

**PROJECT TITLE:** Winter and Spring Wheat Variety Performance Evaluation Under Northern Montana Conditions on the Basis of Gross Production Value as Influenced by Yield, Protein, and Market.

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S.P. Lanning, Research Associate (SW) - Bozeman  
Cooperating County Extension Agents  
Individual Cooperating Landowners

**OBJECTIVES:**

It is the objective of this project to bring quality and quantity together to allow the forces of market value to influence evaluation of winter and spring wheat varieties under varying cropping conditions in northern Montana.

**RESULTS:**

Average annual PNW quotes for Hard Red Winter wheat at 10, 11, 12, and 13 percent protein for the 10-year period 1985-1994 are graphed in Figure 1. The PNW annual market averages for the same period for Dark Northern Spring wheat at 13, 14, and 15 percent protein (plus values for 12 percent protein first available in 1994), are graphed in Figure 2. Both graphs include values along the top axis reflecting the average annual \$/bu price spread between minimum and maximum protein levels for which quotes are consistently given. Similar HRW and DNS market summaries extended for the 15-year period 1980-1994 are graphed in Figures 1a and 2a, respectively.

'Gross Dollar Return' comparisons are graphically presented in Figures 3. through 11b. reflecting research plot response data for the locations and years below:

Figure No.	Crop & System	Research Location	No.of Varieties Included	No.of Data Years	No.of Calendar Years	Calendar Years Spanned
3	Flw-WW	NARC-Havre	8	8	10	1985-1994
*3a	Flw-WW	NARC-Havre	8	5	6	1989-1994
*4	Flw-WW	Big Sandy	7	7	8	1987-1994
*5	Flw-WW	North Havre	7	6	7	1988-1994

(Continued Next Page)

Figure No.	Crop & System	Research Location	No. of Varieties Included	No. of Data Years	No. of Calendar Years	Calendar Years Spanned
6	Flw-SW	NARC-Havre	6	9	10	1985-1994
*6a	Flw-SW	NARC-Havre	8	7	8	1987-1994
*6b	Flw-SW	NARC-Havre	8	5	6	1989-1994
7	Flw-SW	Turner	7	8	8	1987-1994
*7a	Flw-SW	Turner	8	7	7	1988-1994
*7b	Flw-SW	Turner	8	5	5	1990-1994
8	Flw-SW	Big Sandy	8	6	7	1988-1994
*8a	Flw-SW	Big Sandy	8	4	5	1990-1994
9	Flw-SW	North Havre	6	9	10	1985-1994
*9a	Flw-SW	North Havre	7	7	8	1987-1994
*9b	Flw-SW	North Havre	8	4	5	1990-1994
10	Flw-SW	North Joplin	8	6	6	1989-1994
*10a	Flw-SW	North Joplin	8	5	5	1990-1994
11	Flw-SW	North Dodson	6	9	10	1985-1994
*11a	Flw-SW	North Dodson	8	6	7	1988-1994
*11b	Flw-SW	North Dodson	8	4	5	1990-1994

Analyses span the maximum number of calendar years, up to 10, for which data exists for a specific location. Figures marked with an asterisk (\*) denote those for which a reduced number of data years were used in the analyses for purposes of including new or otherwise popular variety releases having fewer data years available. In contrast to the 'Comparable Average' method of comparing varietal performance, graphs in this report reflect only analyses where each variety shown was actually grown at that particular location during all years listed. Thus, values included are actual in terms of agronomic yield and associated gross return based on protein content and average annual market performance for each year.

The Research Center would appreciate comments on this approach to wheat variety performance evaluation. It must be kept in mind that in addition to the influence of price variability; crop fertility, plant available water, and numerous other factors can dramatically affect gross dollar return. All trials included were fertilized. No attempt has been made here to consider fertilizer or other input costs and their subsequent effect on 'net' return. Plant available water estimates and soil fertility data are available for these studies (applied N, P, and K for 1982-1985, and soil nutrient analyses plus applied N, P, and K for 1986-1993). Climatic and nursery management data details for each off-station trial featured here are included with the associated agronomic evaluations in a separate report. All Havre data represents a minimum 'applied' nitrogen rate of 70 lbs actual N/ac. It should be further understood that management plays a key role in affecting dollar return - be it associated with enhanced product quality, quantity or shrewd marketing skills.

#### SUMMARY:

Producers are well aware of the impact protein premiums can have on overall market value, but are troubled by the fact that the market has generally not been consistent in terms of rewarding growers for producing high quality wheat. The potential for discount associated with low quality has likely had more bearing

on production management than have positive incentives in the form of premiums for quality above average. In the past decade, average annual premiums for 10-13 percent protein winter wheat and 13-15 percent protein spring wheat have varied from as little as 1 cent to as much as 59 cents per point increase per bushel.

Producers have encouraged researchers to evaluate potential new practices in terms of dollars and cents. Such is never easy; and this particular effort toward quantifying wheat variety performance on the basis of total dollar return was no exception.

The Research Center initiated development of a 'Gross Dollar Return' database in 1988. Carlson had yield and protein performance data by year back to 1982 for numerous locations throughout northern Montana. A system needed to be developed to couple historic price information with corresponding agronomic performance for overall evaluation. Upon advice sought from Jim Christianson of the Montana Wheat and Barley Committee it was determined that market price values used for evaluating a given actual yield and corresponding protein level for varieties in given data years needed to be based on average annual prices. MWBC had the price information needed, but it was in the form of some 12,000 hand pencil entries for the needed seven years from 1982-1987. A computerized database was needed. As the Committee was already in the initial phases of computerizing the information themselves, the Research Center prepared a temporary, abridged database for pilot use early in 1988 utilizing only Wednesday markets in calculation of annual averages. Pacific Northwest values were used to eliminate confusing variability associated with freight rates at different points of origin. This 'Average of Wednesdays' database was used in 1988 to prepare some preliminary graphics featuring 1982-1987 data for MWBC and producer review.

By December 1988, Mark Schutt (then Information Officer for MWBC) had developed a spreadsheet utility affording more efficient computerization of the market data. However, going back to pick up all previous years for which MWBC had pencil data was going to require considerable time. Thus, NARC helped MWBC enter some of the data. At present, full market data for the years 1980-1994 have been made available to the Research Center. Thus, the analyses in this report feature annual market values per year based on daily market quotes for all years reported.

For each research location a multi-year, average gross market value per acre was determined for each selected variety. Such values were based on gross return for actual yield at the lowest consistently quoted protein level plus added gross return for protein premium, if any. The sum of the two values then represents the gross return per acre in a given market year. Calculations were made for each year the varieties were under evaluation at a particular location. The values were then tested via simple analysis of variance with data years as replications.

It should be noted that the current procedure affords no mechanism for appropriate adjustment of gross return where protein content is either below that termed as "minimum quoted" (10 percent for winter wheat and 13 percent for spring wheat, 12 percent for spring wheat beginning with 1994) or above that termed as "maximum quoted" (13 percent for winter wheat and 15 percent for spring wheat). Thus, discounts for protein below the minimum quoted - or added premiums sometimes available for protein above normal quote maximums, cannot be reflected in these data. Due to fertilization, situations where protein levels were below minimum are extremely rare in these research databases. However, situations where protein exceeded the maximum level for which market quotes were available are common in these data. Thus, in cases where proteins for standard protein

performance varieties in a particular trial are at the maximum level for which a market quote exists; entries with higher protein are not benefitted by additional premium as they may have been in a commercial marketing situation.

One must also remain aware that the marketing periods chosen for these analyses can have pronounced effects on the results due to obvious year differences in overall market price and premium spreads. Not unlike most crop evaluation procedures, but perhaps even more important in this case, data reliability increases with additional years of observation. At present, it would appear that a minimum of four to five years should be involved for meaningful comparison via this system.

In 1994, Carlson initiated a new "paired" trial series at Turner whereby 20 varieties each of wheat and barley will be evaluated for five years under both low and optimum nitrogen fertility.

**FUTURE PLANS:**

The Research Center plans to continue work with MWBC and wheat breeders in further developing and refining the use of these data with agricultural producers. Regression or other more sophisticated means of analysis could be introduced in work with these data. Use of additional data sets representing conditions of lower fertility will also be important to refine the assessment of economic benefits associated with production of high quality varieties.

### Average Annual Market Quotes \* (\$/Bu - Hard Red Winter Wheat) Pacific Northwest Delivery

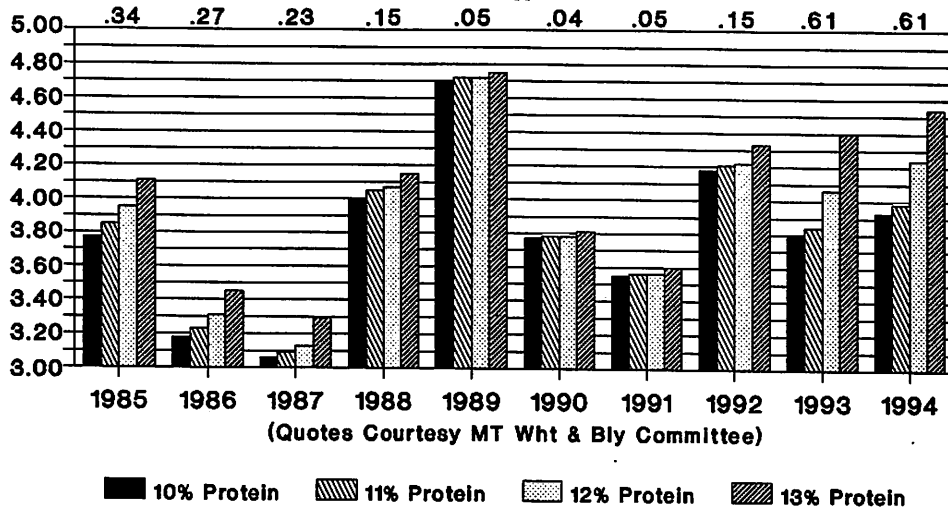


Figure 1.  
MSU/AES/NARC-Havre

### Average Annual Market Quotes \* (\$/Bu - Hard Red Winter Wheat) Pacific Northwest Delivery

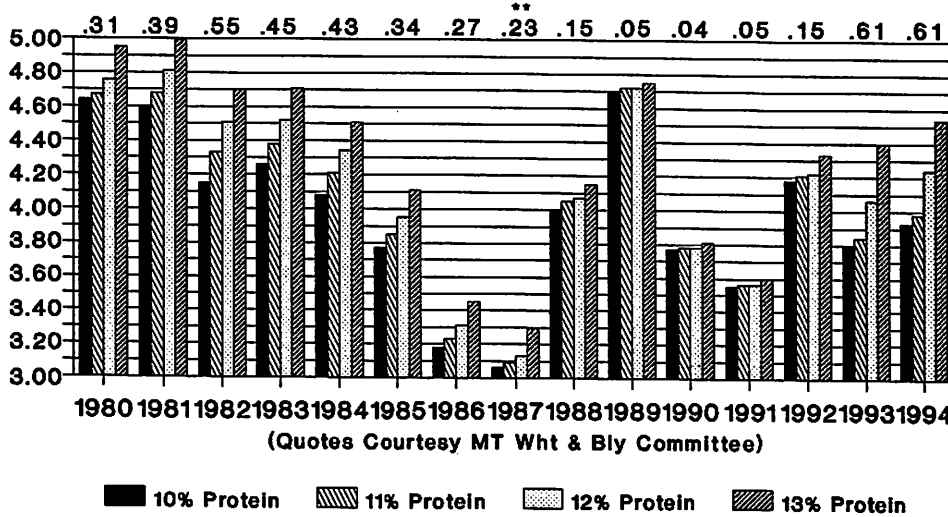


Figure 1a.  
MSU/AES/NARC-Havre

### Average Annual Market Quotes \* (\$/Bu - Dark Northern Spring Wheat) Pacific Northwest Delivery

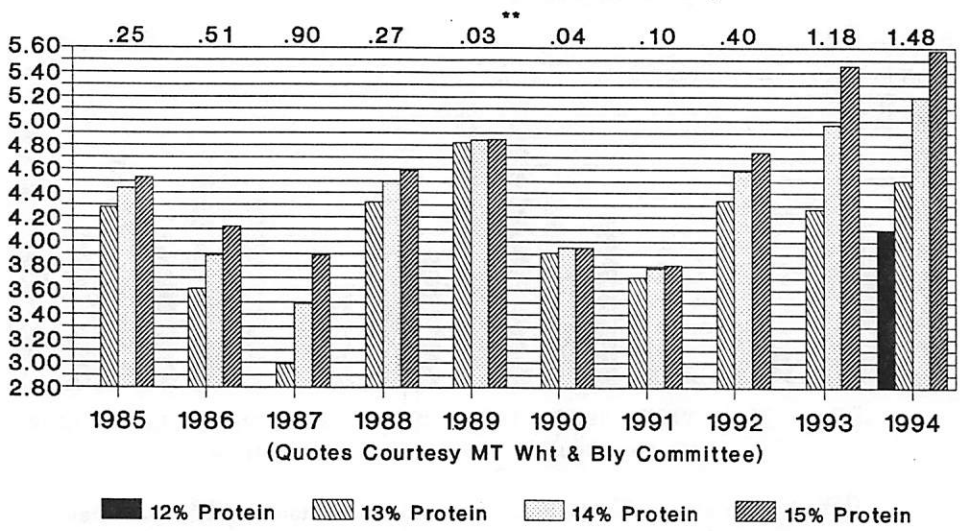


Figure 2.  
MSU/AES/NARC-Havre

• Average of All Market Days/Market Year  
•• \$/Bu Diff Between Min & Max Pro Quote

### Average Annual Market Quotes \* (\$/Bu - Dark Northern Spring Wheat) Pacific Northwest Delivery

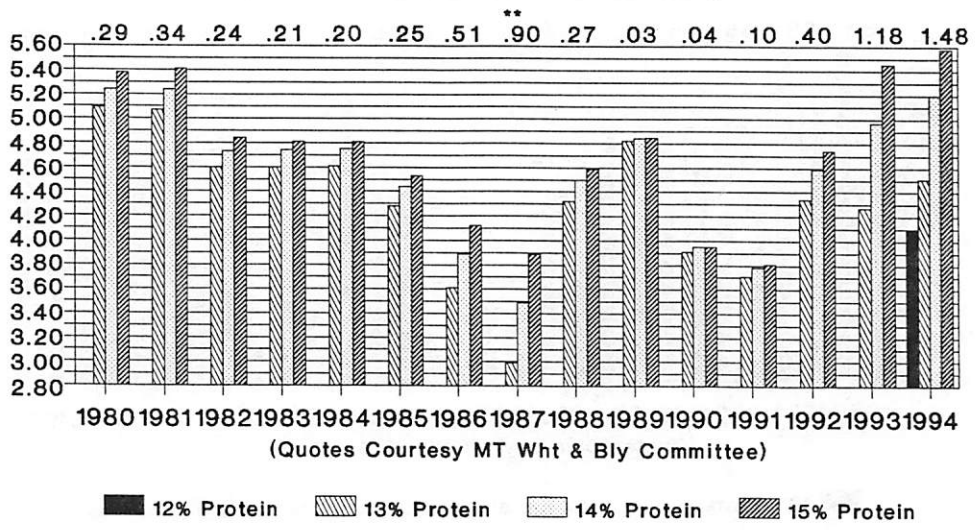
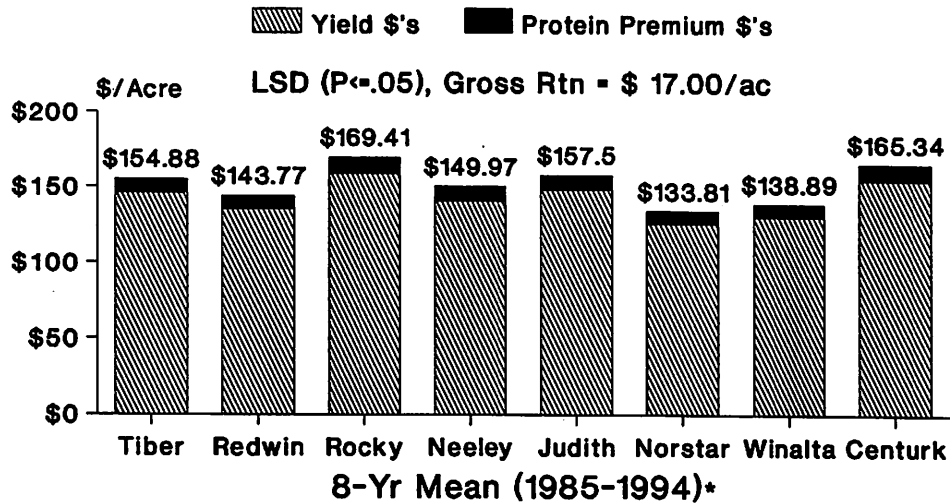


Figure 2a.  
MSU/AES/NARC-Havre

• Average of All Market Days/Market Year  
•• \$/Bu Diff Between Min & Max Pro Quote

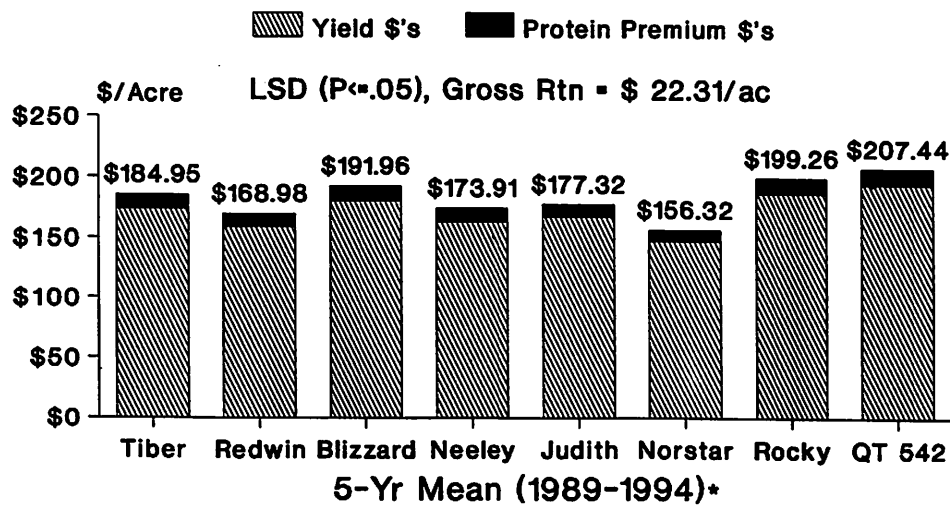
### Gross Return - Fallow Winter Wheat (\$ Yield at 10 % Protein + Premium) Northern Ag Research Center, Havre



**Figure 3.**  
MSU/AES/NARC-Havre

\*1985 Lost to Drought, 1992 Lost to Hail  
Basis = PNW Average Annual Market/Year

### Gross Return - Fallow Winter Wheat (\$ Yield at 10 % Protein + Premium) Northern Ag Research Center, Havre



**Figure 3a.**  
MSU/AES/NARC-Havre

\*1992 nursery lost to hail  
Basis = PNW Average Annual Market/Year

### Gross Return - Fallow Winter Wheat (\$ Yield at 10 % Protein + Premium) Myers Farms Inc., Big Sandy

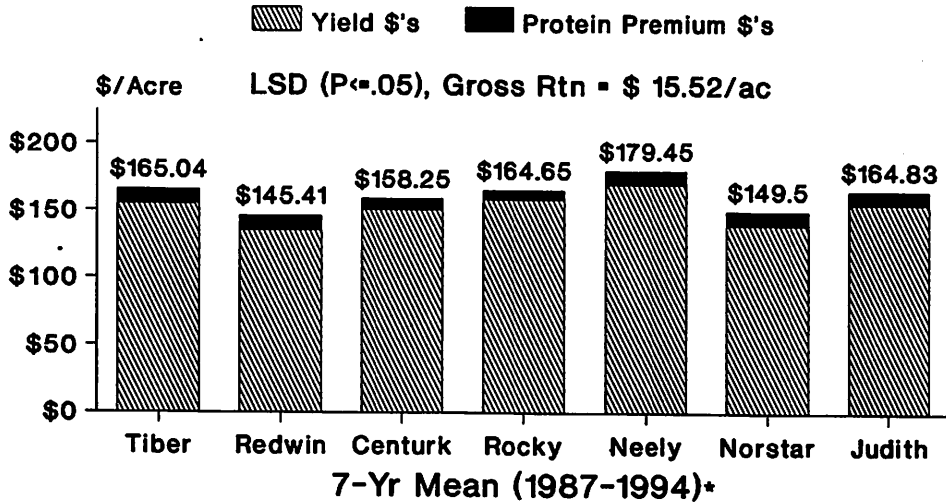


Figure 4.  
MSU/AES/NARC-Havre

\*1989 Lost to Winterkill  
Basis = PNW Average Annual Market/Year

### Gross Return - Fallow Winter Wheat (\$ Yield at 10 % Protein + Premium) Mark & Nancy Peterson Farm, North Havre

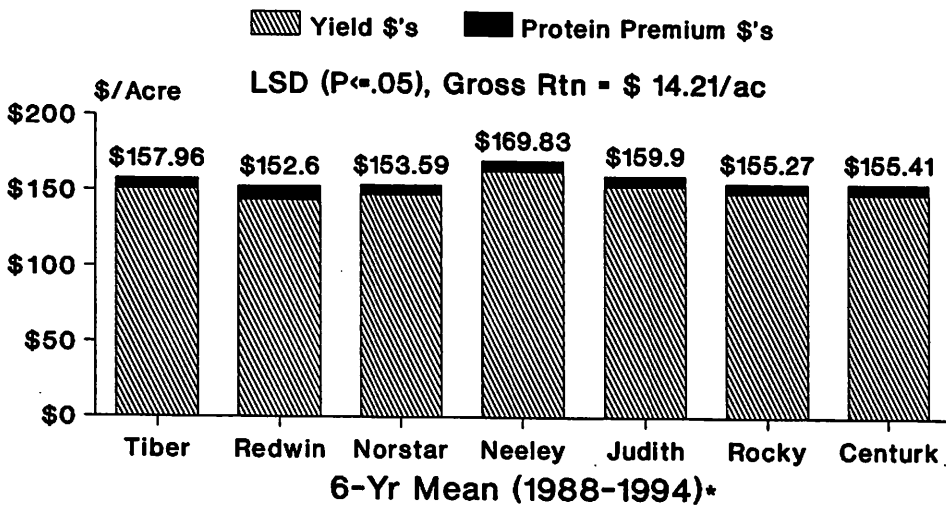
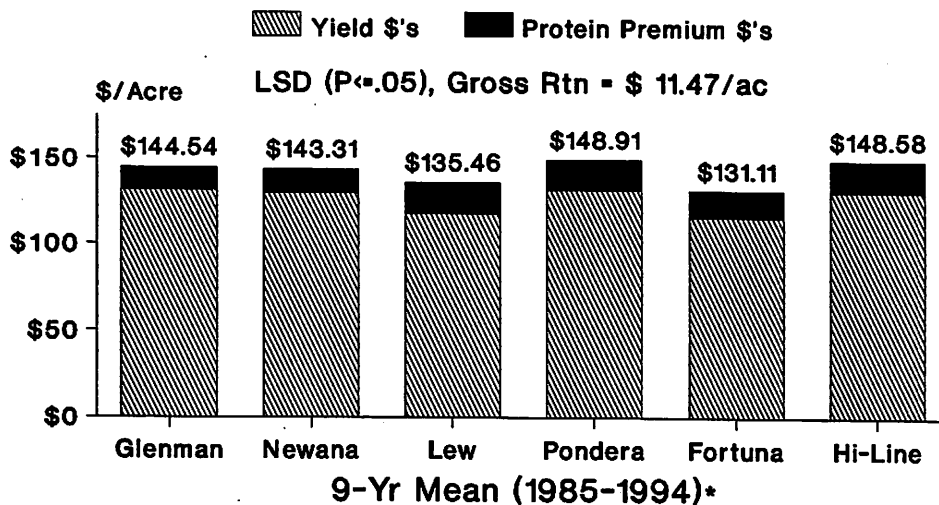


Figure 5.  
MSU/AES/NARC-Havre

\*1989 Lost to Winter Kill  
Basis = PNW Average Annual Market/Year

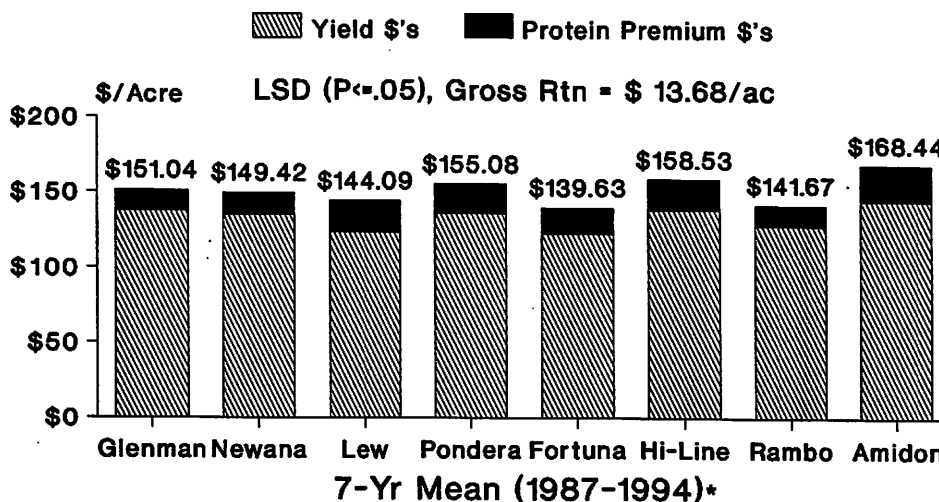
### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Northern Ag Research Center, Havre



**Figure 6.**  
MSU/AES/NARC-Havre

\*1992 nursery lost to hail  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1985-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Northern Ag Research Center, Havre



**Figure 6a.**  
MSU/AES/NARC-Havre

\*1992 nursery lost to hail  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1987-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Northern Ag Research Center, Havre

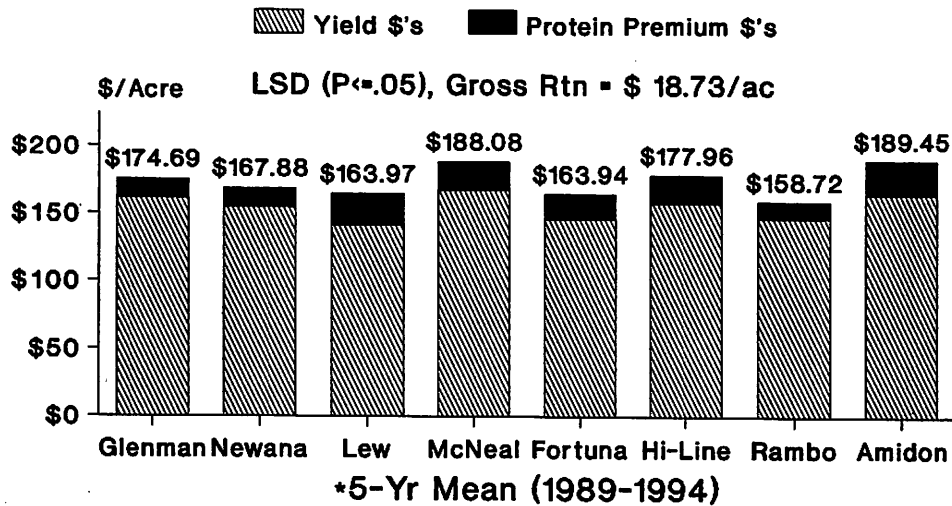


Figure 6b.  
MSU/AES/NARC-Havre

\*\*1992 nursery lost to hail  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1989-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Leon Cederberg Farm, Turner

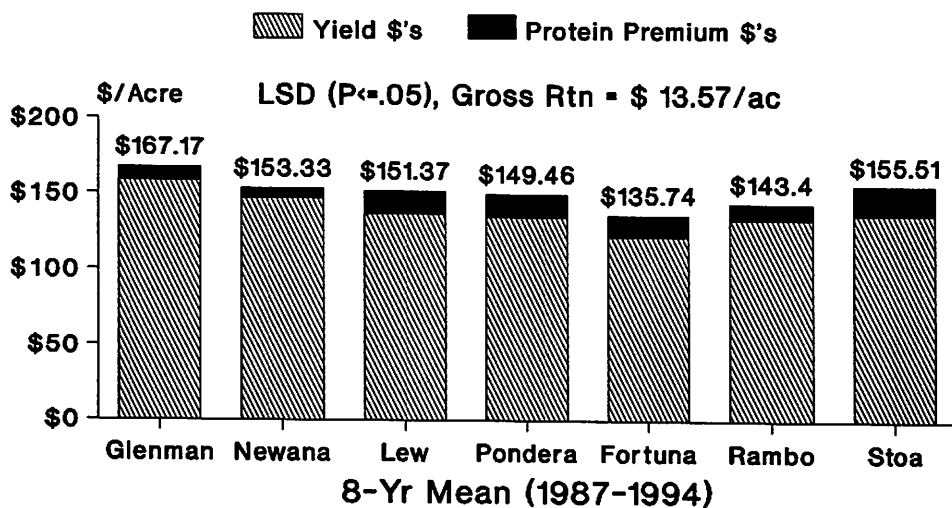
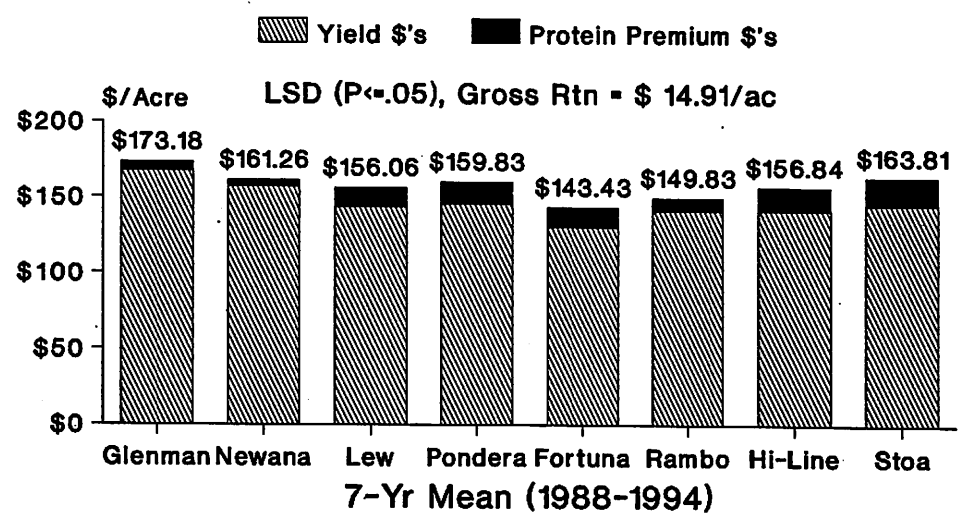


Figure 7.  
MSU/AES/NARC-Havre

Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1987-93)

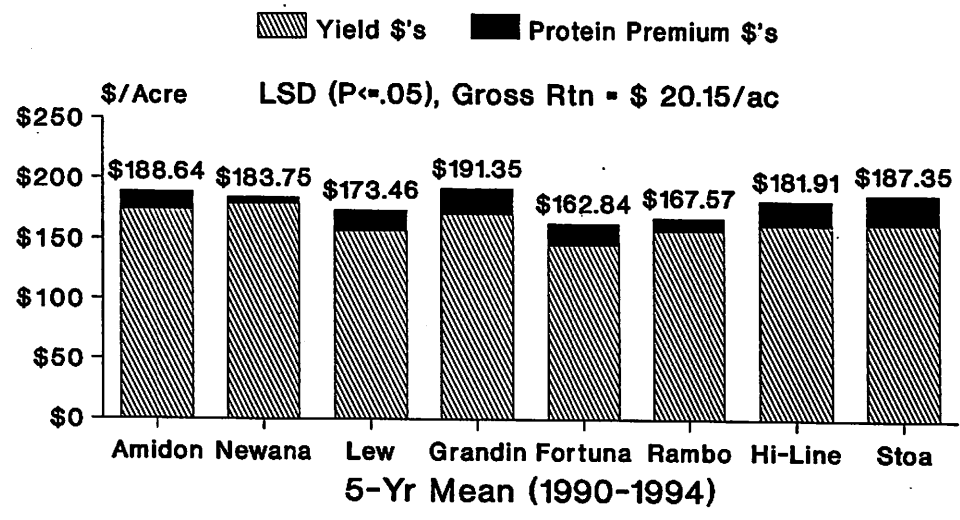
### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Leon Cederberg Farm, Turner



**Figure 7a.**  
MSU/AES/NARC-Havre

Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1988-93)

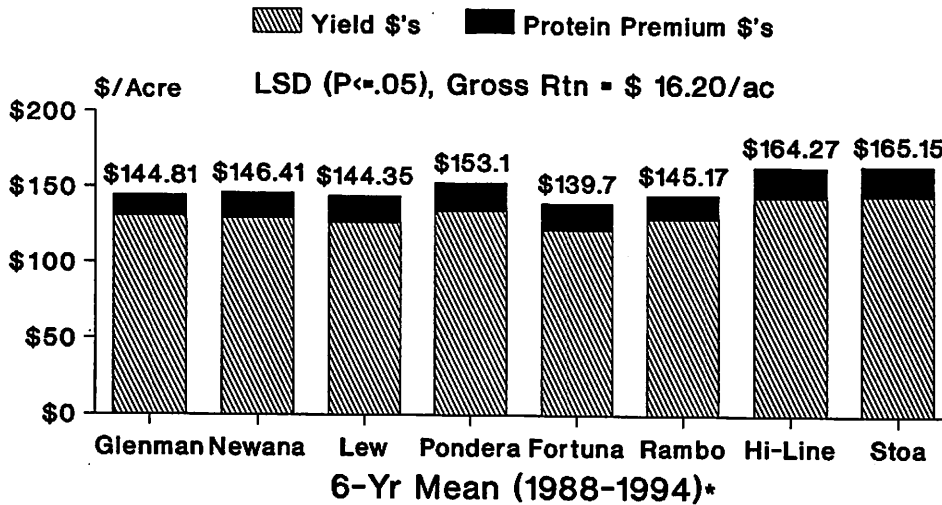
### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Leon Cederberg Farm, Turner



**Figure 7b.**  
MSU/AES/NARC-Havre

Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1990-93)

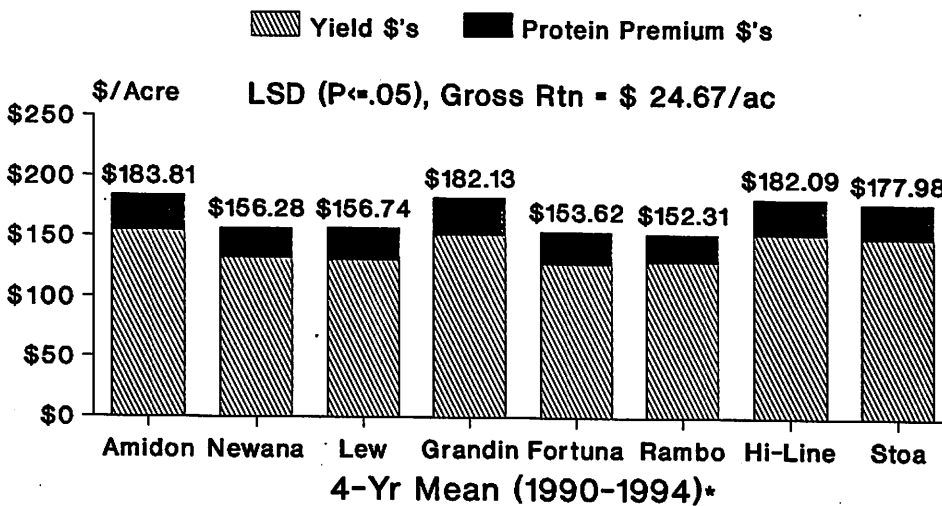
## Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Myers Farms Inc., Big Sandy



**Figure 8.**  
MSU/AES/NARC-Havre

\*1992 Crop Lost to Poor Stand + WSMV  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1988-93)

## Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Myers Farms Inc., Big Sandy



**Figure 8a.**  
MSU/AES/NARC-Havre

\*1992 Nursery Lost to Poor Stand + WSMV  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1990-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Mark & Nancy Peterson Farm, North Havre

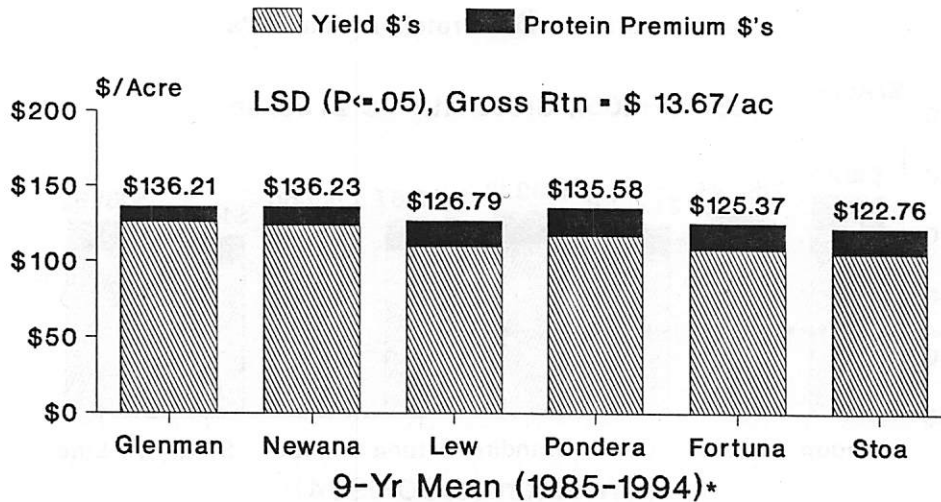


Figure 9.  
MSU/AES/NARC-Havre

\*1992 Nursery Lost to Hail  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1985-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Mark & Nancy Peterson Farm, North Havre

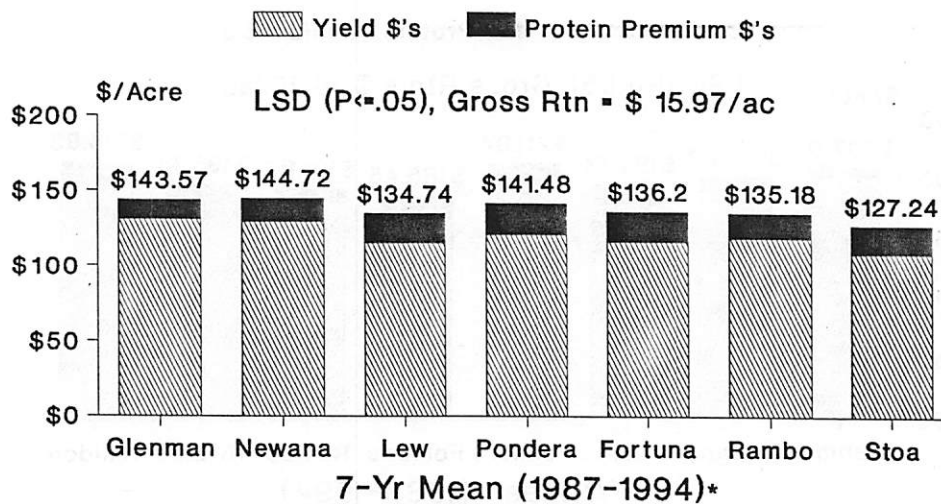


Figure 9a.  
MSU/AES/NARC-Havre

\*1992 Nursey Lost to Hail  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1987-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Mark & Nancy Peterson Farm, North Havre

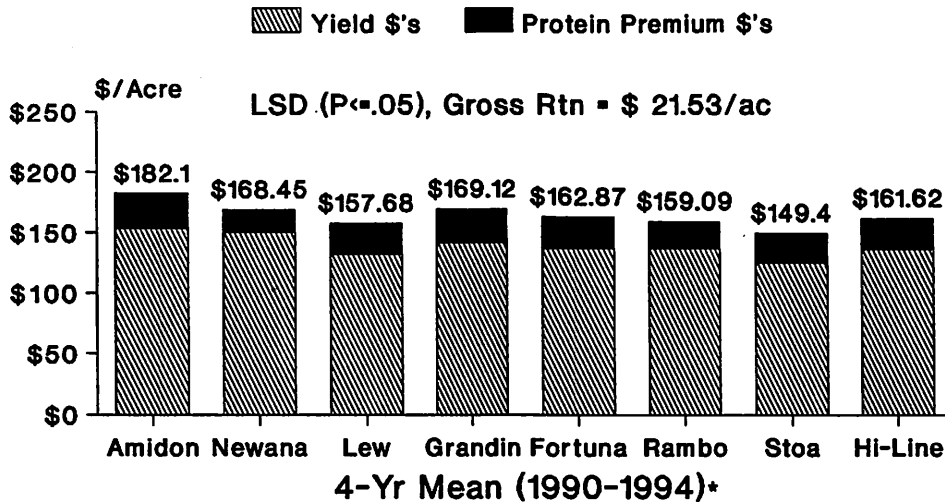


Figure 9b.  
MSU/AES/NARC-Havre

\*1992 Nursey Lost to Hell  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1990-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Graff Farms Inc., No. Joplin

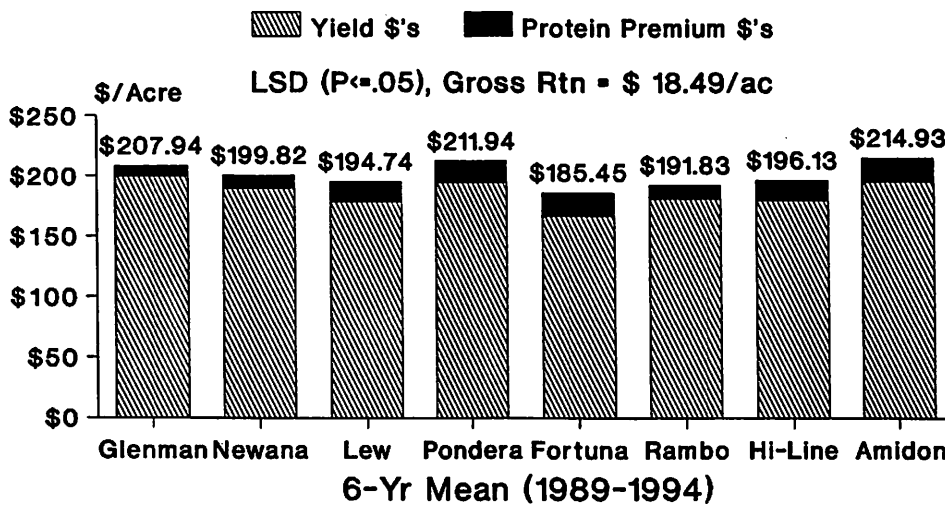


Figure 10.  
MSU/AES/NARC-Havre

Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1989-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Graff Farms Inc., No. Joplin

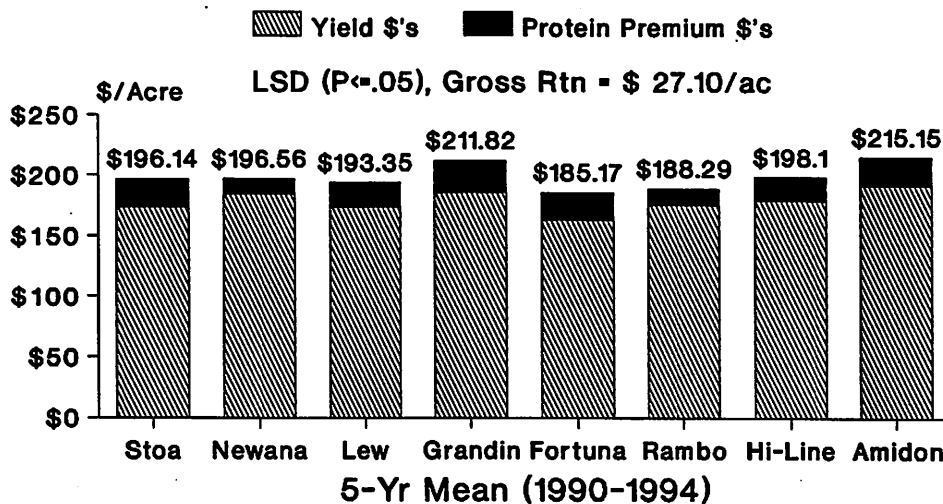


Figure 10a.  
MSU/AES/NARC-Havre

Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1990-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Sidney Solberg Farm, North Dodson

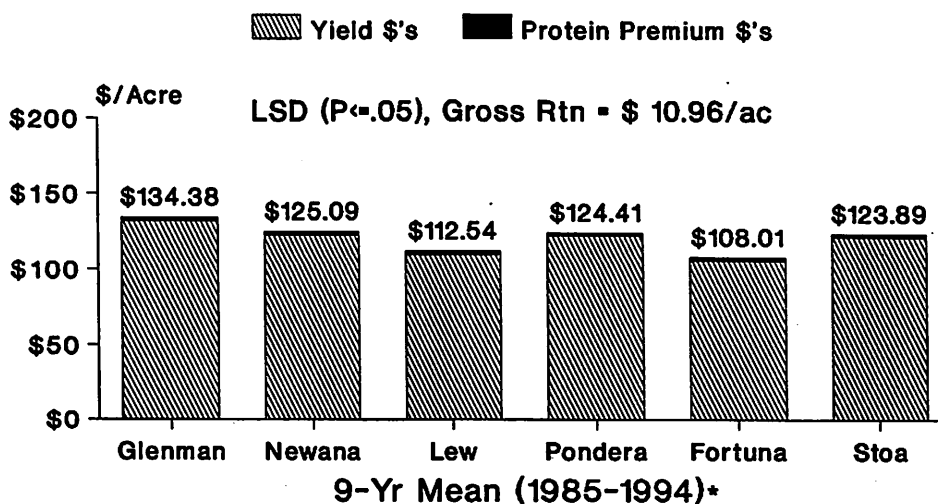


Figure 11.  
MSU/AES/NARC-Havre

\*1992 Trial Lost to Early Season Drought  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1985-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Sidney Solberg Farm, North Dodson

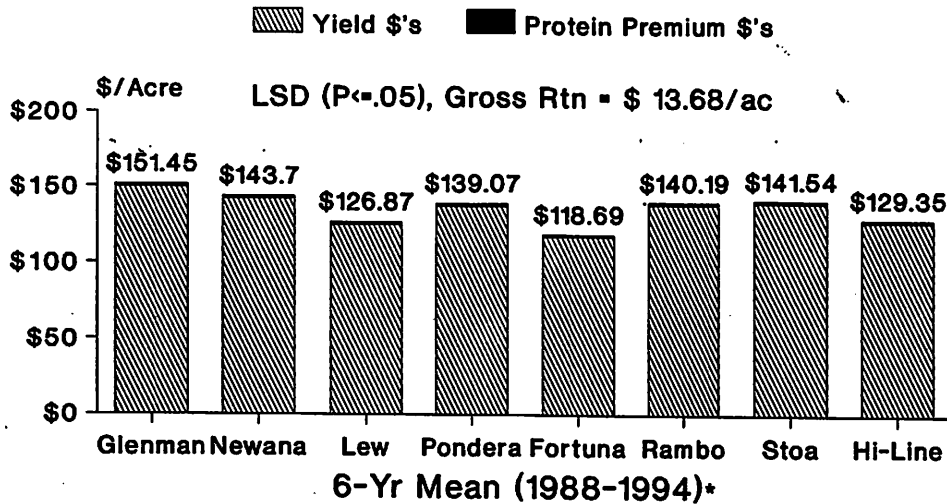


Figure 11a.

MSU/AES/NARC-Havre

\*1992 Trial Lost to Early Season Drought  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1988-93)

### Gross Return - Fallow Spring Wheat (\$ Yield at Min.Quote Protein + Premium) Sidney Solberg Farm, North Dodson

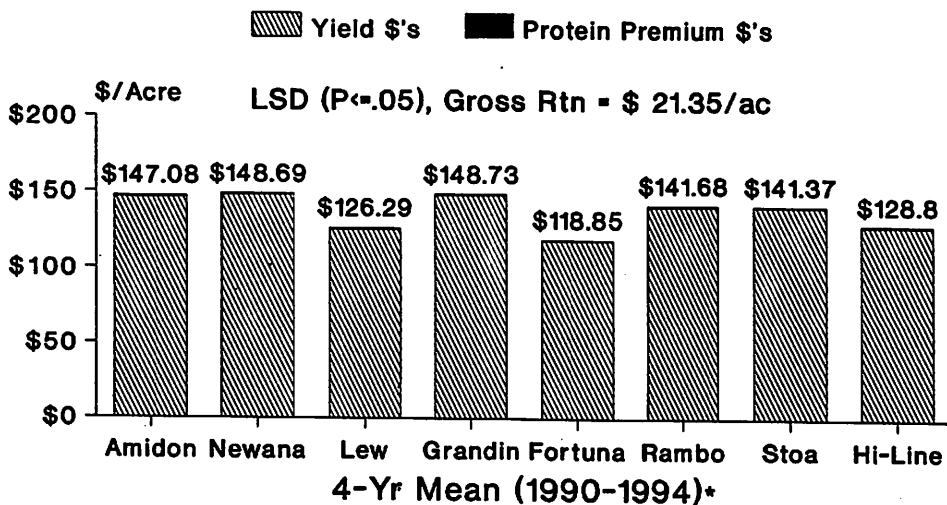


Figure 11b.

MSU/AES/NARC-Havre

\*1992 Trial Lost to Early Season Drought  
Basis = PNW Average Annual Market/Year  
Min.Quote@12%Pro.(1994),13%(1990-93)