

How to manage N fertilizers on bread wheat crop in adverses climatic conditions

Simon-P. Guertin, Ph.D.

Bread wheat



Introduction

Bread wheat crop was expanding and we had to find cultural practices that will optimize the grain yield as well as grain quality. A three years study was conducted at St-Hyacinthe, Quebec, Canada on a clay loam soil (Ste-Rosalie s.). In this area, the climat is classified as maritime temperate. Wheat response to nitrogen fertilizer is greatly affected by the wheather during the growing season. Over the studing's year (1987 to 1989), each growing season was characterised by its amount of rain.

Objective

Determine the best N fertilizer placement depth as well as the N fertilizer source for optimum bread wheat grain production and quality.

Methodology

Factors

- N fertilizer placement depth and N fertilizer sources

Treatments

- Placement depth: 0, 6, 9, 12 cm

- N fertilizer sources: 1) urea 100% (U100)
- 2) ammonium nitrate 100% (NA100)
- 3) urea-ammonium nitrate 100% (UNA100)
- 4) urea 50% - urea 50% (U50-U50)
- 5) ammonium nitrate 50-50% (NA50-NA50)
- 6) urea 50% - ammonium nitrate 50% (U50-NA50)
- 7) ammonium nitrate 50% - urea 50% (NA50-U50)

Experimental design: split plot with N fertilizer sources as main plot and N band depth as sub-plot.

The treatments were repeated 4 times. (N rate: 120kg/ha)

Seeding rate: 370seeds/m² . **Planting depth:** 2,0cm . **Bread wheat variety:** Max . **Weed control:** Buctril

Plot size: 1,8m x 2,8m . **Space between rows:** 18cm . **Fertilizers P₂O₅ and K₂O:** they were applied on soil surface after seeding

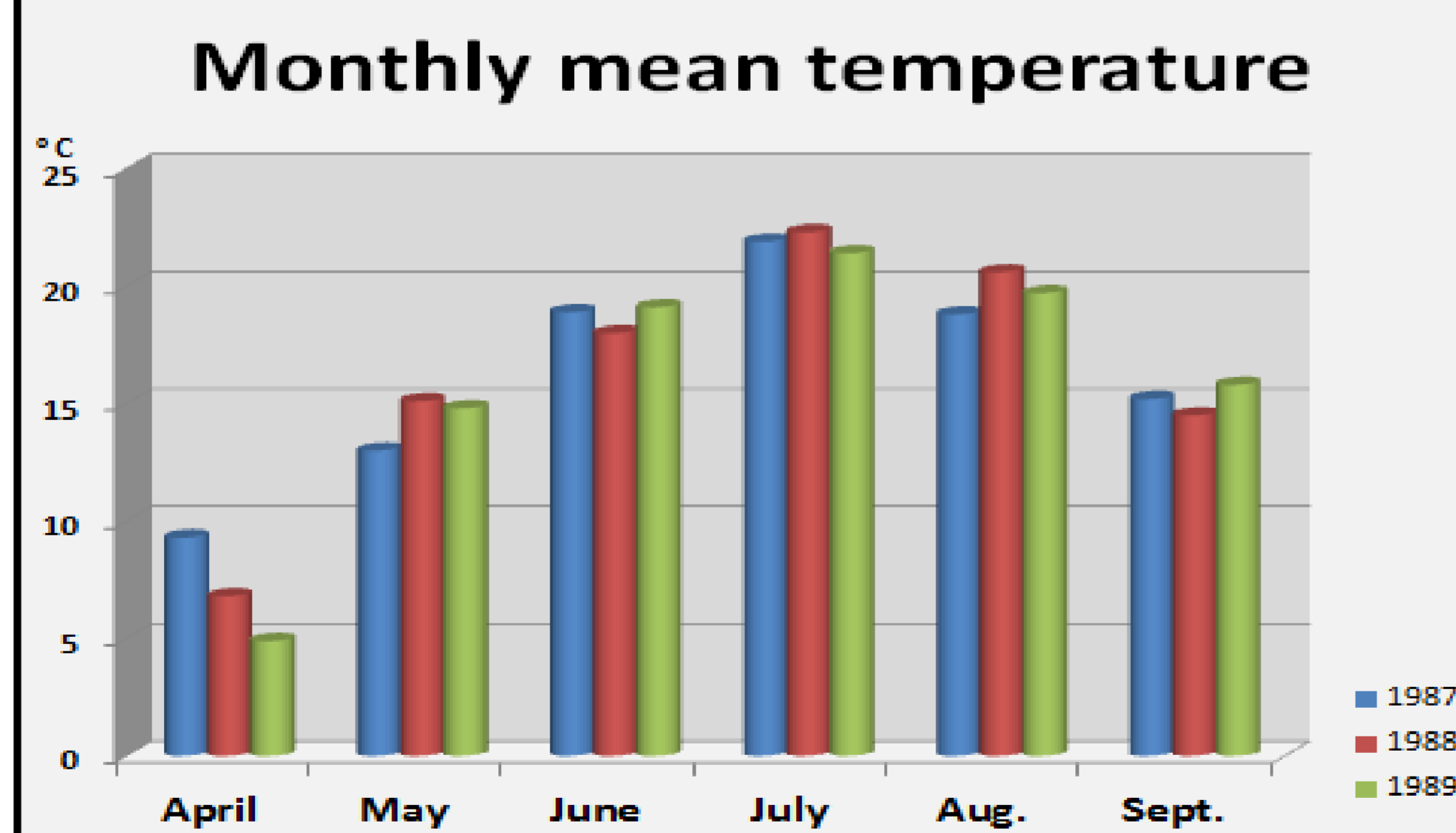
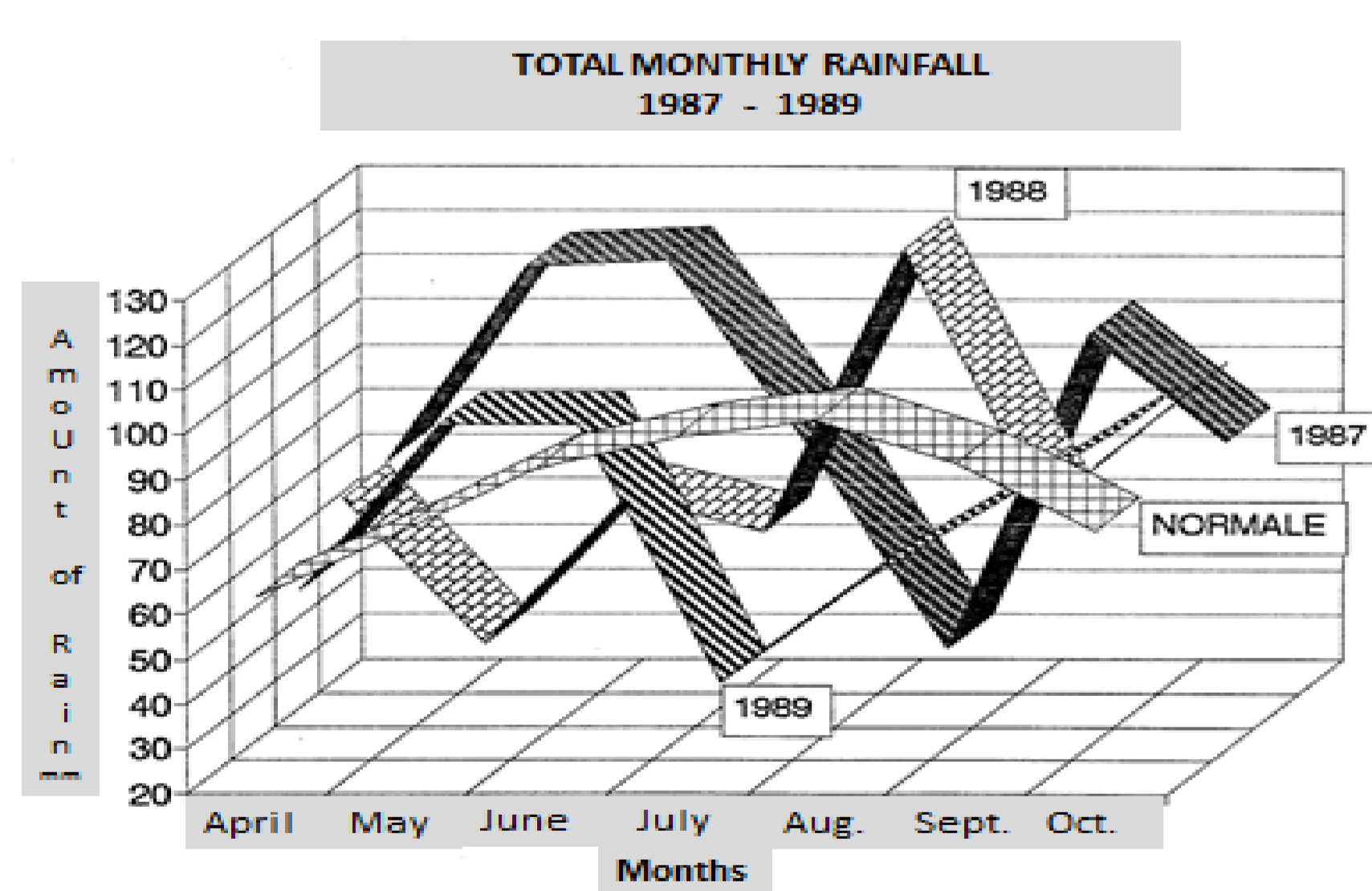
Equipment used to precisely dig to the right depth where N fertilizer was placed



Soil chemical composition

pH: 6,5
O.M.: 1,2%
P(Mel.III): 130 kg/ha
K(Mel.III): 425 kg/ha
Mg (Mel.III): 860kg/ha
Ca (Mel.III): 4360 kg/ha

Climatic Data



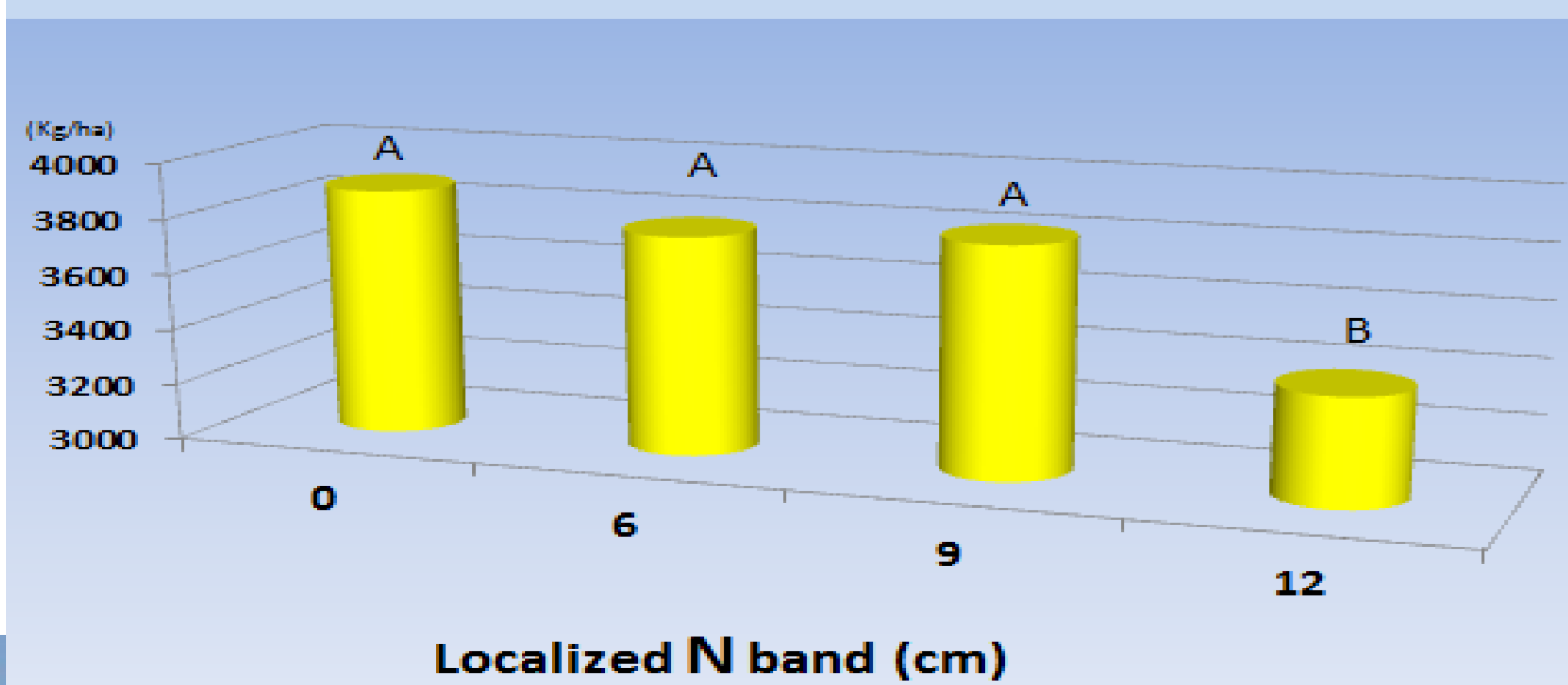
Results

1987 Spring time was particularly wet in May and in June with 115 and 116mm, respectively (the normal was 82 and 102mm)

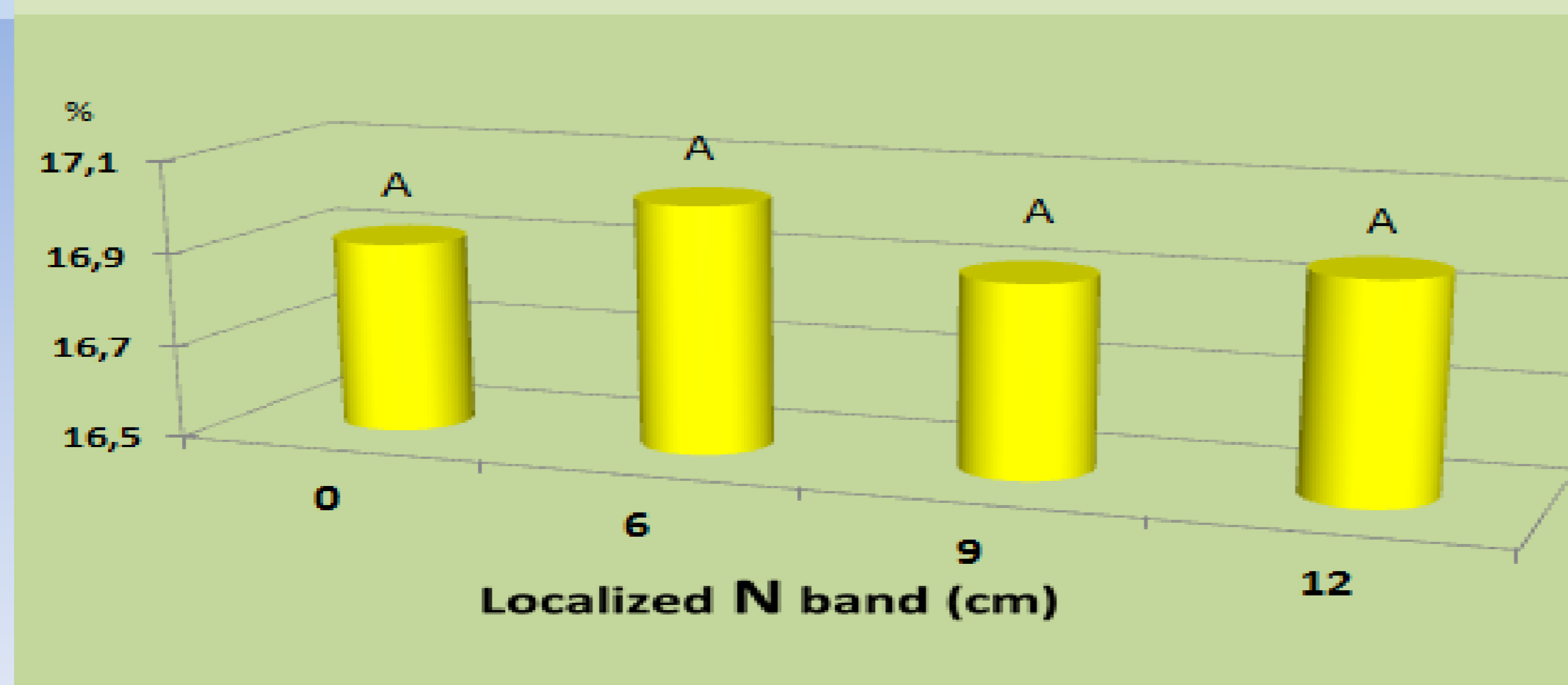
Wheat grain yield (kg/ha)

Wheat grain protein content (%)

Effect of localized N band on grain wheat yield, 1987

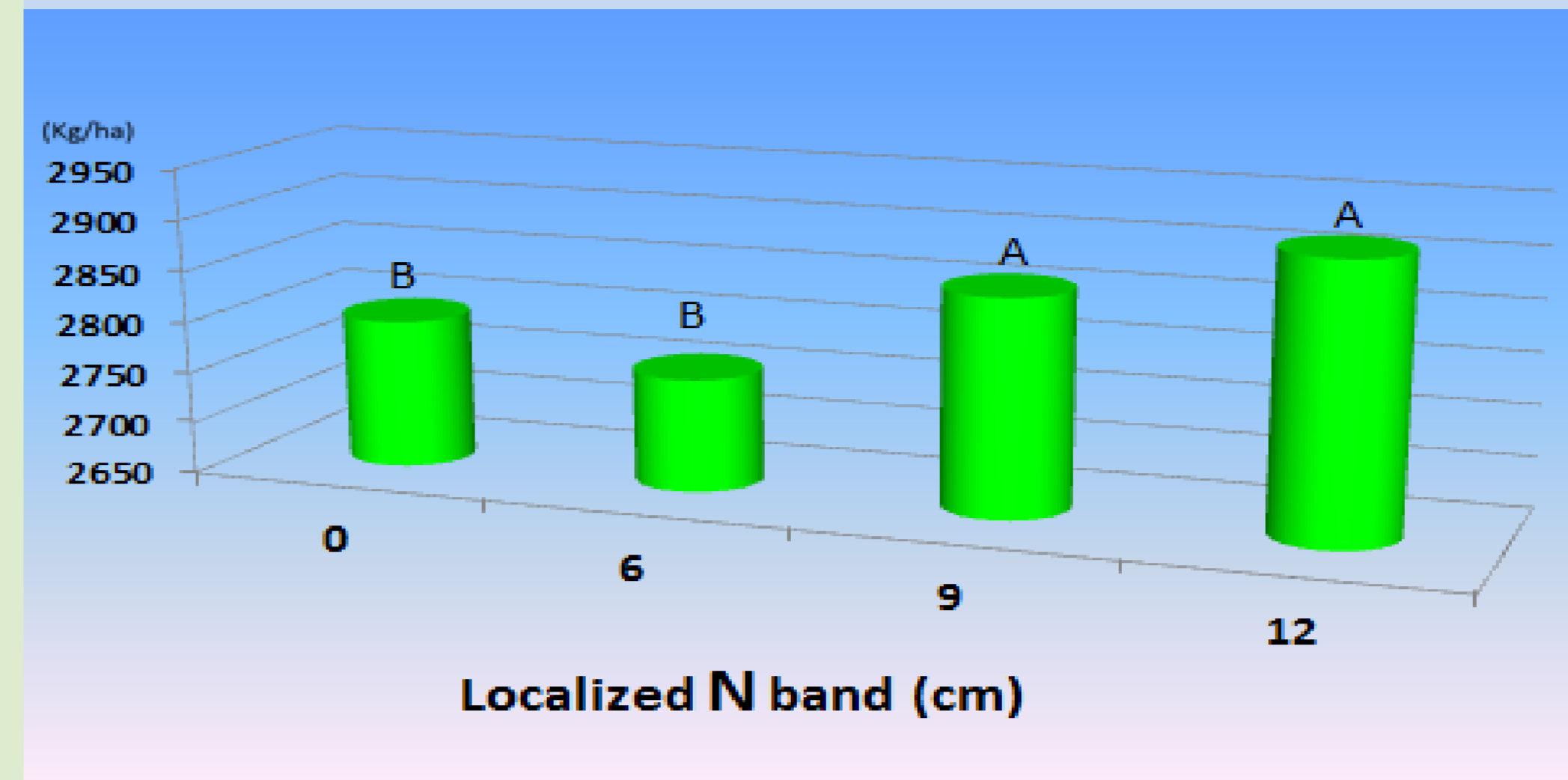


Effect of localized N band on grain wheat protein content, 1987

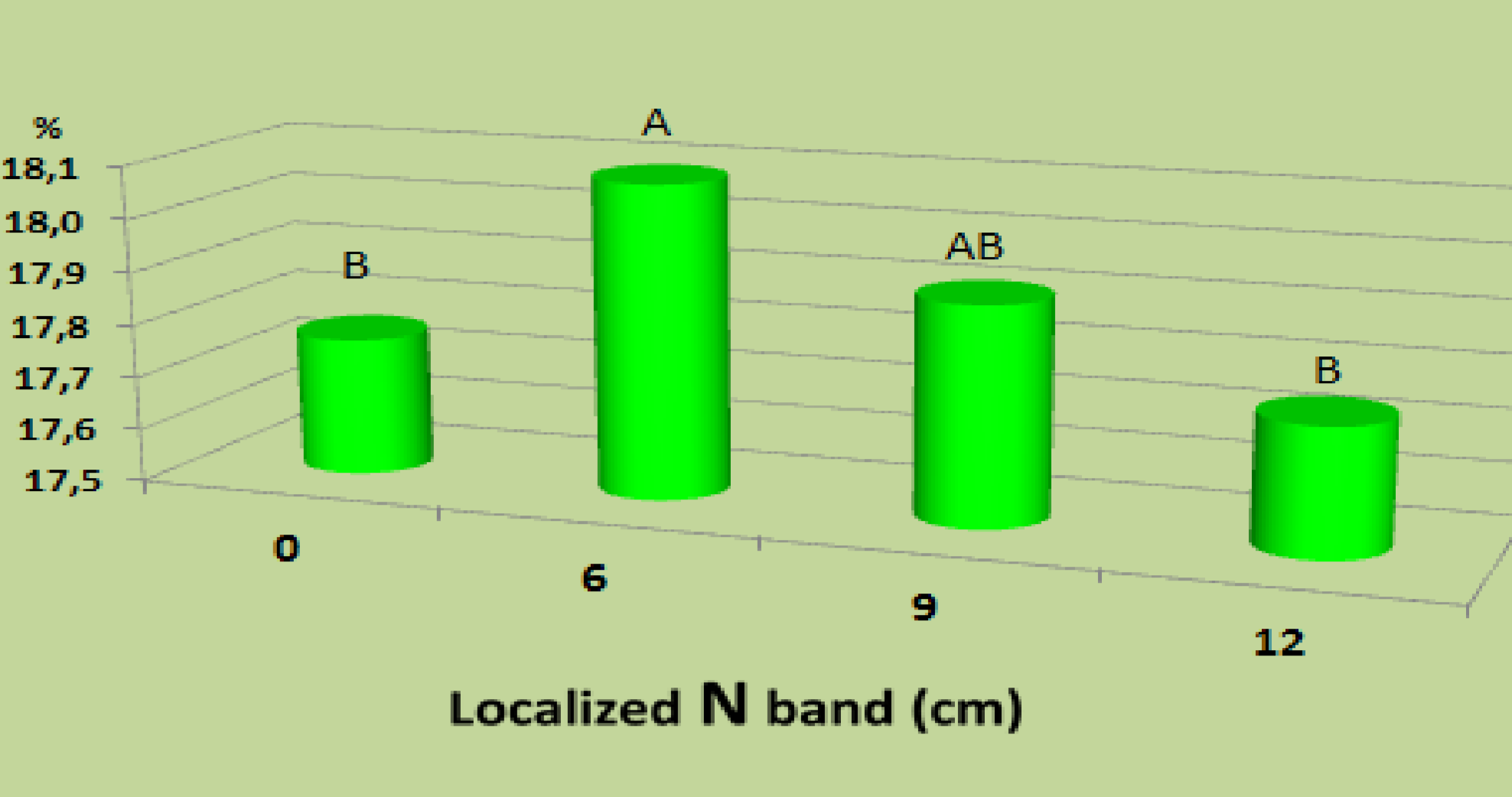


1988 Spring time was particularly dry in May and in June with 38 and 84mm, respectively (the normal was 82 and 102mm)

Effect of localized N band on grain wheat yield, 1988

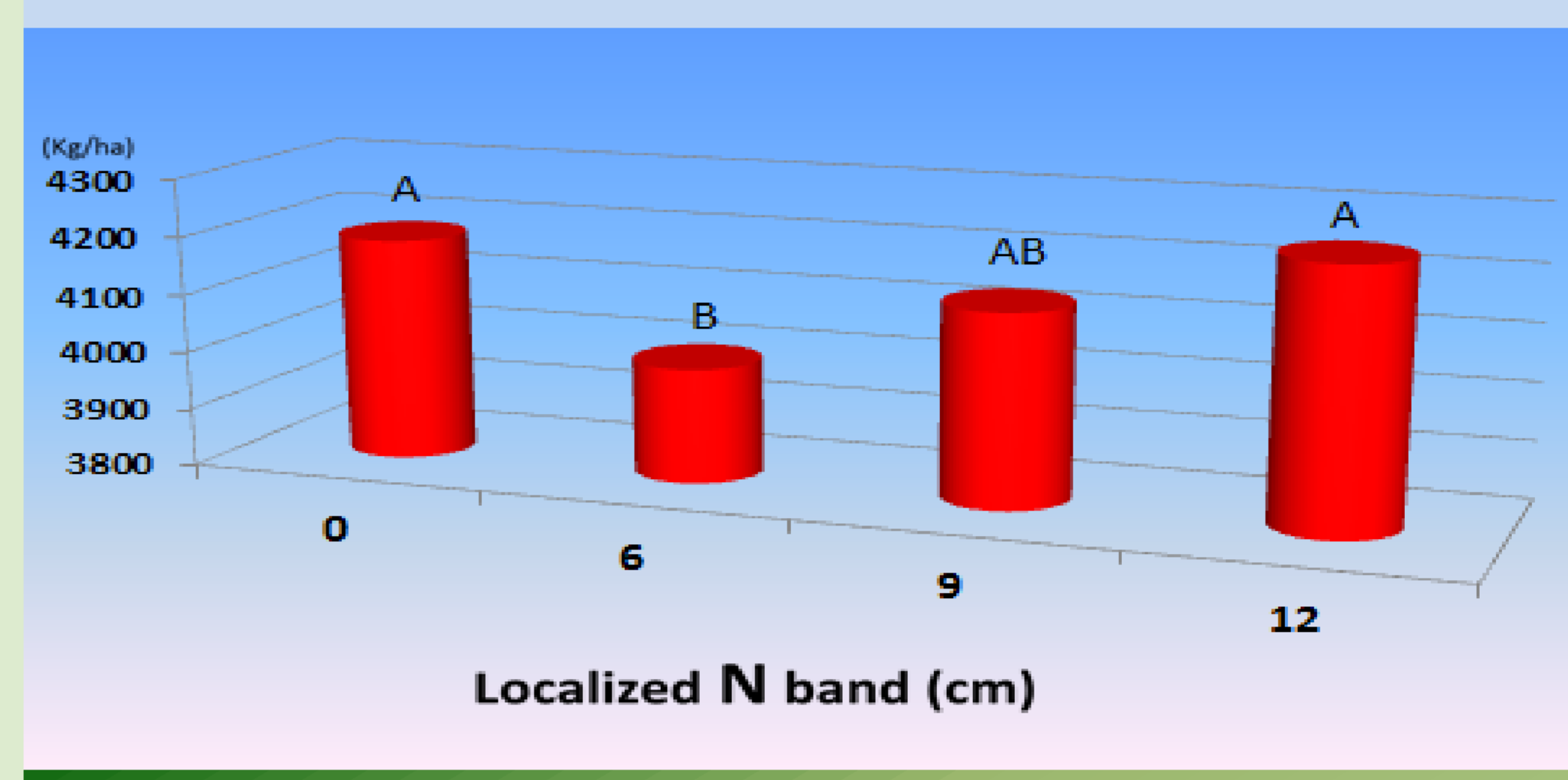


Effect of localized N band on grain wheat protein content, 1988

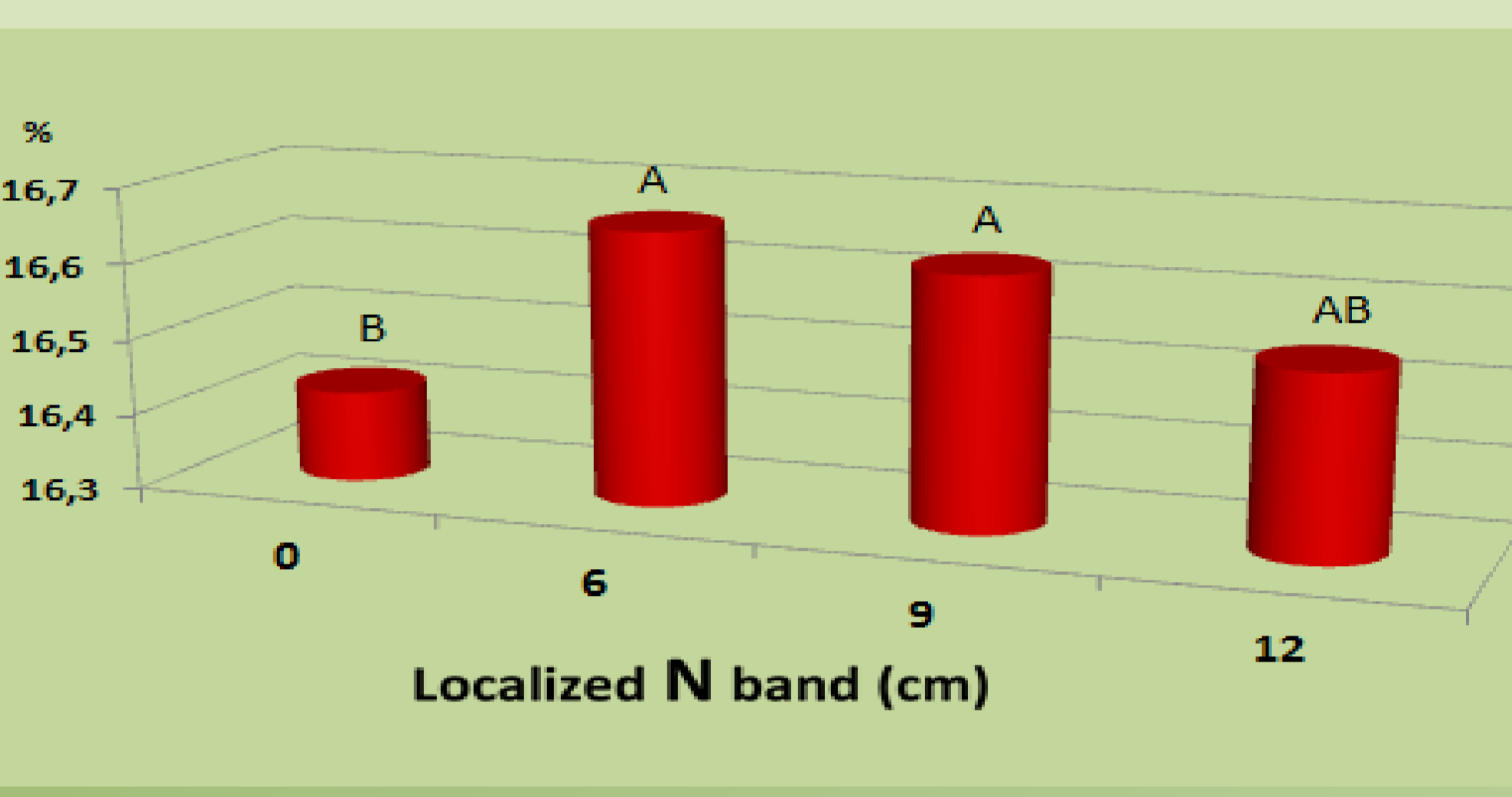


1989 Spring time followed a normal trend in May and in June with 95 and 104mm of rain (the normal was 82 and 102mm)

Effect of localized N band on grain wheat yield, 1989



Effect of localized N band on grain wheat protein content, 1989



AGRONOMIC DATA 1987-1989

N sources	Yield (kg/ha) 1987	%Protein content 1987	Yield (kg/ha) 1988	%protein Content 1988	Yield (kg/ha) 1989	%protein Content 1989	Av.Yield (kg/ha)	Av. % protein content
U100	3662	16,9	2864	17,8	3967	16,5	3504	17,1
NA100	3679	16,9	2771	18,0	4084	16,6	3511	17,1
UNA100	3753	16,9	2913	17,7	4073	16,4	3580	17,0
U50-U50	3778	16,9	2925	17,8	4168	16,6	3624	17,1
NA50-NA50	3769	17,0	2769	17,9	4219	16,7	3585	17,2
U50-NA50	3773	16,8	2756	17,9	4080	16,6	3536	17,1
NA50-U50	3606	17,1	2830	18,0	4369	16,6	3601	17,2

CONCLUSION

N fertilizer sources had no significant effect on bread wheat yield as well as protein content. Therefore, fractionning N rate gave a slight yield improvement mainly when urea was applied at tillering stage.

The N fertilizer placement depth significantly affected the wheat yield, over the studying years. A rainy growing season, wheat yielded less at 12cm as N placement depth. A growing season with low rainfall, wheat yielded most when the N fertilizer placement depth was at 9 and 12cm.

The N fertilizer placement depth had significant effect on bread wheat protein content. Growing season with low or normal rainfall conditions, bread wheat showed a high protein content when the N placement depth was at 6 and 9cm from the soil surface.

Because of uncertainty about the amount of rain that will fall during the growing season, localizing the N fertilizer placement at 9cm from the soil surface will insure the bread wheat crop to get good yield as well as good protein content.