representative of the CRP land in Adams County and because of ready accessibility to water for livestock. The area contains three man-made ponds.

Grazing systems

Two electric-fenced, contoured-lane grazing systems were established in 1991 and have been used for five grazing seasons (1991-1995). These systems are separately managed but utilize a central corral facility and will be referred to as the 13-paddock system and the 4-paddock system (Figure 1).

Figure 1. Map of Adams County CRP Project. 13- and 4-paddock



Paddock design

All systems are fenced with 12.5-gauge, high-tensile electric fence and utilize high-voltage, low-impedance power units. The contoured lanes are a unique feature of the Adams county grazing systems to prevent gully formation from cattle paths.

Paddock size

Paddock size and shape in the 13-paddock system were determined by the landscape and the amount of forage that could be produced allowing for a 30-day rest period between grazings. The maximum stocking rate was projected to be 1.5 acres per cow-calf pair. This led to establishment of paddocks ranging in size from 1.5 to 4.0 acres on the 13-paddock system. In addition, paddocks are subdivided each year for better grass utilization.

On the other hand, paddock size in the 4-paddock system was determined by dividing the land area by four. Paddocks range from 4.7 acres to 6.6 acres in size with no further subdivision.

Forage species

Both grazing systems utilize existing grass stands of smooth bromegrass, tall fescue, Kentucky bluegrass, and some native grass species. Because of a systematic legume interseeding program, some paddocks in each system also include percentages of alfalfa, birdsfoot trefoil, or red clover, but the grasses remain the predominant forage.

Fertility management

Soil samples were taken on all paddocks in the 4-and 13-paddock systems in August of 1991, April of 1993, March of 1994, and March of 1995. Test results in 1991 showed the soil pH level ranged between 6.0 and 7.8. Phosphorus (Bray -1) was either low or very low in each sample, and potassium was high or very high in each sample except one. In this sample, potassium level tested medium. In 1995, test results showed pH ranged between 6.70 and 7.15 in the 4-paddock system and 6.55 to 7.65 in the 13-paddock system. Phosphorus levels ranged from 14Low to 27High in the 4-paddock system and from 9Low to 112Very High in the 13-paddock system. All paddocks showed "Very High" or "High" test results for potassium. In 1995, as in each preceeding project year, Iowa State University Soil Testing Lab recommendations for fertilizer were followed with applications made in the early spring.

Nitrogen management included an October 14, 1994 application of 40 pounds of nitrogen per acre to paddocks 6, 9, 11, and 12B in the 13-paddock system and to paddock 4E in the 4-paddock system and a March 31, 1995 application of nitrogen at the rate of 40 pounds per acre to every paddock in both systems.

Grazing management

1995 grazing management in the 13-paddock grazing system differed slightly from previous years. Several paddocks were subdivided with temporary electric fence in an effort to make the best possible use of every acre. The decision of when to move cattle among paddocks in 1995 was made in the same manner as every other year and was based on amount of forage grazed. The goal was to not graze more than 50% of the standing forage in any paddock. This required moving the cattle every one to three days in 1995, depending on grass growth rate. Forage height was measured with a yardstick as cows and calves were turned into a paddock and then remeasured as they were moved out. Four big round bales of grass hay were fed to the cattle in the 13-paddock system in July and August, 1995.

Grazing management in the 4-paddock system could be defined as rotating the cattle to a new paddock every 6 to 11 days. No supplemental hay was fed to the cattle in the 4-paddock system in 1995.

As in previous years, calves were offered no creep feed in either grazing system in 1995.

Cattle

Thirty-four cow-calf pairs were transported from Iowa

State University's Rhodes Research Farm to the CRP Research and Demonstration Farm in Adams County Iowa on April 28, 1995. These mixed crossbred cows with Angus-sired calves were randomly assigned to the two grazing treatments. Thirteen pairs were assigned to the 4-paddock treatment which includes 22.4 acres, and 21 pairs were assigned to the 13-paddock system which includes 34.6 acres. Care was taken to ensure equal calf sex distribution across treatments.

The cows and calves were conditioned to the electric fence in a training pen and fed alfalfa-bromegrass hay for two days after arrival. During this training period and before being placed in the treatments, all cattle also were allowed to graze in paddock 1 in the 13-paddock system. These two days of grazing are not included in the production data from the 13-paddock system.

Beginning weights of all cows and calves for 1995 were taken on May 1. Cows in both treatments were condition-scored whenever they were weighed. Measurements of cow and calf weights and cow condition scores were repeated approximately every 30 days throughout the summer. One bull was added to each of the two grazing treatments on June 12. The bulls were removed from the pastures on August 1. Final cow and calf weights were obtained on September 25, 1995, and the cows and calves were removed from the systems.

Weather data

Rainfall amounts were in 1995 collected both at the CRP Farm and at the Corning Mercy Hospital weather station about three miles away in (Table 1).

The CRP Farm received 26.34 inches of rain from April through September. This was 1.03 inches above the 25.03 inches that are normal for this six-month period at Corning. By comparison, the Corning hospital measurement was 25.91 inches in 67 events for this six-month period. At first glance, the six month rainfall amounts point to a very near "normal" year in 1995. In reality, 1995 was a very difficult year for area farmers to get their crops planted because of excessive rains in April, May, and early June. Then rainfall amounts fell much below normal in August, September, and October.

Hay production

It is the plan before each grazing season to harvest one or two paddocks in each grazing system as hay. Paddock 6 in the 13-paddock system was harvested for hay in 1995 and yielded 11 big round bales weighing an estimated 1,500 pounds each. No hay was harvested from the 4-paddock system in 1995.

Results and Discussion

The 13-paddock system produced 210.2 pounds of calf gain per acre in 1995 at a stocking rate of .61 cow-calf pairs per acre or 1.65 acres per pair (Table 2). This was exactly the same stocking rate as 1993 and 1994 and it produced amazingly similar results despite the large variability in the weather among these years. The highest production year for the 13-paddock system was 1992 with 241.9 pounds of calf gain per acre. Although cow gain during the grazing season is not utilized in the economic calculations compiled for this system, it is worth noting, that the cows gained 92.6 pounds during the 1,147 days they grazed at the CRP farm even though they were nursing calves that were gaining at the rate of 2.36 pounds per day throughout the season with no supplemental creep feed.

Calf gains averaged 2.38 pounds per head per day for the 147-day grazing season on the 4-paddock grazing system at the Adams County CRP farm in 1995 (Table 3). This produced a total of 350.2 pounds per gain per calf or 203.2 pounds of calf gain for every acre in the 4-paddock system. As in the 13-paddock system, this production was very similar to 1994 production but was not the highest per-acre output for the system in the five years of its operation. The 1992 group of cows and calves hold that record at 263.6 pounds of calf gain per acre. Note that the stocking rate in 1992 was 16 cows on the system vs. 13 in 1993, 1994, and 1995.

Cows on the 4-paddock system gained 119.2 pounds and increased in condition score by .38 over the 147-day 1995 grazing season.

The three grazing systems in operation at the Adams County CRP Research and Demonstration farm vary in size, design, stocking rate, forage composition, date of establishment, and average Corn Suitability Ratings (CSR), so rigorous comparisons between the systems should not be made. This report summarizes the 1995 production data from two of the three systems which had cows and calves grazing them in 1994 and 1995. Although the systems are located on similar Adair-Shelby soils with 9-14 % slopes, they vary considerably in their production potentials as indicated by their CSRs.

The average CSR on the 13-paddock system was calculated to be 27.4 with a potential average corn yield of 84.9 bushels per acre. The average CSR on the 4-paddock system was calculated to be 42.3 with an average corn yield of 110.3 bushels per acre. The third system, an 18-paddock system, was stocked with stocker-steers in 1995. It has an average CSR of 48.7 with an average corn yield potential of 116.5 bushels per acre. The 18-paddock system produced 152.04 pounds of live weight gain per acre in a 133-day grazing season with the steers in 1995. A separate report entitled "Intensive Rotational Grazing Steers on Highly Erodible Land at the Adams County CRP Project" (BreDahl and others) describes the 1995 results of this system in detail.

With these severe soil resource limitations in mind, a main goal of this grazing project is to demonstrate an

economic alternative to row-crop production on such highly erodible land. Results from these demonstrations over the last five years have shown that it is possible to produce more than 200 pounds of calf gain per acre in a five-month grazing season with rotational grazing management on low-productivity soils. The economics of these systems are discussed in detail in a third article in the 1996 ISU Beef Research Report entitled "An Economic Comparison of Rotation Grazing Steers and Cow-Calf Pairs to Eight Crop Alternatives and the CRP Option for Highly Erodible Land in Southwest Iowa."

Rotational Grazing Management Discussion

Grazing management in the 13-paddock grazing system was intensified in 1995 with several paddocks temporarily subdivided in an effort to increase production. Movement of cattle within these subdivided paddocks was still based on forage height, with the goal of grazing no more than 50% of the standing forage in any paddock during each grazing period. This involved moving the cattle 109 times between paddocks in 1995 compared to 78 times in 1994, 86 times in 1993, 73 times in 1992 and 93 times in 1991 (Table 4). Each paddock or paddock subdivision was grazed four, five or six times in 1995, and average length of stay on each paddock was shorter than in the past, ranging between 1.0 and 2.2 days. This compares to an average length of stay on each paddock of 1.0 to 3.0 days in 1994.

Daily "turn in" and "turn out" heights were recorded and averaged for each grazing cycle or period in Table 5. Seasonal variation in heights was less in 1995 than in previous years. Two possible explanations could be offered for this: 1.) with the increased subdivisions in paddocks, each paddock was grazed more uniformly each grazing cycle and 2.) the paddocks were never allowed to get into the vegetative stage because paddock 6 was hayed and the length of stay on each paddock during each grazing period was shortened.

As in 1994, management very closely adhered to the rule of not grazing more than 50% of the standing forage in 1995. Table 5 shows that "out" heights as a percent of "in" were 54.1%, 50.0%, 48.9%, 50.0%, 51.8%, and 46.9% for grazing periods 1 through 6 in 1995. Only during the last grazing cycle was the 50% rule violated to any great degree, and the authors believe that happened because of the extreme dry fall conditions in 1995 (Table 1).

The second grazing management guideline in the 13-paddock system followed throughout the 1995 season was to give each paddock an average of 30 days rest between each grazing. Table 4 shows that this rule was adhered to fairly closely in 1995. In last years report, the authors commented that paddock 4 may produce less in 1995 because rest periods were too short in 1994. It is interesting to note that in 1995, paddock 4 produced 10 total days of grazing compared to 15 in 1994 and 13 in 1993.

Each year it is noted that production from the more simplistic 4-paddock system is nearly the same as production from the more intensively managed 13-paddock system. Cattle were moved 18 times and by the calendar in the 4-paddock system vs. 109 times with grass measurement management in the 13-paddock system. A possible explanation for this similar production with differing intensities of management could be the differences in production potential of the two areas fenced into the systems. The average CSR of the 13-paddock system was calculated to be 14.9 points lower than the average CSR of the land in the 4-paddock system. To achieve the same level of production with the poorer land, it takes increased management of the forage resources.

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Table 1. Precipitation at Corning, Iowa, 1995 (inches of rainfall).

Month	Normal	Corning Hospital 1995	Deviation from Normal 1995	CRP Farm 1995	Deviation from Normal 1995
January	.90	0.75 (4 events)	-0.15		
February	.92	0.39 (6 events)	-0.53		
March	2.14	2.72 (7 events)	+0.58		
April	3.15	5.71 (17 events)	+2.56	5.79 (5 events)	+2.64
May	4.06	6.50 (15 events)	+2.44	5.76 (8 events)	+1.70
June	4.55	4.57 (12 events)	+0.02	4.64 (7 events)	+0.09
July	4.09	4.51 (7 events)	+0.42	6.28 (7 events)	+2.19
August	4.90	1.73 (6 events)	-3.17	0.62 (2 events)	-4.28
September	4.28	2.89 (10 events)	-1.39	3.26 (6 events)	-1.02
October	2.33	1.81 (7 events)	-0.52	NA	NA
November	1.58	1.75	+0.17	NA	
December	.89	NA	NA	NA	
ANNUAL	33.79	33.33 in 11 mos.		26.34 in 6 mos.	

Table 2. Adams County CRP project summary of 13-Paddock System Cow-Calf Production, 1991-1995.

Item	1991	1992	1993	1994	1995	5-Yr. Ave.
Acres in System	34.60	34.60	34.60	34.60	34.60	34.60
No. of Pairs	23.00	22.00	21.00	21.00	21.00	21.60
Pairs / Acre	0.66	0.64	0.61	0.61	0.61	0.62
Acres / Pair	1.50	1.50	1.65	1.65	1.65	1.60
Days Grazed	134.00	155.00	144.00	155.00	147.00	147.00
Calf Beg. Wt. (lbs.)			147.10	147.80	129.20	138.50
Calf ADG	2.10	2.45	2.35	2.37	2.36	2.33
Ave. Calf Gain	280.90	380.50	338.80	366.91	346.40	342.70
Calf Gain / A	186.73	241.94	205.63	222.69	210.20	213.40
Cow Beg. Wt. (lbs.)			1145.67	1187.40	1084.50	1139.19
Cow Wt. Chg.	72.00	76.90	13.40	74.70	92.6	65.90
Cow Cond Chg.	0.00	0.40	0.30	0.20	0.86	0.35
Cow Days / A	89.08	98.55	87.40	94.08	89.2	91.70

Table 3. Adams County CRP project 4-Paddock System Cow-calf Production Data, 1991-1995.

Item	1991	1992	1993	1994	1995	5-Yr. Avg.
Acres in system	22.40	22.40	22.40	22.40	22.40	22.40
No. of pairs	12.00	16.00	13.00	13.00	13.00	13.40
Pairs / acre	0.54	0.71	0.58	0.58	0.58	0.60
Acres / pair	1.87	1.40	1.72	1.72	1.72	1.69
Days grazed	134.00	154.00	144.00	155.00	147.00	147.00
Calf beg. wt. (lbs.)			143.38	159.80	135.20	146.13
Calf ADG (lbs.)	2.25	2.38	2.38	2.50	2.38	2.38
Avg. calf gain	301.50	369.10	342.70	387.53	350.20	350.21
Calf gain / acre	161.52	263.64	198.89	224.91	203.20	210.40
Cow beg. wt. (lbs.)			1155.00	1172.6	1082.30	1136.63
Cow wt. chg.	50.00	82.10	36.50	83.90	119.20	74.30
Cow cond chg.	-0.10	0.40	0.50	0.20	0.38	0.28
Cow days / acre	71.79	110.71	83.57	89.96	85.30	88.30

Table 4. Thirteen-paddock system grazing data from 1991, 1992, 1993 and 1994.

Paddocks	Acres per Paddock	Times Grazed					Total Days Grazed					Ave. Days Total Grazed Per Period				Ave. Days Rested Between Periods		
		1991	1992	1993	1994	1995	1991	1992	1993	1994	1995	1992	1993	1994	1995	1993	1994	1995
Bromegrass-dominant paddocks - 17.5 acres																		
1*	3.7	8	5	6	5	12	17	14	17	14	15	2.8	2.8	2.8	1.3	24.2	28.6	27.6
2	1.5	5	4	6	5	5	6.5	7	6	9	7	1.8	1.0	1.8	1.4	26.0	29.6	29.0
3*	1.5	5	4	6	5	9	6.5	7	9	9	10	1.8	1.5	1.8	1.1	25.5	29.6	29.3
10	1.8	7	5	5	5	5	7.5	8	9	9	8	1.6	1.8	1.8	1.6	30.6	29.6	28.3
11	2.5	5	4	5	5	5	7.5	8	10	9	11	2.0	2.0	1.8	2.2	30.4	29.6	27.0
12A	2.6	8	5	5	5	5	14.5	13	13	12	11	2.6	2.6	2.4	2.2	29.8	30.2	27.8
12B	1.4	5	5	5	5	5	10	7	6	5	5	1.4	1.2	1.0	1.0	31.2	30.4	29.0
13*	2.5	7	5	6	5	12	11.5	12	10	9	12	2.4	1.7	1.8	1.0	25.3	29.6	27.8
TOTAL	17.5	50	37	44	50	58	81.0	76	80	76	79							
Fescue-dominant paddock - 17.1 acres																		
4	3.2	4	5	6	6	10	9	10	13	15	10	2.0	2.2	2.5	1.0	24.8	23.7	27.3
5A	4.0	6	5	6	5	5	8	11	10	10	7	2.2	1.7	2.0	1.4	25.3	29.4	28.3
5B	4.0	6	5	5	5	5	8.5	10	9	9	8	2.0	1.8	1.8	1.6	30.6	29.6	28.8
6**	3.0	5	3	5	5	6	7	8	15	15	6	2.7	3.0	3.0	1.0	29.4	28.4	32.0
7A	1.1	6	4	5	4	5	6.5	6	5	4	5	1.5	1.0	1.0	1.0	31.4	38.2	30.3
7B	0.7	4	4	5	4	5	4.5	6	5	6	5	1.5	1.0	1.5	1.0	31.4	27.8	28.0
8	1.6	7	5	5	4	5	7.5	7	7	6	7	1.4	1.4	1.5	1.4	31.0	37.8	29.3
9	3.5	5	5	5	5	10	9	14	13	13	16	2.6	2.6	2.6	1.6	28.2	28.8	27.3
TOTAL	17.1	43	36	42	38	51	60	72	77	78	64							
Lakes & ponds							7	7	5	3	6							
13 paddock totals		93	73	86	78	109	148	155	162	157	149							

*** Split into two paddocks in 1995.**
**** Hayed in 1995.**

Table 5. Average “in” and “out” grass heights for the 13-paddock system, 1992-1995.

Grazing Cycle on a Paddock	Grass Height (Inches)								“Out” as % of “In”			
	1992 In	1993 In	1994 In	1995 In	1992 Out	1993 Out	1994 Out	1995 Out	1992	1993	1994	1995
First	9.5	9.3	7.2	8.5	5.6	4.8	4.1	4.6	58	51.6	56.9	54.1
Second	8.1	9.7	8.4	8.8	3.4	4.7	4.4	4.4	41	48.5	52.3	50.0
Third	8.5	10.3	9.6	8.8	3.4	5.3	4.7	4.3	40	51.5	49.0	48.9
Fourth	7.2	8.8	8.8	8.8	3.4	3.6	4.4	4.4	47	52.3	50.0	50.0
Fifth	7.2	8.7	7.9	8.3	3.33	4.7	4.0	4.3	46	54.0	50.6	51.8
Sixth		8.0	7.0	8.1		4.1	3.5	3.8		51.3	50.0	46.9
Seventh												